Executives’ Characteristics and Corporate Policies

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Dedication

I dedicate this thesis to my late friend, teacher, and grandfather, Sheikh Abdullah Al-Mubarak. May Allah grant him paradise.

Abstract

Recent regulatory and demographic developments in corporate governance point to changes in managerial gender and age. These changes call for a better understanding of the various implications of managers' gender and age on firms. Existing studies suggest that managerial gender and age are systematically related to the riskiness of the firm (Huang and Kisgen 2013; Serfling 2014). These studies are mainly focused on the CEO. However, Hambrick and Mason (1984) advance the Upper Echelons Theory (UET) and argue that management is a shared activity, in which CEOs delegate responsibilities and authority to the rest of their top management teams (TMTs). They call for examining the implications of managerial characteristics at the TMT level, rather than the CEO alone. This thesis extends the literature by analysing the predictions of the UET, specifically by empirically examining whether the proportion of female managers in the TMT and the average age of the TMT are related to three major corporate financial policies.

The first empirical chapter (Chapter 3) investigates corporate cash holdings, which are held for precautionary reasons (Bates, Kahle, and Stulz 2009). Hence, I examine whether managerial gender and age at the TMT level are related to cash holdings. Using a large sample comprising S&P 1500 firms for the period 1992 to 2013, the results indicate that the percentage of female managers in the TMT is positively related to cash holdings, indicating a possibility that TMTs with more female executives are more risk-averse or less overconfident, leading to further emphasis on the precautionary need for cash. Further, the average age of the TMT is negatively related to cash holdings, suggesting that older TMTs are more confident with regard to taking risker choices. Further analysis suggests that the ages of the CEO and CFO are negatively related to cash holdings, indicating that executives other than the CEO may exercise some influence over the cash holdings decision.

The second empirical chapter (Chapter 4) studies R&D investments, which are risky since they entail certain costs with highly uncertain payoffs (Abdel-Khalik 2014). Therefore, I investigate whether managers' gender and age at the TMT level are related to R&D investments. The analyses indicate that the percentage of female managers in the TMT and R&D investments are negatively related, consistent with the view that TMTs with more females might be more risk-averse or less overconfident, reducing investments in risky assets. Also, both female CEOs and CFOs are negatively related to R&D investments. Moreover, the results point to the lack of a systematic relationship between the average age of the TMT and R&D investments, which is theoretically possible since the experience we gain from ageing could offset the risk-

aversion we develop as we age (Worthy et al. 2011). Nevertheless, the additional analysis shows that the CEO’s age (CFO’s age) is negatively (positively) related to R&D investments. Thus, the lack of a systematic relation between the average age of the TMT and R&D investments might be a product of cancelling out effect within the members of the TMT.

The third empirical chapter (Chapter 5) examines two aspects of corporate payout policy; namely, the payout levels and payout methods. First, managers may face trade-offs between payouts and investments, assuming that they cannot accumulate cash for perpetuity (Caliskan and Doukas 2015). Thus, I examine whether managerial gender and age at the TMT level are related to the corporate payout levels. The analysis indicates that the percentage of female managers in the TMT is positively related to the payout levels. This is possibly because TMTs with more females are more risk-averse or less overconfident, choosing to distribute funds, given that that this choice is less risky than investments. There is also some evidence to suggest that the average age of the TMT and payout levels are negatively related, indicating that older TMTs take more risks (i.e. invest rather than distribute funds). Further analysis reveals some evidence that the CFO’s age is negatively associated with the payout levels, suggesting that CFOs are more influential in setting the payout levels.

Second, after setting the payout amount, managers decide on the payout method; broadly, dividends or stock repurchases (Eisdorfer, Giaccotto, and White 2015). Compared to dividends, stock repurchases improve the financial flexibility of the firm since they do not entail future commitments (Bonaimé, Hankins, and Harford 2014). Accordingly, I investigate whether managerial gender and age at the TMT level are related to the corporate payout method. The analysis shows that the proportion of female executives in the TMT and the proportion of stock repurchase to total payouts are positively related. This is possible because such TMTs rely more on stock repurchases in distributing cash to the shareholders to retain the financial flexibility of the firm. The average age of the TMT is negatively related to the payout flexibility, indicating that older TMTs may adopt risker choices. Additional analysis shows that the ages of the CEOs and CFOs are negatively related to payout flexibility, supporting the view that managers other than the CEO could influence the corporate policies and highlighting the importance of incorporating other TMT members when examining managerial characteristics.

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Chapter 1 Introduction

The traditional accounting and finance literature has investigated the influence of various firm, industry, and country characteristics on corporate financial policies. This strand of literature has identified factors determining the variations in corporate policies. Yet, a growing body of literature is departing from this tradition and investigating whether managerial characteristics can influence the policy decisions and outcome of the firms. The aim of this strand of literature is to explore what determines corporate polices (Malmendier and Tate 2005a; Malmendier, Tate, and Yan 2011). The underlying premise of this literature is that managerial preferences can affect corporate policies, contrary to the argument that managers strictly follow firms' pre-set policies. Indeed, Bertrand and Schoar (2003) formally show that managers have fixed effects on their firms, i.e. managerial preferences play an important role in explaining the variation in corporate policies.

Prior studies have tended to focus on the influence of various CEO and, to a lesser extent, CFO characteristics on corporate policies. However, one of the earliest frameworks to incorporate managerial characteristics when investigating the outcome of the firm is the Upper Echelons Theory (UET), postulated by Hambrick and Mason (1984). They argue that managerial characteristics could potentially play an important role in setting corporate policies. The underlying reason is that managerial characteristics could alter the ways in which reality is seen and analysed. This could in turn affect managerial corporate decisions. For example, they suggest that, because ageing could potentially increase risk-aversion, it is possible that older executives prefer conservative policies.

Moreover, one of the key features of the UET relates to the measurement unit when investigating the influence of managerial characteristics on corporate policies. In particular, while Hambrick and Mason (1984) acknowledge that the CEO might be the most influential executive in setting corporate policies, they argue that senior executives work in teams. Hence, studies should cover the influence of the wider managerial team rather than the CEO alone. They suggest that "At a more practical level, study of the entire team increases the potential strength of the theory to predict, because the chief executive shares tasks and, to some extent, power with the entire team" (p.196). When revisiting the theory, Hambrick (2007) further states that the "Leadership of a complex organization is a shared activity, and the collective cognitions, capabilities, and interactions of the entire TMT enter into strategic behaviors" (p.334). The UET argument finds support from two strands of literature. First, studies in the psychology literature document that the risk-aversion of one group member can influence the risk-aversion of the rest of the group (Wallach, Kogan, and Bem 1962). In line with this argument, Malmendier and Zheng (2013) note the possibility of a peer effect between managers within the same firm. Similarly, Berger, Kick, and Schaeck (2014) emphasise the importance of the team's perspective and postulate that the process of decision-making is achieved via dynamic interactions among the managers within the management team. Serfling (2014) examines the effect of CEO age on the riskiness of the firm and documents a stronger influence when considering the ages of both the CEO and second most influential executive.

Furthermore, prior studies investigating the influence of managerial characteristics on corporate financial policies demonstrate that executives other than the CEO matter in setting corporate policies. For example, CFOs may have more influence over debt maturity (Chava and Purnanandam 2010), future stock price crash (Kim, Li, and Zhang 2011), and financial reporting (Liu, Wei, and Xie 2016). Other studies advocate that COOs might have a substantial influence over the outcome of the firm (Aggarwal and Samwick 2003). Given these reasons, and the scarcity of finance studies adopting the UET perspective, this thesis extends the literature by adopting the UET and investigating whether managerial characteristics of the top management team (TMT) can explain some of the variation in corporate financial policies.

In particular, this study examines the potential influence of two important characteristics of the top management team, namely gender and age, on corporate policies. The importance of these two characteristics is due to the evolving developments in the global regulatory and demographics environments, which affect managerial gender and age. For various reasons, including gender equality, countries are pushing for larger female representation within corporations. Governments are pushing for more female participation in their economies and corporate leadership. A recent report by the World Bank [1] finds that several countries, including Norway, Spain, India, and Germany, have introduced legal quotas for female board representation in publically traded firms.

[1] Iqbal, Sarah. 2015. *Women, business, and the law 2016: getting to equal (English)*. Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/455971467992805787/Women-business-and-the-law-2016-getting-to-equal

Similarly, managerial age is changing due to several reasons, including the improvements in healthcare (i.e. longevity) and the declining birth rate (Brooks et al. 2018). Average life expectancy has increased from 52 in 1960 to 67 in 2000, reaching 72 in 2016.[2] In turn, several countries are extending their retirement age to match these demographic changes. For example, the retirement age in the US is expected to increase.[3] These regulatory and demographic changes call for a better understanding of the various implications of managerial gender and age on corporate policies.

To contribute to this front, this thesis examines whether the aforementioned characteristics can affect corporate policies. The argument that managerial gender and age can influence corporate policies is conceivable, given that these two characteristics have been linked theoretically and empirically to risk-taking. First, prior studies in the psychology literature provide strong evidence for a systematic difference between males and females in risk-taking behaviour. These studies mainly demonstrate that males take more risks than females, either because of female risk-aversion or male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). Nonetheless, Croson and Gneezy (2009) suggest that this relationship is smaller or even missing in the studies examining managerial gender. This has elevated scholars' interest in examining whether this gender-based difference persists among executives. For instance, Faccio, Marchica, and Mura (2016) argue that it is possible that the gender-based difference in risk-taking does not persevere among top executives since these executives may differ from the rest of the population.

Several studies examining the influence of managerial gender on the riskiness of the firm have emerged. Huang and Kisgen (2013) report that male CEOs and CFOs adopt aggressive policies, such as conducting more acquisitions, issuing more debt, and provide a smaller range of earning forecasts. They attribute their findings to male overconfidence. Khan and Vieito (2013) report that female CEOs are associated with lower stock volatility (total risk), and suggest that this is due to female risk-aversion. Faccio, Marchica, and Mura (2016) find that female CEOs are associated with lower leverage and earnings volatility, and higher survival chance. Nevertheless, this strand of literature is mainly focused on the CEOs and CFOs to a lesser extent.

[2] The World Bank Webpage (https://data.worldbank.org/)
[3] Social Security Webpage (https://www.ssa.gov/)

Recent studies have begun to incorporate the UET argument and investigate the influence of gender diversity on the riskiness of the firm. For example, Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin (2014) and Perryman, Fernando, and Tripathy (2016) find that the percentage of female executives in the TMT is negatively associated with the total risks of the firm (stock return volatility). On the other hand, Berger, Kick, and Schaeck (2014) document an increase in banks' portfolio risks following an increase in female participation on the executive board, attributing their findings to the lower experience of female executives compared to that of male executives. This thesis aims to extend this strand of literature by investigating the influence of female representation on the TMT on three corporate financial policies that could determine the riskiness of the firm. Hence, it is the first comprehensive study that investigate the role of TMT gender on the riskiness of corporate policies.

Secondly, while the influence of gender on risk-taking is well established in the literature, at least among the lay population, the relationship between ageing and risk-taking remains unclear. At the individual level, the literature encompasses theoretical reasoning supporting a positive, negative, and non-significant relationship between ageing and risk-taking. Empirically, studies at the individual level report mixed evidence on the relationship between age and risk-taking (Bonem, Ellsworth, and Gonzalez 2015).

Moreover, scholars investigating the influence of managerial age on risk-taking have incorporated other theoretical models to explore how managerial age might influence their risk-taking behaviours within the firm (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). On one hand, managerial age could be negatively associated with corporate risk-taking. As managers age, their career horizons become shorter, incentivising them to adopt conservative policies whose benefits may appear in the near future. Further, younger executives may wish to signal their abilities since they do not have a well-established reputation. One possible way to build such a reputation is by adopting more aggressive policies, such as investing in R&D. Also, Hambrick and Mason (1984) present several additional reasons for a negative association between managerial age and corporate risk-taking, including a greater commitment to the *status quo* of the firm.

However, it is also possible that the decline in risk-taking behaviour due to ageing is offset by the increased experience associated with ageing, suggesting the lack of a systematic difference in risk-taking between older and younger managers (Worthy et al. 2011). On the other hand, managerial age might be positively related to corporate risk-taking. As managers age, they develop a reputation, based on their previous accomplishments. This view assumes that managers continue to be managers since they have been performing well and accumulating a good reputation over time. This reputation could in turn protect them when they fail, allowing older managers to take bolder and riskier decisions.

The findings on the relationship between managerial age and the riskiness of the firm seem to favour a negative relationship between managerial age and the riskiness of the firm. Yim (2013) reports a negative association between CEO age and the likelihood of conducting acquisitions, a risky investment. Similarly, Serfling (2014) shows that older CEOs are associated with lower total risks and conservative corporate policies, such as lower R&D investments and leverage. Li, Low, and Makhija (2017) report similar results and show that younger CEOs are more likely to change the size of the firm and introduce new lines of businesses into them. However, Iqbal (2013) finds that younger CEOs are more likely to use hedging instruments, a conservative choice. Notably, these studies are mainly focused on the CEO, but the relationship between the average managerial age and the conservativeness of corporate financial policies is not clearly understood. Thus, this study extends the literature and investigates this relationship at the TMT level.

The aforementioned discussion establishes the possibility that managers' gender and age can influence their risk-taking behaviour, and consequently the riskiness of the corporate policies. That is: TMT members with characteristics that are associated with risk-aversion (overconfidence) may adopt safer (risker) policies. Therefore, this study examines the influence of the TMT members' gender and age on three corporate financial policies that might be influenced by managerial risk-taking behaviour. Consistnet with Chava and Purnanandam (2010), the examined policies are theoretically and empirically related to the riskiness of the firm. These policies are cash holdings (chapter 3), R&D investments (chapter 4), and payout policy (chapter 5).

1.1. Executives' Characteristics and Cash Holdings

Following the recent rise of corporate cash holdings, scholars have begun to investigate the determinants of corporate cash holdings. This chapter extends the literature by investigating whether managerial gender and age can explain some of the variation on corporate cash holdings with the framework of UET.

Prior studies have identified several motives for holding cash. One of the commonly-cited motives is the precautionary. Firms hold cash in order to have the resources needed to weather periods of financial distress and invest in opportunities at times when external finances are unavailable or costly (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999). From this perspective, cash holdings could be seen as negative debt, a hedging instrument, or internal capital, that can be used when external finance is unavailable or costly (Chava and Purnanandam 2010). Given these reasons, several studies have argued that maintaining more liquid assets is a conservative policy (Cassell et al. 2012; Ferris, Javakhadze, and Rajkovic 2017). Thus, risk-averse (overconfident) managers may hold more (less) cash.

Using a large dataset from ExecuComp and Compustat spanning the period 1992 to 2013 for S&P 1500 firms, two main findings have emerged. First, the analysis shows that the proportion of female executives on the TMT and corporate cash holdings are positively related. This is consistent with the view that TMTs with more female managers place more emphasis on the precautionary need to hold cash, due to female risk-aversion or male overconfidence. Second, the average age of TMT members is negatively associated with cash holdings. A potential explanation for this is that TMT with older managers can take more risks since they have a better reputation that could protect them when they fail, leading them to hold less cash for precautionary reasons. These results continue to hold using alternative measures for cash holdings, managerial gender and age, control variables, using different estimators, and controlling for managerial compensation and wealth.

In an additional analysis, I use hand-collected data and investigate the characteristics of CEOs and CFOs. The results show a positive association between female CEOs and corporate cash holdings. Moreover, the ages of CEOs and CFOs are negatively related to cash holdings. These results continue to hold when controlling for managerial compensation and wealth. Therefore, these findings support the view that senior managers other than the CEO matter in setting corporate policies (Hambrick and Mason 1984).

This chapter contributes to three strands of literature. It contributes to the ongoing research examining the determinants of cash holdings by identifying managerial gender and age as two managerial characteristics that affect cash holdings. Second, it contributes to studies examining the relationship between managerial gender and cash holdings. Adhikari (2018) finds a positive relationship between the percentage of female executives in the TMT and corporate cash holdings.[4] This study complements his findings by showing that this relationship persists even after controlling for managerial age, tenure, compensation and wealth. Moreover, several studies show that female CEOs (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015) and CFOs (Peltomäki, Swidler, and Vähämaa 2018)[5] are positively associated with cash holdings. This study provides similar results for female CEOs, but the gender of CFOs does not systematically influence cash holdings. While previous studies mainly explain these findings based on the female risk-aversion argument, this study suggests that it is equally possible that these results are driven by male overconfidence (Barber and Odean 2001; Huang and Kisgen 2013). Third, prior studies provide mixed evidence on the relationship between executives' age and cash holdings. Studies have reported a positive relationship between CEO age and cash holdings (Bertrand and Schoar 2003; Orens and Reheul 2013). Conversely, Peltomäki, Swidler, and Vähämaa (2018) report a negative relationship between the ages of CEOs and CFOs and cash holdings. Using a large dataset, the evidence in this study indicates that the average age of TMTs and the age of CEOs and CFOs are negatively related to cash holdings. These findings could be attributed to the better reputation that older executives enjoy, enabling them to take more risks.

1.2. Executives' Characteristics and R&D Investments

Given the importance of corporate R&D investments as a key driver of economic growth, prior studies investigate the determinants of R&D investments. This chapter

[4] Adhikari (2018) was published after the completion of this chapter.
[5] Working paper (https://ssrn.com/abstract=2547516)

extends this strand of literature by incorporating the UET and investigating whether managerial gender and age can influence R&D investments.

Prior studies have argued that R&D investments are risky for several reasons (Abdel-Khalik 2014; Barker and Mueller 2002; Kim and Lu 2011; Serfling 2014). First, investing in R&D requires certain costs with highly uncertain results. Second, because R&D investments require hiring researchers, adjusting R&D investments becomes costly due to the costs arising from firing and hiring researchers, thereby reducing the financial flexibility of the firm and potentially leading to a loss of know-how to competitors. Third, R&D investments produce intangible assets, which may not be accepted as collateral, reducing the ability of the firm to raise capital (Berger and Udell 1995). Existing studies adopt the argument that R&D investments are risky (Cassell et al. 2012; Hirshleifer, Low, and Teoh 2012; Hutton, Jiang, and Kumar 2015). Hence, TMTs with characteristics related to risk-aversion (overconfidence) might be associated with lower (higher) R&D investments.

The results show a negative relationship between the percentage of female executives in the TMTs and R&D investments. This relationship continues to hold when several robustness checks are applied. One possible explanation for this is that TMTs with more female executives are more risk-averse or less overconfident, leading to lower level of R&D investments, since these are risky.[6] However, the relationship between the TMT's average age and R&D investments is generally insignificant. This finding may suggest that the decline in risk-taking associated with ageing is offset by an increase in risk-tolerance resulting from experience (Worthy et al. 2011). Yet, the insignificance may also arise if managerial age at different levels affects R&D investments in different directions.

To resolve this issue and gain further insight, I examine the relationship between managerial gender and age and corporate R&D at finer levels; namely, the CEO and CFO levels. The findings indicate that female CEOs and CFOs are associated with lower R&D

[6] It is important to note that reducing the R&D investment does not necessarily have a negative effect on the firm. For instance, it is possible that an "only male" TMT is more overconfident, and therefore overinvests in R&D. That is, while both higher risk-aversion and lower overconfidence may lead to this negative association, these two explanations may differ in terms of the impact on the value of the firm.

investments, in line with the findings from the TMT model. Importantly, while the age of the CEO is negatively related to R&D investments, the age of the CFO is positively related to it. This discrepancy might be why a relationship is not observed between TMT average age and R&D investments.

This study extends the literature in several ways. First, it identifies managerial gender and age as potential determinants for R&D investments. Second, Peltomäki, Swidler, and Vähämaa (2018) find that R&D investments and female CEOs (CFOs) are positively (negatively) associated. Elsaid and Ursel (2011) document a decline in R&D investments following the appointment of a female CEO. Using a larger dataset, I show that both female CEOs and CFOs are negatively related to R&D investments. Importantly, this study provides new evidence that the percentage of female managers in the TMT is negatively related to R&D investments. Third, consistent with prior studies (Barker and Mueller 2002; Chowdhury and Fink 2017; Peltomäki, Swidler, and Vähämaa 2018; Serfling 2014), the results show that CEO age is negatively related to R&D investments, even after controlling for managerial gender and tenure. However, the results indicate the CFO age is positively associated with R&D investments.[7] Further, the evidence suggests that the average age of the TMT and R&D investments are not systematically related. This discrepancy calls for a better understanding of the relationship between managerial age and R&D investments.

1.3. Executives' Characteristics and Payout Policy

Conflicting theoretical arguments on what determines corporate payout policy exist in the literature. Several studies have investigated the demand (i.e. investors) and supply (firm/managers) determinants of payout policy. DeAngelo, DeAngelo, and Skinner (2009) argue that managerial bias and hubris may play an important role in explaining corporate payouts. This chapter aims to contribute to this literature by investigating whether managerial gender and age influence payout policy. I began by analysing the payout levels before investigating the payout method, adopting the view that managers decide on the payout level before deciding on the payout method (Bonaimé, Hankins, and Harford 2014; Eisdorfer, Giaccotto, and White 2015).

[7] Peltomäki, Swidler, and Vähämaa (2018) do not present the results on the CFO age.

1.3.1. Payout Levels

Whether a higher payout policy is risky or not is not well-established. Caliskan and Doukas (2015) argue that a higher payout policy is a conservative choice since the alternative is investing in the risky asset. Prior studies provide evidence of an inverse relationship between investments and payout policy (Fama and French 2001; Grullon and Michaely 2004), and systematic risks (Fama and French 2002; Grullon, Michaely, and Swaminathan 2002). Additionally, firms can use payout cuts to withstand financial distress (Bernile, Bhagwat, and Yonker 2018; Bliss, Cheng, and Denis 2015; Brown, Fazzari, and Petersen 2009). These arguments suggest that a higher payout level is a conservative policy.

Alternatively, studies have argued that a higher payout policy is risker, since it leaves the firm with less cash for precautionary motives (Saeed and Sameer 2017). Nevertheless, Caliskan and Doukas (2015) refute this, positing that firms cannot continue accumulating cash in an environment characterised by high investor activism and protection. At some point, firms need to decide whether to invest their excess cash or distribute it. Based on this view, TMTs with characteristics related to risk-aversion (overconfidence) might be associated with higher (lower) payout levels so that they spend less (more) on investments.

The analysis shows that the proportion of female executives in the TMT and the payout levels are positively associated. These results persist under several robustness checks. Potentially, TMTs with more female managers may choose to distribute cash to the shareholders rather than make investments because of female risk-aversion or male overconfidence.[8] Moreover, the empirical analyses provide some evidence of a negative relationship between the average age of the TMT and the level of payout. It is possible that TMTs with older managers may choose investments over cash distributions to

[8] I acknowledge another strand of literature which attributes the positive association between females and payout levels to reduced agency costs (Byoun, Chang, and Kim 2016; Evgeniou and Vermaelen 2017; Saeed and Sameer 2017). However, these studies are mainly built on the work of Adams and Ferreira (2009), who find that female *board* members improve monitoring, which pushs managers to increase their payouts in order to reduce the free cash flow problem (Jensen 1986). While this explanation may not apply to this study, since it focuses on managers rather than directors, it remains a potnantial explanation.

shareholders since older managers have well-established reputations, providing them with confidence that their reputation might protect them if their policy fails.

Looking at CEOs and CFOs, there is some evidence that female CFOs are positively associated with payout levels. Also, the age of the CFO is negatively related to the payout levels. This analysis may indicate that CFOs exercise a larger influence over the decision to set the corporate payout levels.

1.3.2. Payout Methods

Broadly, there are two payout methods that are commonly used: dividends and stock repurchases. While these two methods represent cash distributions (Grullon and Michaely 2002), they may not be perfect substitutes (Andriosopoulos and Hoque 2013). Dividends are sticky since managers are reluctant to cut them (Brav et al. 2005; Lintner 1956), while stock repurchases are continuously adjusted (Guay and Harford 2000; Jagannathan, Stephens, and Weisbach 2000; Skinner 2008).[9] Bonaimé, Hankins, and Harford (2014) provide evidence that the proportion of stock repurchases to total payout is a substitute for hedging activities, attributing their findings to the flexibility of stock repurchases. Guay and Harford (2000) posit that managers rely more on stock repurchases when they feel less confident about the stability of the future cash flow. Therefore, relying on stock repurchases rather than dividends when distributing cash flows is plausibly a conservative choice since it maintains the financial flexibility of the firm. Consequently, it is possible that TMTs with characteristics related to risk-aversion (overconfidence) are associated with a larger (smaller) proportion of stock repurchases to total payout.

The analysis reveals a positive association between the proportion of female executives in the TMT and the flexibility of the payout policy (stock repurchases as a proportion of total payout). Since stock repurchases provide financial flexibility for the firm, it is possible that TMTs with more female managers may prefer to preserve the choice of reducing future payouts in the event of financial distress.[10] Moreover, the

[9] One can argue that special dividends are not sticky, but this type is disappearing, as shown in (Skinner 2008) and also in this study (see the data section in Chapter 5).

[10] I acknowledge the argument that overconfident managers may conduct more repurchases since they are more likely to perceive their firms to be undervalued (Andriosopoulos, Andriosopoulos, and Hoque 2013; Banerjee, Humphery-Jenner, and Nanda 2018; Shu et al. 2013). A key premise to this argument is that undervaluation is a precondition for conducting repurchases. However, prior studies suggest that females

results indicate that the average age of the TMT is negatively related to the flexibility of the payout levels. This might be attributed to the better reputation that older managers enjoy, leading them to adopt risker policies. These results continue to hold under several robustness checks and also when using different estimation techniques. The results, however, suggest that female CEOs and CFOs are negatively associated with payout flexibility.[11] In line with the main analysis, CEO and CFO ages are negatively related to payout flexibility.

This chapter contributes to three strands of literature. First, it documents that managerial gender and age can influence not only the payout level but also the payout method. Second, it contributes to studies examining the relationship between managerial gender and the riskiness of the firm. Empirical studies on the relationship between managerial gender and payout levels are limited, since most studies focus on gender diversity within the board of directors. However, Jurkus, Park, and Woodard (2011) show a positive relationship between the percentage of female executives in the TMT and dividends payout, which they attribute to a reduction in agency costs that is associated with female managers. I extend their study by showing a positive association between the percentage of female executives in the TMT and the total payout. I also provide an alternative explanation. In particular, it is possible that female executives increase the corporate payout levels due to their higher risk-aversion or lower overconfidence via making a reduction in investments which are a risker choice compared to payouts. Furthermore, this study documents that the proportion of female executives in the TMT is positively associated with payout flexibility. Third, this chapter contributes to the literature examining the relationship between managerial age and the riskiness of corporate policies. Studies on the relationship between managerial age and payout levels are limited. I document weak evidence on a negative relationship between TMT average age and payout levels, and a negative association between CFO age and payout levels. Moreover, this study finds that the average age of the TMT is negatively associated with

(including executives) are less overconfident (Barber and Odean 2001; Huang and Kisgen 2013). This argument leads to the prediction that female executives are associated with fewer stock repurchases, which is inconsistent with the findings of this chapter.

[11] This anomaly may benefit from further research but is beyond the scope of this thesis.

payout flexibility. The ages of both CEOs and CFOs are negatively related to payout flexibility.

1.4. Overall Contributions

Collectively, this thesis contributes to three strands of literature. First, it contributes to the literature by examining the predictions of UET. By showing that managerial gender and age are related to corporate financial policies, this study supports the view of Hambrick and Mason (1984) that managerial characteristics affect corporate policies. Moreover, Hambrick and Mason (1984) and Hambrick (2007) argue for examining the managerial characteristics of the TMT as a single unit. This thesis sheds lights on this approach too. Consistent with their argument, I find that executives other than the CEO do matter in setting corporate financial policies. Moreover, by documenting that the ages of the CEO and CFO are related to R&D investments in different directions, this study highlights the importance of examining the TMT rather than the CEO or CFO alone.

Second, it contributes to the ongoing debate on whether the documented gender difference on risk-taking behaviour holds. Prior studies mainly find that female CEOs and CFOs are associated with conservative policies (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). I extend this strand of literature by showing that the proportion of female executives in the TMT is also associated with conservative policies. Additionally, Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin (2014) and Perryman, Fernando, and Tripathy (2016) show that the proportion of female executives in the TMT is negatively associated with the firm's total risk. This thesis points to potential channels through which this may occur. In particular, female executives seem to be associated with conservative practices around cash holdings, R&D investments, and payout policy. These results are consistent with the view that female executives are more risk-averse or less overconfident.

Third, this thesis is also related to the study of the impact of managerial age on the riskiness of corporate polices. Prior studies generally document that older CEOs are associated with conservative corporate policies (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). In contrast, I provide some evidence that younger managers are generally associated with conservative corporate financial policies, consistent with the view that older managers take more risks since they may believe that their reputations could shield them from adverse career outcomes if their policies fail.

The rest of the thesis is structured as follows. Chapter 2 presents the literature review. This chapter provides an overview of studies that demonstrate the influence of managerial behaviour and characteristics on corporate policies, followed by an overview of the Upper Echelons Theory. The chapter then proceeds with an extensive review of the relationships between managerial gender and age on one hand, and risk-taking on the other hand. Chapter 3 investigates the relationship between managerial characteristics and cash holdings. Chapter 4 studies the relationship between managerial characteristics and R&D investments. Chapter 5 examines the relationship between managerial characteristics and payout policy. In each empirical chapter, I review the literature on the determinants of the studied policy, paying special attention to managerial characteristics and traits as explanatory variables of these policies. Lastly, Chapter 6 summarises and concludes the thesis.

Chapter 2 Literature Review

2.1. Introduction

It is plausible to argue that Berkshire Hathaway could not have reached its current position without Warren Buffett. Apple, Microsoft, and Facebook are hardly imaginable as they are today without their leaders. The critical decisions they made over their careers are largely responsible for their success stories. Success depends on the decisions we take when we are faced with opportunities or challenges. Such decisions are influenced, at least in part, by our personalities and characteristics.

The implications of various personal characteristics on decision-making have been studied extensively. The aim of this field is to explain some of the decision-making variations that are not explained by situational or contextual factors. To do so, several studies have investigated the influence of different human traits and characteristics on decision-making. Specifically, the phycology literature has established that several human characteristics systematically influence our decisions in various contexts; for example, ethical decisions are related to personal attributes (Ford and Richardson 1994), while risk preferences regarding work, health, and personal finance are related to individuals' personalities (Soane and Chmiel 2005). Similarly, personal attributes (age and gender) are reported to affect risks taking in the recreation, career, safety, and health domains (Nicholson et al. 2005). More broadly, personal characteristics affect decision-making competence (Dewberry, Juanchich, and Narendran 2013).

Moreover, gender and age are two characteristics that have been thoroughly investigated. Scholars have paid particular attention to whether these two characteristics systematically influence our desire to take risks. While this literature provides strong evidence that women are more risk-averse than men (Croson and Gneezy 2009) or that men are more overconfident (Barber and Odean 2001), the relationship between ageing and risk-aversion is poorly understood. For instance, studies show that risk-aversion and ageing are positivity (Deakin et al. 2004), or negatively related (Huang et al. 2013). Other studies report that ageing and risk-taking behaviour are not systematically related (Dror, Katona, and Mungur 1998).

Naturally, this strand of literature raises the question of whether this influence can affect the outcome of the firm. If people's decisions are influenced by their characteristics, it is possible that managerial characteristics affect the outcome of the firm. Indeed, a number of studies demonstrate that managerial characteristics play a significant role in determining the outcome of the firm. For example, Bertrand and Schoar (2003) document the existence of a managerial fixed effect. Also, managerial overconfidence affects investment decisions (Malmendier and Tate 2005a), and financial policies (Ben-David, Graham, and Harvey 2007), while managers' experiences also play a role in determining the capital structure of the firm (Güner, Malmendier, and Tate 2008; Malmendier, Tate, and Yan 2011). This strand of literature points to the existence of a managerial fixed effect, which can be partially predicted by managerial characteristics.

Notably, the majority of this strand of literature analyses the CEO, CFO, or board levels. Nonetheless, Hambrick and Manson (1984) propose the Upper Echelons Theory (UET) and argue that it is important to analyse the characteristics of the top management team (TMT) collectively. While CEOs are the main decision makers in firms, they tend to share their responsibilities with their teams. They argue, therefore, that it is important to measure the central tendency of the team. Their argument is that TMT characteristics, such as their demographics or previous experiences, act as a lens through which they observe events and process information. This, in turn, is mirrored in the decisions they make, since our judgments are influenced by our understanding (i.e. perspective/perception) of a situation.

This thesis examines the influence of managerial gender and age on three corporate policies of the firm. Hence, this chapter aims to motivate and justify this argument in several ways. First, it surveys the literature on managerial characteristics and the financial policies of the firm, demonstrating the importance of managerial characteristics as determinants of firms' financial policies. Second, the UET argument is central to this thesis, given that the empirical analysis is focused on the characteristics of the TMT collectively. This chapter presents the theory to explain the underlying reasoning for using the TMT as the unit of the analysis. Third, the chapter surveys the literature on the relationship between gender and risk-taking. This strand of literature provides strong evidence for the idea that females are more risk-averse and/or less overconfident than males. Fourth, it reviews the literature on the relationship between age and risk-taking. The evidence from this literature is mixed (Bonem, Ellsworth, and Gonzalez 2015; Worthy et al. 2011). The goal of this chapter is to inform the thesis by providing a theoretical basis, supported by empirical evidence, regarding how different personal characteristics may affect corporate policies.

The rest of this chapter is structured as follows. Section 2.1 reviews the literature on the influence of managerial characteristics on corporate decisions. Section 2.2 presents the Upper Echelons Theory. Section 2.3 appraises the literature on the influence of gender on risk-taking behaviour. Section 2.4 discusses the literature on the relationship between age and risk-taking behaviour. Section 2.5 summarises and closes the chapter.

2.2. Executives' Characteristics and Corporate Decisions [12]

A growing body of literature has emerged to examine the link between managerial personalities, bias and corporate decisions. The purpose of this strand of literature is to find some of the undiscovered determinants of corporate policies, given that the traditional theories have failed to explain all of the variations in corporate policies (Malmendier, Tate, and Yan 2011).

This line of literature begins by investigating whether managers have fixed effects on their firms. Specifically, scholars study whether managers' decisions follow firms' pre-set policies or whether they have their own managerial style. Answering this question is crucial to the study of the influence of managerial characteristics on firms' financial policies. For example, while the psychology literature has established that certain human characteristics are associated with behaviours such as risk-aversion and overconfidence, it is important to establish whether managers have sufficient discretion to pronounce their preferences regarding the policies of the firm. That is: if managers have a fixed effect on their firms, their preferences may play some role in their decisions and consequently influence corporate financial policies.

One of the early studies on this strand of literature, at least within the finance domain, is that of Bertrand and Schoar (2003), who study the managerial fixed effect, which is the effect of the managers on corporate policies that is above and beyond other determinants of corporate policies. They draw their data from Forbes 800 files from 1969 to 1999 and ExecuComp from 1992 to 1999 to construct a manager-firm matched panel dataset. They show that managers have a fixed effect on their firms, as evident by the explanatory power of the variables identifying managers, arguing that managers have their own styles. For instance, they find that CEOs' age is linked with conservative policies while having an MBA is associated with more aggressive policies. The significance of their findings stems from demonstrating that managers have substantial discretion over the policies of the firm.

[12] The aim of this section is to establish that managerial characteristics can influence corporate policies, by influencing their risk-aversion/confidence levels.

Extending this analysis, Malmendier and Tate (2005a) suggest that managerial traits can affect corporate decisions. They examine whether an overconfident manager would be more responsive to cash flows in relation to investment decisions. The proxy for CEOs' levels of overconfidence is the level of CEOs' own exposure to firms' risks (overinvesting in the firm or unexercised vested options). Examining the data for Forbes 500 CEOs and their investments decisions, they conclude that overconfident managers tend to increase their investments following an increase in cash flows. Further, Malmendier and Tate (2005b) review the psychology literature on overconfidence and revisit their previous study. They change the overconfidence proxy to CEOs' press portrayals, a proxy that depends on outsiders' perceptions. They confirm the relationship between CEOs' overconfidence and corporate decisions.

Ben-David, Graham, and Harvey (2007) examine the relationship between managerial overconfidence, defined as a mis-calibration of beliefs, and corporate policies. Their proxy for overconfidence is based on the forecasts of financial executives in 6,901 S&P 500 over a six-year period. For instance, managers who provide a small range of forecasts are deemed to be overconfident. These data are collected via a survey. They first conclude that financial executives are overconfident. Companies with overconfident[13] CFOs are found to adopt risker financial policies, such as using a low discount rates, investing more while using more debts, preferring stock repurchasing over paying dividends[14], and utilising longer term debts.

The work of Ben-David, Graham, and Harvey (2007), Bertrand and Schoar (2003), Malmendier and Tate (2005a), and Malmendier and Tate (2005b) shows that managerial personality has an impact on corporate policies. The level of overconfidence/risk-aversion among the CEOs and CFOs are determinants of corporate policies. These results are in line with the predictions of the UET, although Hambrick and Mason (1984) suggest a relationship between observable managerial characteristics

[13] Overconfidence relates to the perception of risks. Overconfident managers underestimate the risks or overestimate their ability to manage them, while a risk-averse person avoids them. This thesis focuses on the level of risk-taking associated with managerial characteristics, rather than its source (i.e. not realizing the risk vs. refraining from taking risks). The distinction between overconfidence and risk-aversion is beyond the scope of this thesis.

[14] Based on their model, firms issue debt to finance investments and repurchases. Hence, they suggest that repurchases are risker than dividends.

(rather than personality traits) and corporate policies, arguing that it is difficult to observe executives' personalities (rather than characteristics) without undertaking laboratory experiments.

In line with this logic, Güner, Malmendier, and Tate (2008) examine the impact of the financial expertise of directors (an observable characteristic) on corporate decision-making. They hand-collected the data from the directors' biographies available on IRRC for the board members of publicly-traded companies from 1988 to 2001. They show that directors who are commercial bankers increase external funding and lower the investment sensitivity to cash flow. They also report that investment bankers increase bond issuance while decreasing the quality of acquisition. Yet, they draw from the agency theory and provide a different explanation from that of the UET; they suggest that bankers serve the interests of the creditors.

Expanding the work of Güner, Malmendier, and Tate (2008) on the effect of managerial experience on corporate policies, Malmendier, Tate, and Yan (2011) suggest that the traditional theories fail to explain all of the variations in capital structure and, therefore, aim to explain some of the remaining part using managerial traits. They suggest that CEOs' personal characteristics and traits explain a significant part of this variation. Managers who observe undervaluation in their firms' values tend to avoid external financing, those who witnessed the great depression prefer internal finance over external finance, and those who served in the military adopt more aggressive financial policies. Unlike Bertrand and Schoar (2003), they find that older managers tend to have more debts (i.e. they adopt a risker policy).

Cronqvist, Makhija, and Yonker (2012) examine whether CEOs' personal leverage (in the leverage choices when they purchase their personal residences) affects their firms' capital structures. They argue that the advantage of this approach, compared to that in (Ben-David, Graham, and Harvey 2007; Malmendier and Tate 2005a, 2005b), is that it captures all of the traits that can impact debt decisions. The results are consistent with the previous findings and show that CEOs' personal and corporate debts are significantly and positively related, especially when governance is weak. The disadvantage of this measure is that it is not readily available for a large sample of executives.

In a similar vein, Cain and McKeon (2016) employ a new proxy for CEOs' personal risk-taking to investigate its impact on corporate risk-taking. CEOs who have pilot licenses are labelled risk-takers. The results show that firms that are managed by pilots are risker, based on the volatility of the equity returns as well as borrowing and acquisition polices. They conclude that personal risk-taking in non-financial contexts could affect corporate policies.

Graham, Harvey, and Puri (2013) surveyed CEOs and CFOs to study how US CEOs compare to the rest of the population, to CFOs, and to non-US CEOs. They find that CEOs differ from the general population and CFOs. They also report that American CEOs, compared to non-American CEOs, are more optimistic and more inclined to take risks. In line with the previous work, the psychological traits of CEOs (e.g. overconfidence, optimism, and risk-aversion) are linked to corporate policies and compensation structures.

Managers' personal traits and observable characteristics both seem to affect corporate decisions, but the literature is inconclusive on the sources of this effect. While corporate decisions could be affected by personal characteristics and traits through the agency problem, it is equally possible that this influence takes the form of behavioural bias (Serfling 2014; Yim 2013). That is, it is possible that certain characteristics may make managers more entrenched and lead them to serve their own interests by adjusting corporate policies (e.g. empire building). Equally, these characteristics may simply affect their judgments, leading to changes in corporate policies even when they are well-intentioned and wish to serve the interest of the shareholders.

Similar to Cronqvist, Makhija, and Yonker (2012) and Malmendier and Tate (2005a), Huang-Meier, Lambertides, and Steeley (2015) study the effect of managerial optimism (unexercised options) on cash holdings motives. Confirming the role of CEO personalities in explaining some of the variations in cash holdings, they report that optimistic managers prefer internal funds, to hold more cash for investment opportunities, to use more cash for acquisitions and capital expenditure, and to hold more cash in difficult times. In other words, they have a growth demand for cash holdings rather than a precautionary demand. On the other hand, non-optimistic managers hold more inventories, more receivables, and more cash for precautionary reasons.

Similarly, Malmendier and Zheng (2013) examine how overconfidence bias among managers in different positions (CEO and CFO) could affect both the decisions under their control and those decisions that lie beyond their original roles. They report that only CEO overconfidence affects non-financial decisions, while financial decisions are mainly affected by CFO overconfidence. They also highlight the possible peer effects on the members of the top executive teams.

Overall, this strand of literature informs this thesis in two ways. First, managerial traits and characteristics can influence corporate outcomes, supporting the argument that there exists a managerial fixed effect. Managers use their discretion to pronounce their personal preferences. These preferences are influenced, in part, by their characteristics, including their gender and age, as shown later in this chapter. Second, while several scholars have attempted to capture managerial preferences directly (e.g. overconfidence proxies), this approach has its drawbacks, that are highlighted in the Upper Echelons theory, discussed in the following section.

2.3. The Upper Echelons Theory

The work of Hambrick and Manson (1984) may be the first to propose a comprehensive framework explaining the influence of managerial characteristics on corporate decision-making. The Upper Echelons Theory (UET) predicts that the variations in organizational outcomes as well as strategic decisions and performance levels can be partially predicted by managerial characteristics. The UET, given bounded rationality, suggests that a combination of contextual factors and upper echelons characteristics can better predict corporate outcomes than using one of them alone. In other words, the framework recognises that the situation and the context of the decision being made are vital in determining corporate decisions, but it is also important to consider managerial characteristics, since these influence their decisions, assuming bounded rationality. This is due to the influence of managerial characteristics on the perception of reality and its analysis.

Further, Hambrick and Manson (1984) criticise the focus on the CEO when studying the influence of managerial characteristics on decision-making. While acknowledging the power of the CEO, they argue for shifting the focus to the top management team (TMT) as the unit of analysis. This is because CEOs share their responsibilities with their fellow TMT members and, in some cases, share their powers with the rest of the team. As a result, studying the role of managerial characteristics at the TMT level could improve our ability to test arguments pertaining managerial characteristics. Hambrick (2007) revisits the views of Hambrick and Manson (1984) and continues to advocate analysing managerial characteristics at the TMT level. He argues that, because the leadership of sophisticated organisations is a shared activity, the combined abilities, cognitions, and interactions across the entire TMT may affect corporate decisions. Indeed, albeit indirectly, the accounting and finance literature provides evidence for the validity of studying the central tendency of the team.

In particular, recent studies provide evidence that not only do CEO characteristics matter for the outcome of the firm, but also those of other executives. For instance, Chava and Purnanandam (2010) report that the compensation structure (i.e. risk-increasing vs. risk-decreasing) of the CEO influences leverage and cash balance, while the compensation of the CFO is more closely related to debt maturity choices and earnings management. Similarly, Kim, Li, and Zhang (2011) find a positive and significant relationship between future stock price crashes and the sensitivity of the option portfolio value of the CFO to stock price, but the evidence of this relationship at the CEO level is weak.

Also, firms with female CFOs are more conservative in their financial reporting than those with male CFOs (Liu, Wei, and Xie 2016). Banks provide loans at lower costs, with fewer collateral requirements, and longer maturity for firms with female CFOs (Francis, Hasan, and Wu 2013). Similarly, Bertrand and Schoar (2003) find that including other executives' fixed effect (other than the CEO and CFO) increases the explanatory power of their acquisition model. Further, the COO (Chief Operating Officer) plays a broader role compared to executives with specific roles (Aggarwal and Samwick 2003). Serfling (2014) finds that the negative relationship between age and risk-taking is more pronounced when considering the age of the second most influential executive in the firm.

Besides the evidence from the accounting and finance literature, the psychology literature suggests that, when decisions are taken by groups, the level of risk-aversion for one group member may influence that of the other members within the same group (Wallach, Kogan, and Bem 1962). This may suggest that the inclusion of a risk-averse manager on the TMT increases that TMT's risk-aversion, while the inclusion of an overconfident executive on the TMT increases that TMT's overconfidence. Indeed, Malmendier and Zheng (2013) provide evidence of peer influence from the corporate context. They find some evidence that the level of overconfidence of one executive on the TMT may affect other executives on the TMT. Berger, Kick, and Schaeck (2014) assert: "We argue that a team perspective is crucial because a firm's executives form a team and interact dynamically with one another in the decision-making process" (p.49). These findings further attest to the argument of Hambrick and Manson (1984).

Another benefit of the TMT approach may accrue to those responsible for hiring and developing the upper management personnel. Understanding how TMTs with certain attributes are likely to act can be useful. For instance, if we know that TMTs with certain backgrounds or characteristics can influence the riskiness of the firm, we may factor these characteristics into the hiring decision when constructing the TMT to meet our goals with respect to the riskiness of the firm. This may serve as a tool for increasing or decreasing managerial risk-taking behaviours. Similarly, such insights can help in developing the compensation packages of executives by choosing whether to provide them with risk-inducing compensation or not.

In addition, the UET emphasises the importance of examining managerial observable characteristics rather than psychological traits. Understanding a psychological trait, such as the risk-tolerance of executives, requires executives' participation in experiments, which represents an obstacle to scholars.[15] However, finding data on the observable characteristics of managers, such as gender and age, is convenient. While Hambrick and Manson (1984) acknowledge that these managerial characteristics might be noisy compared to purely psychological measures, they assert that understanding the influence of such characteristics is important in many areas, including analysing competitors' managers whose psychological traits are difficult to investigate.

Also, Hambrick and Manson (1984) suggest another advantage of this approach, which is bypassing the complexity of psychological issues (e.g. overconfidence vs. risk-aversion). In doing so, we do not restrict the study of managerial behaviour to physiological dimensions alone but allow for broader considerations. For example, it might be the case that managerial age does not influence the riskiness of corporate policies because older people are systematically different from younger managers with regard to their risk tolerance (e.g. more risk-averse/less overconfident), but rather because age is linked to career horizon in the corporate context (Serfling 2014; Yim 2013). In this sense, and when studying observable characteristics, one can incorporate other frameworks such as agency theory in analysing the relationship between age and risk-taking.

Hambrick (2007)[16] revisits the UET and points out that executive influence can differ across different national systems and cultures. He argues that the UET may well explain the American market since CEOs in American firms have more discretion than their peers in other advanced economies. He provides several reasons for this assertion.

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[15] Although, as shown in the previous section, some scholars have used reasonable proxies to capture managerial tendencies towards risks.
[16] In this article, he further asserts "And, as we proposed in our initial 1984 AMR article, we anticipate that TMTs matter even more" (p.341).

For example, CEOs in America have a major say on board appointments, and that the dispersed ownership reduces investors' oversight. Consequently, one would expect the theory to explain some of the variations in corporate policies in America.[17] Indeed, this argument finds substantial empirical support in the literature reviewed in this chapter. In particular, managerial characteristics, both observable and unobservable (i.e. proxied for), play a role in determining the outcome of the firm, with many studies drawing conclusions based on US data (Francis, Hasan, and Wu 2013; Huang-Meier, Lambertides, and Steeley 2015; Huang and Kisgen 2013; Khan and Vieito 2013; Serfling 2014).

Given that the focus of this thesis is managerial gender and age, this chapter provides a comprehensive review of their influence on risk-taking. For these two characteristics, the psychology literature is surveyed to understand how gender and age can influence our decisions as individuals, before reviewing the literature on the influence of these characteristics on our decisions as corporate managers.

[17] This thesis uses US data, but the abovementioned argument is also applicable to other contexts where managers have sufficient discretion over the policies of the firm.

2.4. Gender and Risk-taking

This section reviews the studies examining the influence of gender on risk-taking at both the individual and managerial levels.

2.4.1. Individual Level

One area that has received considerable attention in the literature is risk-taking and gender. Researchers have examined the following questions. Are men and women systematically different in terms of their risk-taking behaviour? If so, who takes more risks? Also, does gender *per se* determine risk tolerance? Or does it interact with a combination of other personal and social features? These questions have been investigated by psychologists and economists. In this section, I review, discuss, and summarise the strand of literature that seeks to answer these questions.

There are several theories explaining why men and women could differ in their risk-tolerance. Fehr-Duda, De-Gennaro, and Schubert (2006) assert that this difference may stem from a difference between men and women with regard to weighing probabilities. If males underestimate the probability of the occurrence of a negative event, they will become less cautious about it. Alternatively, Eckel and Grossman (2002) argue:

The primary argument for an evolved basis for the observed sex difference in attitudes toward risk arises from the marked difference faced by the sexes in the returns to alternative investments in reproductive success. For females, the low-risk steady-return investment in parenting effort often yields the highest returns, whereas for males, the higher-risk investment in mating effort produces a higher expected payoff (see Daly & Wilson, 1988, Chapter 7; Geary, 1998, pp. 42-45; Low, 2000, Chapter 4; Rubin & Paul, 1979). Successful parenting consists in part of avoiding risks to oneself and one's offspring. In contrast, successful competition for mating opportunities often involves highly risky strategies. A successful risk- taker acquires superior material resources, enhancing his value as a mate.

Optimal investment behavior would generally require that an agent invest in two alternative activities until the expected returns, adjusted for risk, were equal, yet peoples of many hunter-gatherer societies appear to overinvest in the pursuit of high-variance *food resources (Hawkes, 1991, 1993; Hawkes, O'Connell, & Blurton Jones, 2001; Hill & Kaplan, 1993; Kaplan & Hill, 1985a, 1985b; Smith & Bird, 2000).* (p.282)

Given these possible reasons, the notion that there might be a gender difference in risk-taking has been investigated empirically. Prince (1993) examines gender differences in money style, which concerns how and why one obtains or spends money. The paper is motivated by the literature that suggests the existence of a gender identity difference that leads to differences regarding the meaning of personal possessions as well as the literature indicating a gender difference in traits and a possible impact on money style.

He interviewed 47 males and 45 females between the ages of 18-34 from different locations in a large American metropolitan area. Both the men and women were found to accept the American norms of perceiving money as a means of prestige, power, and success. However, females seem to have a stronger sense of money hunger and are more likely to be envious of those who are better off. Also, the results indicate that men perceive themselves as risk takers and are more willing to risk money for potential gains. Males are more confident about their financial skills, of which they are proud. He finally notes that one limitation of his study is the small sample that prevented him from including other control variables, calling for future research to consider variables, such as education. One should also note that the results are based on the perceptions of the respondents, which may not necessarily reflect their actual risk-tolerance level.

Extending this work, the seminal study of Barber and Odean (2001) aim to test the claim that men are more overconfident than women. They use a dataset of the investments and trading records of 35,000 male and female households. Their model predicts that, if men are more overconfident, they will trade more than women and their return will be harmed by over trading. The findings confirm their hypothesis that men trade significantly more than women, reducing their return compared to that of women.

Eagly (1995) asserts that there is agreement on the existence of gender differences in many areas, including decision-making. However, some of the previous work suggests that gender differences in terms of risk-taking behaviour do not exist. Rather, the gender-based difference in risk-taking might have been reported due to methodological issues, especially with respect to framing the questions and selecting the sample (e.g. not considering the participants' familiarity and skills in decision-making).[18]

Powell and Ansic (1997) address this claim. To do so, they use two computerised laboratory experiments limited to financial decisions. The first relates to insurance coverage decisions, with which both types of individuals are assumed to be familiar and possess the same prior knowledge. It is framed to consider how different costs could affect the potential losses. The sample consists of 64 males and 62 females from undergraduate and postgraduate programmes with an average age of 20.57 years. Although the results suggest that both genders are risk-averse with respect to insurance decisions, women tend to be more risk-averse.

The second experiment provides the subjects with information about the costs of re-entering the currency market and exchange rates, and asks them to make a decision about entering or leaving the currency market, with which most subjects are assumed to be unfamiliar and possess no prior knowledge. The results of this test also suggest that females are more risk-averse than males. Since both experiments suggest that females are more risk-averse, the paper concludes by arguing that the difference is in fact related to gender rather than contextual factors. The researchers call for treating these results cautiously and conducting further research.

Jianakoplos and Bernasek (1998) examine the 1989 Survey of Consumer Finances which covers 3143 participants in the US. In addition to reporting their demographic information, the respondents are asked about the amount of financial risks they are willing to take. The choices are 1) substantial financial risks, 2) above average financial risks, 3) average financial risks, and 4) no financial risks. Approximately 60% of the women were unwilling to take any risks compared to 40% of the men. They further investigate two issues; the effect of wealth on risks, and the effect of gender on financial risks.

The paper is built on the theoretical framework of the expected utility theory, which holds that the degree of risk-aversion of an individual is dependent on his/her

[18] See examples (Bromiley and Curley 1992; Eagly 1995; Unger 1990), as reported in (Powell and Ansic 1997).

wealth. The results confirm that women are more risk-averse than men, at least in their sample. Also, they report that households increase their risky assets as their wealth increases, excluding personal residences and human capital. This relationship is stronger for single men than it is for single women and exists across all age ranges. A negative relationship between the percentage of risky assets to total wealth and the number of dependent children is found for single women. Interestingly, they show that single black women take more financial risks than single white women, single men, and married couples, shedding light on the impact of other demographic factors.

Using a more recent edition of the same survey for the years 1992 and 1995, Sundén and Surette (1998) examine gender differences within the context of defined contribution plans, which allows the contributors to choose their investments.[19] The sample covered 3906 households in 1992 and 4299 households in 1995, with slightly more men than women. The paper aims to observe any systematic differences between the male and female participants' choices, which are: 1) invest mostly in stocks, 2) invest mostly in interest earning assets (bonds), and 3) invest in both stocks and interest earning assets (diversified).

The results suggest that gender plays a role but does not determine the investment choice on its own. For example, single men are found to be more likely to choose "mostly stocks" compared to single women and married men. Their results show that gender variations in risk behaviour are significantly affected by marital status. However, age and education are not found to affect the allocation decisions. The authors suggest taking the gender and marital effects cautiously due to their imperfect controls and unobserved differences.[20]

Byrnes, Miller, and Schafer (1999) perform a meta-analysis of 150 studies that examine the differences in risk-taking behaviour across gender, representing more than 100,000 participants. They report that their results "clearly support the idea that male

[19] Sundén and Surette (1998) provide an overview of the studies examining gender differences with regard to investment decisions.

[20] While they assert that marital status can affect the relationship between gender and risk-taking, in the context of executives, and given the data availability, it is reasonable to assume a lack of a systematic difference between males and females in terms of marital status. That is, marital status is randomly distributed.

participants are more likely to take risks than female participants" (p.377). Nevertheless, these gender differences are affected by context and age. For instance, as we age, gender differences in risk-taking increase in the context of driving behaviour, but decrease in other contexts (e.g. smoking). However, while they suggest that the magnitudes of the gender differences change as we age, these differences continue to exist in most contexts.

To this point, the literature supports the argument that women tend to take less risks. However, there are other demographic and contextual factors that could intervene with the gender-based differences in risk tolerance. While it has been established that such factors can have an impact, the full picture remains unclear.

Realising this gap, Grable (2000) surveys a random sample of 1075 faculty and staff members from a Southern American university, including 591 women and 484 men. Their ages ranged from 20 to 75 years, with an average of 43.5 years.[21] The aim is to explore how demographic, socioeconomic, and attitudinal characteristics affect risk-taking with regard to daily money management. He reports that males and older people seem to tolerate more risks. Married people, professionals, and high income individuals take more risks, and risk tolerance increases with superior education, financial knowledge, and better economic expectations. Furthermore, he considers that these variables might be related and found "that a combination of education, financial knowledge, income, and occupation explained the most-between group variability in risk tolerance" (p.628). However, only 22% of the risk tolerance variation between respondents is attributed to these factors, leading the author to call for further investigation of other demographic, socioeconomic, attitudinal, and psychological factors.

Bernasek and Shwiff (2001) extract their data from a survey of 270 faculty members from five US universities, enabling them to isolate education’s impact on risk attitude. Further, the data allow them to define the primary decision-maker, in case a respondent has a spouse or a partner. They question whether there is a gender-based difference regarding the percentage of stocks in the respondents' defined contribution

[21] Grable (2000) reviews a substantial part of the literature examining the demographic and socioeconomic factors affecting risk tolerance.

plans. They conclude that women are more risk-averse. Since they consider the primary decision-maker in a couple, their results extend the findings of Jianakoplos and Bernasek (1998) by showing how the gender difference persists even when a person has a spouse or partner.

Moreover, Eckel and Grossman (2002) build on the proposition that gender differences in risk-taking arise from the differences in terms of reproduction, in which men tend to take higher risks in mating efforts while women focus more on parenting efforts that require low-risk, steady investments. They assert that their study is the first to distinguish between variance aversion and loss aversion. Also, the experiment consists of two parts: a "decision task" to assess risk-aversion attitude and a "forecasting task" to identify the perception of risk-aversion by others. The argument behind the latter is that women might have been found to be risk-averse in investments studies because men perceive them as such and offer them investment opportunities accordingly. In other words, a stereotype might be causing the observed difference. The tasks were completed by 200 people, of whom 104 were male and 96 female, with an average age of 20 years and mostly majoring in economics and business. The findings suggest that women are more risk-averse than men. Females are more likely to pick a risk-free choice compared to men and less likely to choose the highest-risk gamble. However, women do not differ from men with respect to loss aversion (as opposed to risk-aversion in general). Lastly, the forecasting task shows that both men and women expect women to be more risk-averse.

Controlling for knowledge, Dwyer, Gilkeson, and List (2002) studies the 1995 survey of 2,000 random mutual fund investors conducted by the Office of the Comptroller of the Currency and the SEC. The survey includes demographic data as well as the allocated investments and their risk levels. They argue that this sample controls for the investors' financial knowledge since mutual funds are popular and widely discussed. The results suggest that wealthier, better educated people take more risks than less wealthy, less educated individuals. Women are found to be more risk-averse, but this systematic difference is less pronounced when considering education, indicating that knowledge is a key factor that interacts with gender in determining risk behaviour.

In an extension to the work of Dwyer, Gilkeson, and List (2002), Atkinson, Baird, and Frye (2003) control for both knowledge and wealth. They examine the performance and investment behaviour of female fund managers relative to male ones. They identify 72 female-managed mutual funds and match them with male-managed funds in the same investment category. The matched funds should be similar in terms of managers' tenure and comparable in size. They suggest that there are no significant differences in performance, risk, and other funds features whether they are managed by males or females. They also report that male and female fund managers have the same educational qualifications. They conclude that the gender differences reported in previous studies could be attributed to knowledge and wealth differences. Finally, female-managed mutual funds attract fewer investors. They argue that this could be one reason for the well-documented low proportion of female-managed funds compared to male-managed ones.

More broadly, Hallahan, Faff, and McKenzie (2004) aim to examine the demographic determinants of risk tolerance levels. To do so, they employ a database that has a psychometrically derived financial risk tolerance score (RTS) for 20,000 individuals, 70.75% of whom are male. The database includes each participant's demographic data. The results show that both males and females overestimate their risk-aversion. Gender, income, and wealth are found to affect financial risk tolerance significantly. Married people are found to be more risk-averse. Also, they demonstrate a negative nonlinear relationship between age and risk tolerance. Importantly, women are found to have less risk tolerance compared to men.

Fehr-Duda, De-Gennaro, and Schubert (2006) theorise that the reported gender-based difference in risk tolerance is due to the different ways in which men and women weigh probabilities. Considering the argument that the documented gender difference could result from the methodological flaws of previous studies, they design an experiment in which males and females respond to winning and losing gambles in abstract and contextual environments, framed in terms of losses and gains. The abstract environment is based on gambling decisions whereas the contextual environment frames the same decisions in the context of investment and insurance choices. They find that women and men weigh probabilities differently. Men are more sensitive to probability changes, while women tend to underestimate large probability in the gain domain relative to the loss domain. When framing wining gambles in investment terms, women tend to be more pessimistic than men.

In a similar vein, Harris, Jenkins, and Glaser (2006) surveyed 657 undergraduate students to identify the underlying reasons for gender-based differences in risk behaviour. Assessing the probability of students carrying out risky activities in four different contexts (gambling, health, recreation, and social), the study documents the perception: of 1) the likelihood of negative outcomes, 2) the severity of any negative outcomes, and 3) the anticipated enjoyment from engaging in the activity. The results indicate that, in the first three areas, women's greater expectations of negative outcomes and lesser expectations of enjoyment affected their low risk propensity. Further, women are found to be more likely to engage on activities that include high potential payoff with certain minor costs.

Meier-Pesti and Penz (2008) further investigate the issue by looking at the degree of masculinity and femininity rather than pure biological sex.[22] Their work is built on the following argument. As the role of women changes over time towards masculinity, the gender-based risk variations should weaken, given that gender-specific behaviour is shaped by the interaction between gender biological and social factors. To do so, they conduct a survey and perform an experiment in two separate studies. The first study surveys 101 women and 85 men with an average age of 40.30 years, and mostly highly educated. The second study covers 180 humanity students. Their results show that masculinity is indeed linked to risk-taking, but femininity is not associated with risk-aversion. The female participants in the second study see themselves as equally masculine as men. The paper concludes that risk-taking is unaffected by gender but rather by the masculinity attributes of both males and females. Still, based on these findings, one can plausibly argue that females are, on average, more feminine, and therefore may potentially take less risks.

While this paper sheds some light on an important factor, a major limitation of it is that the levels of masculinity and femininity are self-reported, and so may not

[22] Meier-Pesti and Penz (2008) provide a discussion of the theories underlying gender-based differences in risk-taking (sociological vs. biological).

necessarily reflect the actual level of masculinity. The same limitation applies to the level of risk tolerance, as argued previously. Nonetheless, their findings might provide another explanation regarding why the difference in risk tolerance between professional males and females is smaller than it is within the lay population. While prior studies attribute this smaller difference to other factors, such as wealth, income, and knowledge, it is possible that professional men and women do not differ substantially in terms of their masculinity.

Croson and Gneezy (2009) review the literature on how gender affects social, competitive, and risk preferences. They conclude that gender affects social preferences and that men have a higher preference for competitive situations. In the risk domain, they report that the majority of the literature suggests that women are more risk-averse than men. However, they argue that, in the smaller number of studies that focus on managers and professionals rather than the general population, the gender differences in risk behaviour appear to be smaller or even absent. In an effort to explain the differences in risk tolerance between the genders, they suggest that it could be due to different emotional reactions, men's documented overconfidence, and/or the perception of risks (e.g. they argue that men tend to see risky situations as a challenge while women see them as a threat).

Cárdenas et al. (2012) study how gender affects risks and competitive behaviour among 1200 children in the capitals of Colombia and Sweden. Since these two countries have different levels of gender equality, with Sweden scoring higher in terms of equality, they are able to examine the impact of gender equality on the gender-based risk preferences. The results show that girls are indeed more risk-averse than boys, although Colombian boys take 40% more risks than Colombian girls while Swedish boys take only 15% more risk than Swedish girls. Their results suggest that the gender equality affects the risk-aversion levels across the genders.

These findings may lend some support to the argument of Meier-Pesti and Penz (2008). If the underlying reason for the reported gender-based difference in risk tolerance is driven by social factors rather than biological differences, then it is reasonable to expect this difference to be affected by the level of gender equality in a given society. This is because, as gender equality increases, the social factors that create the gender difference in risk tolerance may diminish.

Charness and Gneezy (2012) note that there could be selection bias in the articles, leading to results that confirm the proposition that women are more risk-averse. To deal with this possibility, they collect data from 15 different studies investigating different issues but using the same investment game. The results show that women tend to invest less in risky assets and, therefore, they conclude that women appear to be more risk-averse in the financial sphere.

Nelson (2015) questions the conclusions of Croson and Gneezy (2009) and Charness and Gneezy (2012), and revisits some of the previous literature. She argues that there has been a lack of distinction between the differences at the individual level and those at the aggregate level, reinforcing the claim of the differing risk preferences existing between men and women. She also argues that there has been a misapplication of the statistical techniques and data selection bias. Replicating the study of Charness and Gneezy (2012), using the same data, Nelson (2015) asserts that "this study finds substantial similarity and overlap between the distribution of men and women in risk-taking, and a difference in means that is not substantively large" (p.1). She concludes by calling for a further consideration of intra-sex variability and overlap.

Overall, this strand of literature generally supports the argument that women are more risk-averse/less overconfident compared to men. However, the magnitude of this difference might be influenced by other factors, such as the context in which the decision is made. Thus, the following section surveys studies examining this relationship among managers in the corporate context.

2.4.2. Corporate Level [23]

Interest in examining the role of managerial gender has arisen for several reasons. The first is the evidence of the existence of a systematic difference between men and women in terms of their decision-making and risk-taking, which raises the question of whether this difference continues to hold among managers. Theoretically, even if women

[23] Studies directly related to each chapter (policy) are discussed within each chapter.

are more risk-averse or less overconfident than men, women who make it to the top might differ from the average woman (Adams and Funk 2012; Faccio, Marchica, and Mura 2016; Sila, Gonzalez, and Hagendorff 2016). This is possible since some of studies reviewed in the previous section suggest that the gender-based difference in risk-taking might be context-specific. Second, because there might be a managerial fixed effect, as shown earlier in this chapter, it is possible that gender can affect the firm provided that it influences managerial choices. The third reason relates to the recent attention paid to gender diversity within corporations, evinced by recent regulations setting gender diversity rules. Therefore, a growing body of literature investigating the effect of managerial gender on risk-taking is emerging. [24]

Huang and Kisgen (2013) note that behavioural differences in gender have not been studied in the field of corporate finance, despite the vast literature in the field of psychology. They investigate whether male executives are more overconfident than female ones, in light of the literature suggesting that men are more overconfident and women are more risk-averse. Using a dataset of CEOs and CFOs in the US, they find evidence to support the argument that men are more overconfident. In particular, they find that male executives undertake more acquisitions and issue more debts, both of which are accompanied by lower returns than those undertaken and issued by female executives. Also, male executives provide a smaller range of earnings forecasts, and are less likely to exercise their stock options early.

Berger, Kick, and Schaeck (2014) examine the influence of the demographic characteristics of the executive board on risk-taking on banking. Their focus is on the age, gender, education, and compensations of the managers of financial institutions. Using a sample of German banks,[25] they conclude “Second, in the 3 years following the increase in female board representation, portfolio risk increases although the change is statistically and economically marginal. Our exploration of the underlying mechanism suggests that

[24] Another strand of literature examines the impact of female *board* members. For example, Adams and Funk (2012) find female directors to be more risk-loving, while Sila, Gonzalez, and Hagendorff (2016) do not find a systematic relationship between female directors and the riskiness of the firm once they account for the firm fixed effect.
[25] Germany applies a two-tier board system, in which the executive board includes the CEO and runs the daily affairs of the firm.

this result is mainly attributable to the fact that female executives have less experience than their male counterparts" (p.64).

In contrast, Faccio, Marchica, and Mura (2016) point out that, in perfect markets, managers are not influenced by their characteristics, and therefore their preferences are irrelevant to firms. However, the agency theory and asymmetry of information are two traditional models that allow for managerial preferences to play a role in shaping corporate policies. Building on the literature pointing to female risk-aversion and male overconfidence, they examine whether this can be extended to female managers, given that they may differ from the average population. Using a European sample for the period 1999-2009, they find that female CEOs have lower leverage, more stable earnings, and a higher chance of survival. They conclude that their results extend the findings from the fields of psychology and economics to top executives, by demonstrating a systematic difference in risk-taking between male and female agents.

Khan and Vieito (2013) examine whether CEO gender affects firm performance and risk, and if there is a difference between the compensation packages of male and female CEOs. Using a US sample for the period 1992-2004, they find that firms managed by female CEOs report higher performance and lower risk than those managed by male CEOs. They attribute their findings to female risk-aversion.[26]

Closely related to this study, Perryman, Fernando, and Tripathy (2016) examine the effect of the presence of female executives on the TMT on the performance and riskiness of the firm. They adopt the view of Khan and Vieito (2013), who suggest that choosing a less risky path is not equivalent to a sub-optimal performance choice.[27] They also suggest that, if females are more careful in their choices, they may seek to convince the rest of the TMT to be careful too. Because females are more risk-averse than males and gender diversity improves decisions, they predict a negative (positive) relationship

[26] One may argue that such results may in fact better fit the male overconfidence explanation rather than the female risk-aversion one.

[27] This contrasts with the argument of Sila, Gonzalez, and Hagendorff (2016), who assert that: "If firms that appoint more female board members were to make less risky policy choices and investment decisions, these firms could ultimately become less competitive players in their industries" (p.26). This implies that risker policies produce sub-optimal performance, under the assumption that all of the risks taken are rational and wealth-maximising decisions (optimal). This is a strong assumption in light of the behavioural literature (see e.g. (Barber and Odean 2001).)

between female representation and firm risk (performance). They proxy for firms' total risk with the standard deviation of daily returns, systematic risk with beta, and performance with Tobin's Q. Using OLS regression on a US sample, they find evidence that female representation on the TMT negatively influences risks and positively influences performance.

While studying the influence of the TMT's stock options (ESOs) on firms risk-taking, Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin (2014) investigate the moderating role of TMT gender diversity on this relationship. They report an inverted relationship between TMT's ESOs and the riskiness of the firm, as measured by the standard deviation of returns (i.e. total risks). More importantly, TMTs with more females are more conservative compared to TMTs without female presence.

2.4.3. Summary

In summary, this body of literature seems to support the notion that men and women are systematically different in their risk-taking levels. Women seem to take less risks, at least on the aggregate level. While there has been some work that attributed this difference to sample bias and other methodological issues, these factors have been studied and reasonably rolled out.

Moreover, the gender-based difference in risk-taking is affected by other factors. The most important ones in the context of this thesis are knowledge and professionalism, wealth and income, and age. The extant literature seems to support the argument that the first four factors are positively related to risk-tolerance. However, the differences in these factors are expected to be less pronounced, if present, at the top executives' level compared to the general population.

Before closing this section, it should be noted that the existing studies seem to suggest that there are two different gender-based biases that affect people's risk-tolerance: overconfidence and risk-aversion. Overconfidence interacts with risk tolerance by pushing the individual to take more risks than the optimal level. An overconfident person overestimates the probability of the future results being favourable. Overconfidence is defined "as the overestimation of mean returns to investment." (Malmendier, Tate, and Yan 2011) (p.1689). Overconfidence also leads to an overestimation of one's abilities and skills. On the other hand, risk-averse individuals overestimate the probability of negative outcomes, leading them to divert downwards from the optimal level of risk-taking. When studying the relationship between gender and risk, some studies seek to distinguish between the overconfidence and risk-aversion explanations. For example, Huang and Kisgen (2013) suggest that the documented male overconfidence and female risk-aversion can lead to similar predictions (i.e. aggressive male policies or conservative female ones), and conclude that their results are more consistent with the male overconfidence explanation.

Because it is difficult to accurately determine the optimal level of risks that a manager should take (in a natural context), it is difficult to attribute a gender-based systematic difference – when one exists – to males' overconfidence or females' risk-aversion. Therefore, I focus on investigating the existence of systematic differences between men and women in risk-related policies, given the difficulty of determining the optimal levels of these policies. Determining whether this difference is driven by overconfidence or risk-aversion lies beyond the scope of this project.

2.5. *Age and Risk-taking*

This section reviews the literature on the relationship between age and risk-taking at both the individual and managerial levels.

2.5.1. Individual Level

In almost every culture, ageing has its own connotations. One of the associations with ageing relates to risk-taking. For example, in "A Farewell to Arms" by Ernest Hemingway, when a mature character is informed "You are wise", he replies, "No, that is the great fallacy; the wisdom of old men. They do not grow wise. They grow careful". "Perhaps that is wisdom", the younger character responds. The reply is "It is a very unattractive wisdom" (p.187). Such passages in the literature are common and point to the existence of risk-related connotations associated with age.

Perhaps motivated by these connotations, the relationship between age and decision-making has been examined by psychologists and economists, who tend to investigate the existence of systematic differences in risk-taking between old and young people. They also attempt to understand the underlying reasons for such a difference, where it exists. For instance, if older individuals are more risk-averse, is this difference due to a decline in cognitive ability among this group, or to excessive risk avoidance? In this section, I review the extant literature on risk-taking behaviours across the human lifespan.

Theoretically, one possible reason for the alleged risk-avoidance among older people is their decline in cognitive abilities, causing the elderly to miss optimal choices (Samanez-Larkin et al. 2010). On the other hand, ageing could facilitate a better understanding to one's own abilities, leading older people to be less overconfident compared to younger people (Kovalchik et al. 2005). Moreover, the risk avoidance of older people may arise due to the increasing responsibilities associated with ageing (Vroom and Pahl 1971). These arguments may lead to similar predictions, i.e. we become more conservative as we grow older. Although, risk-avoidance, that co-occur with ageing, may be offset by increased experience, since experience is positively related to risk-taking (Worthy et al. 2011).

Comparing a group of 16 young doctors and nurses with an average age of 26.8 years, ranging from 22 to 33 years (the young group), and another group of 16 residents with an average age of 78.1 years, ranging from 68 to 88 years (the old group), Basowitz and Korchin (1957) report a relationship between age and ambiguity intolerance. Older people seem to be more conservative in their judgments. The researchers argue that this difference could stem either from a negative relationship between age and integrative ability or the excessive cautiousness associated with ageing.

Wallach and Kogan (1961) further examine the findings of Basowitz and Korchin (1957) by trying to isolate age's impact on the extremity of judgment from the effect on confidence levels. Using a sample of 511 subjects, that included males and females and young and old people, they find that older people tend to choose more conservative options while noting that this risk-taking behaviour may not be similar in different domains.

Vroom and Pahl (1971) note the lack of research on the link between age and risk-taking behaviours. To bridge this gap, they employ a data set of almost 1500 male managers working in over 200 companies. The mean age of the sample is 39.43, with a range of 22-58 years. They measure risk-taking by using an adjusted version of the Kogan and Wallach (1964) choice-dilemma questionnaire. The questions provide a choice between safe, certain outcomes as opposed to more risky but desirable ones. The findings indicate that older managers tend to be more risk-averse. The type of managers' work (finance, engineering, etc.) is not found to affect their risk-taking behaviour. Interestingly, they report that managers who work in older firms tend be more risk-averse compared to those who work in younger firms. The results also show that people tend to overestimate their risk appetite. Finally, they attribute age-based difference in risk-taking to developmental (e.g. having more responsibility as a person grows older), and sociocultural changes (e.g. having witnessed WWII). Notably, the age statistics of their sample are not comparable to those of the top executives in S&P 1500 firms.

Okun and Siegler (1976) employ a small sample of 11 young men (mean= 19.2 years, and range 17-21 years) and 11 old men (mean= 66.5, and range 60-74 years) to examine whether the previously reported inverse relationship between age and a preference for intermediate risks is generalizable or not. The results indicate that older men tend to avoid intermediate risks and high levels of difficulty following their success. They suggest that this approach can be seen as a way for older people to protect their self-ego from failure.

This work may shed some light on the effect of vested interests in mediating the age-risk relationship. In the corporate sphere, the majority of top managers could be considered successful. Therefore, and if the previous findings hold, one would expect the tendency to protect one's self-ego to be higher among managers, possibly leading to a stronger negative relationship between age and risk-taking.

Addressing some of these issues, Okun, Stock, and Ceurvorst (1980) note that the existing research on ageing and cautiousness could be biased due to the use of extreme samples, a one-dimensional risk measure, and inadequate reliability and validity tests. Using a larger sample of 126 men and women with an age range of 18-78 years, they study the relationship between ageing and risk-taking based on three different measures of risk. They find that age significantly increases risk-aversion only on one measure, but no significant results are found using the other three measures. This finding led the researchers to call for the investigation of other factors that could further explain this relationship.

To bridge this gap, Pålsson (1996) aims to observe how Swedish households' risk-aversion may vary based on their characteristics. She randomly choses the tax returns of 7000 households from 1985. Measuring risk-aversion in terms of the representation of risky assets in the total wealth and the price of the risk, the findings indicate that Swedish households are risk-averse. None of the economic and demographic factors (e.g. wealth and income) are found to affect risk-aversion, with the exception of age, which seems to positively and significantly increase risk-aversion. While the majority of the papers observe the relationship in a laboratory context, the main advantage of this study is the use of a natural context. This may help in eliminating the perception of risks by reporting the actual behaviour adopted by these individuals.

Dror, Katona, and Mungur (1998) build on the argument that decision-making ability can differ as we age due to external and/or internal factors. They conduct a laboratory experiment involving 36 participants divided into a group of young people (average age = 19) and old people (average age = 74). They examine the cognitive mechanism (internal factor) to see if the older people perform differently. The older participants made comparable decisions to those of the younger people. The type and length of the risk-taking decision-making processes are found to be similar for the older and younger groups. They conclude that ageing has no effect on the quality or speed of risk-taking decision-making, and call for an investigation of other internal and external factors.

Deakin et al. (2004) address this call and seek to understand how risk-taking behaviour change with age while controlling for other relevant factors, such as knowledge. They task 177 individuals (age range = 17-73) with a computer-based gambling game. Their results show that, compared to the younger participants, the older ones tended to take longer before making a decision, which is also less likely to be the optimal one. They also find that risk-tolerance decreases with age, suggesting that such a trend could be attributed to the generational effect, or to the relationship between youth recklessness and earlier mortality.[28]

Kovalchik et al. (2005) study the relationship between economic decision-making and age, using a group of young individuals (age range 18-26) and a group of healthy old individuals (age range 70-95). They report that the older people seem to make more accurate estimates about their own knowledge and its limitations. Both age groups performed similarly. However, in the gambling experiment, the researchers report that the older females, compared to older males, are more likely to choose the low payoff high variance deck. These findings call for controlling for managerial gender when studying managerial age, and *vice versa*.

Zabel et al. (2009) assert that the negative relationship between age and risk-taking is well-established. Thus, they investigate the potential reasons for this relationship. Using a sample of 299 individuals (age range 17-90, 61% female), they examine whether this relationship is driven by biological need for sensation. The results show that sensation-seeking serves as a full mediator of the relationship between age and

[28] That is, risk-averse people are more likely to survive longer.

financial risk, providing one explanation of the observed relationship between age and risk-taking, at least with regard to financial matters.

In a broader sense, Samanez-Larkin et al. (2010) study the difference in financial decisions across the life-span, using a sample of 110 individuals (average age 51.4, range 19-85, 52% female). The subjects participate in dynamic investment tasks while their neural activities are recorded. The researchers find that ageing affects rational decision-making via a neural mechanism. Rational choices are negatively and significantly related to age, even when controlling for factors such as numeracy and education.

To investigate the relationship between age and decision-making further, Worthy et al. (2011) use a sample of 28 old adults (average age = 68.55) and 28 young adults (average age = 20.29). They perform two experiments in which they make the reward value either independent or dependant of the preceding order of choices made. The first experiment, in which the rewards are independent of these choices, confirms the previously reported findings that age is negatively related to optimal decision-making. The second, which links rewards to choices, suggests an age advantage when taking decisions. The researchers attribute their findings, at least in part, to expertise in decision-making that could offset the cognitive decline with age.

This study provides some important insights when studying the age-risk relationship. In the corporate environment, it is common for executives to be rewarded based on their companies' performance, which should reflect, at least in part, the executives' own performance. In other words, the reward is dependent on the previous choices. If these results hold, then ageing, which is usually correlated with experience, could be related to better performance in the form of being closer to the optimal level of risks. Nevertheless, one potential issue with this study is that the importance of rewards is subjective to one's wealth, and older people, at least on average, might be wealthier than younger ones, making the motivator less effective for them.

Mata et al. (2011) survey the extant literature on the relationship between age and decisions involving risk-taking (N=4,093). They suggest that the differences depend on the tasks' framing, especially that regarding the learning requirements for these tasks. Compared to the younger people, the older people take less risks when their learning guided them to take more risks and more risks when their learning guided them to avoid risks. This is the case for decisions that are based on experience. On the other hand, for decisions based on descriptions, no age-based systematic difference in risk-taking is found, regardless of the framing.

Rolison, Hanoch, and Wood (2012) note that the reported age-based systematic difference in risk-taking may depend on the tasks employed and the analysis performed. They, therefore, ask their sample of two groups (N= 40, age average = 19.3, N=44, age average = 76.61) to perform the Balloon Analogue Risk Task[29], arguing that it captures the learning effect. They report that younger adults are willing to take more risks than older ones only when the decision is based on an initial assessment. When it is based on experience, however, the younger and older subjects made identical decisions. These findings support those of Worthy et al. (2011).

Pointing to the importance of context, Huang et al. (2013) study risky decision-making across the lifespan in a framework whereby older people have a lower deliberative decision-making capacity while maintaining their affective abilities. Using the Columbia Card Task with 148 individuals (age range 18-93), they report no age systematic difference on risk-taking between the old and young groups. The older people took more risks when the decision did not involve emotional information, indicating that context is critical in determining risk propensity among older people.

Using an alternative theory, Shulman and Cauffman (2014) build on the argument that risk-taking is usually driven by emotional actions rather than reasoned thinking. Thus, they study the relationship between age and non-conscious risk decisions. Their sample includes 282 individuals (age range 10-30, average = 19.35, 58% female). They report a curved relationship between age and risk-taking whereby the majority of risks are taken by those whose age is 20. Contrary to the finding of Zabel et al. (2009), sensation seeking is not found to explain the relationship between age and risk propensity. While these findings are important, they may be inapplicable to the corporate strategic

[29] In BART, the participants must inflate different balloons via software each time. They are also told that they will receive 1 US cent per pump, but will not be rewarded if they overinflate the balloon (if it bursts). They are not told about the probability increase with each pump, so they have to learn this from experience.

decisions. This is because it is reasonable to assume that it is more likely for corporate policies to be set after reasoned thinking than as an emotional reaction alone.

Bonem, Ellsworth, and Gonzalez (2015) assert that the current literature is mixed regarding the existence of risk-taking differences across the human life span. Using studies involving 176 and 182 participants, respectively, with an age range of 18 to 83, they investigate risk-taking preferences across different domains, examine the risk preferences and perceptions across these domains, and explore the motives that could explain the age difference. The results show that older people observe more risks in the health and ethics domains but fewer in the social domain. Further, older people enjoy risky behaviour in the health and ethical domains less than younger individuals, and found such behaviour to be less likely to produce favourable outcomes. These findings attest to the work of Wallach and Kogan (1961), who suggest that the relationship between age and risk-tolerance might be domain-specific.

Best and Charness (2015) update the work of Mata et al. (2011) using a sample of 3,232 participants. Interestingly, the results are different. For gains tasks, younger people tend to take more risks compared to older individuals, especially when the scenarios included small financial gains or a high mortality rate. For tasks within negative frames, no age-based systematic difference is found.

Recently, Brooks et al. (2018) use a data set of the responses to a questionnaire that was provided by over 500,000 investors to their financial advisors. They investigate whether there is a relationship between age and financial risk tolerance. They find that risk-tolerance decreases with age at an increasing but slow rate. In their investigation of the underlying reasons behind this systematic difference, they do not find evidence that the cause is the decline in cognitive power associated with ageing. They conclude that "Overall, our results are indicative of a modest age effect in risk tolerance that cannot be attributed to changes in other observable characteristics that differ between younger and older investors" (p.52)

Overall, this line of literature is not conclusive regarding the existence of a systematic difference in risk-taking between old and young people. We now turn to survey this relationship among corporate managers.

2.5.2. Corporate Level [30]

The debate on the relationship between age and risk tolerance has shifted to the corporate context. There are two possible reasons for this shift. First, if there exists a systematic difference in individuals' risk tolerance based on age, then this phenomenon can extend to managers and consequently affect the outcome of the firm. This is plausible given the managerial fixed effect on firms, discussed earlier in this chapter. Another motive behind studying the implications of managerial age relates to the ageing of the general population. For example, the low risk tolerance of the elderly could have implications for the cost of capital for firms (Brooks et al. 2018). Similarly, if older TMTs have lower or higher risk tolerance and the population continues to age, there are possible implications for corporate risk-taking. Therefore, it is important to understand whether or not age affects the outcome of the firm.

Theoretical attempts to understand the influence of managerial age and risk-taking are not new. For instance, Hambrick and Mason (1984) build on the existing literature and provide three explanations regarding why younger managers might take more risks.

The first is that older executives may have less physical and mental stamina (Child, 1974) or may be less able to grasp new ideas and learn new behaviors (Chown, 1960). Managerial age has been negatively associated with the ability to integrate information in making decisions and with confidence in decisions, though it appears to be positively associated with tendencies to seek more information, to evaluate information accurately, and to take longer to make decisions (Taylor, 1975). A second explanation is that older executives have greater psychological commitment to the organizational status quo (Alutto & Hrebiniak, 1975; Stevens, Beyer, & Trice, 1978). Third, older executives may be at a point in their lives at which financial security and career security are important. Their social circles, their spending traits, and their expectations about retirement income are established. Any risky actions that might disrupt these generally are avoided (Carlsson & Karlsson, 1970). (p.198)

Recently, the accounting and finance literature has begun to investigate whether managerial age affects the riskiness of the firm. Yim (2013) studies whether CEO age

[30] Studies that are directly related to each chapter are discussed within the chapters.

affects corporate acquisitions. They provide two frameworks through which age can influence acquisitions. First, the agency framework predicts that younger managers may increase the size of the firm via acquisitions to increase their compensation early on in their career (i.e. empire-building). Alternatively, younger executives may have more career concerns, leading them to avoid risky investments that might reduce their earnings in the future. Second, since they psychology literature is not conclusive on the direction of the relationship between age and risk-aversion/overconfidence, it is possible that age can either positively or negatively affect acquisitions. Alternatively, age may be negatively associated with acquisitions, given the reported energy decline associated with ageing.

Using a dataset for US CEOs between the years 1992-2007, Yim (2013) reports that the likelihood of acquisitions decreases as CEOs age. The findings also show that acquisitions are linked to a permanent increase in CEO compensation, leading her to attribute this variation to agency problem rather than the declining overconfidence that may accompany aging. The paper rules out the possibility of younger CEOs sorting in acquisition-intensive firms.

In contrast, Iqbal (2013) examines whether CEO age and education are related to the introduction of hedging in the oil and gas sector. With respect to age, he provides two opposing arguments. On one hand, younger managers have greater career concerns because they are not yet known for having superior managerial skills, given their shorter careers. Therefore, their careers might be vulnerable to failure, inducing them to become more risk-averse. On the other hand, younger managers may become risk-takers to demonstrate their superior abilities. He documents that younger CEOs are associated with the initiation of hedging activities, which is in line with the argument that younger CEOs are more risk-averse.

Additionally, Serfling (2014) examines the relationship between CEO age and risk-taking behaviour for US companies between 1992 and 2010. He observes that the literature provides contradictory predictions. On one hand, younger managers, having greater career concerns, may lower the risk of the firm and therefore adopt safer polices. On the other hand, they may adopt risker policies in order to signal their superior performance.

Serfling (2014) finds that younger CEOs make more risky investments by investing more in R&D, choosing less diversified acquisitions, managing firms with less diversified operations, and sustaining a higher operational leverage. The relationship between age and corporate policies is more pronounced when both the CEO and the next person in the managerial pyramid are old/young.[31] The paper also shows an inverse relationship between CEO age and the volatility of stock returns. These findings contrast with those of Iqbal (2013).

In their study of the impact of demographic characteristics of the board of executives, Berger, Kick, and Schaeck (2014) find that younger executive teams in German banks increase the portfolio risks compared to older executive teams.

Li, Low, and Makhija (2017) build on the career concern literature and advance two hypotheses. The Market Learning Hypothesis predicts that younger managers are more conservative due to their career concerns, because investments reveal additional information about their abilities and therefore become more risky for them. Alternatively, the Managerial Signalling Hypothesis suggests that younger managers take more risks, since they have to prove themselves by undertaking more aggressive policies.

Their results are in line with the literature indicating that younger managers take more risks and also confirm the Managerial Signalling Hypothesis. Younger executives are more likely to enter or exit from new sectors, and to significantly increase or decrease the size of the firm. They also find that CEO age is negatively related to R&D investments and capital expenditures.

2.5.3. Summary

Two strands of literature have been reviewed; age and risk-taking at the individual level, and age and risk-taking at the managerial level.

At the individual level, scholars propose the possibility of a decline in risk-taking as we age due to a decline in cognitive power (Samanez-Larkin et al. 2010), decline in overconfidence (Kovalchik et al. 2005), and/or an increase in responsibilities (Vroom and Pahl 1971). Alternatively, the gained experience associated with ageing could offset this

[31] This finding further highlights the importance of considering executives beyond the CEO.

effect (Worthy et al. 2011). Empirically, the literature is mixed on this relationship (Bonem, Ellsworth, and Gonzalez 2015).

At the executive level, prior studies generally report that older managers are more conservative (Bertrand and Schoar 2003; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), while some find the opposite (Iqbal 2013). Under the rationality assumption, these findings can be explained by the changes in managers' self-interests at different stages of their lives. In other words, they change the risk of the firm to the level that maximizes their own interests. Assuming bounded rationality, the existence of a systematic difference in managerial risk-taking within firms is explained by the aforementioned theories at the individual level. A notable drawback of this literature is the lack of control for executives' gender (e.g. (Barker and Mueller 2002; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013)), given that executives' ages are systematically different across genders (Withisuphakorn and Jiraporn 2017).

2.6. Conclusion

The existing literature demonstrates that different managers have different preferences on risk-taking. Managers have their own styles (Bertrand and Schoar 2003), and part of their "style" is their willingness to take risks. In turn, the managerial fixed effect (i.e. their style) is influenced by their personal traits and characteristics. Several empirical studies have demonstrated this phenomenon. For example, managerial overconfidence, a personal trait, affects investments (Malmendier and Tate 2005), capital structure, and payout policy (Ben-David, Graham, and Harvey 2007).

One of the first theoretical frameworks explaining why managerial characteristics can influence the outcome of the firm is the Upper Echelons Theory (UET). Hambrick and Manson (1984) argue that, because managerial characteristics influence managers' perception of reality and its analysis, these characteristics can affect their decisions within the firm. In their theory, they point to the importance of focusing on observable managerial characteristics rather than traits. One of the advantages of this approach is not limiting the study of managerial influence to the psychological dimensions but rather broadening it to include alternative models and explanations.

Indeed, several empirical studies have demonstrated that observable managerial characteristics can influence the riskiness of the firms. For example, managerial financial experience influences capital structures and acquisitions (Güner, Malmendier, and Tate 2008), witnessing the great depression affects capital composition (Malmendier, Tate, and Yan 2011), and managers with pilot licenses adopt risker policies (Cain and McKeon 2016). Such studies provide evidence for the view that managerial risk preferences are reflected in their firm-related decisions, a central premise of this thesis.

Two observable characteristics have received considerable attention in the literature; namely, gender and age. First, gender has been linked to risk-tolerance, with substantial evidence on female risk-aversion/male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). Similarly, several studies report a link between age and risk-tolerance, but the existence and direction of this relationship is poorly understood (Bonem, Ellsworth, and Gonzalez 2015; Worthy et al.

2011). Such studies at the individual level have elevated scholars' interest in investigating these phenomena in corporations.

Regarding gender, most studies propose that gender can affect the riskiness of the firm and its policies through female risk-aversion or male overconfidence.[32] Empirically, while several studies have found that female executives are associated with lower risks (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin 2014; Huang and Kisgen 2013; Khan and Vieito 2013; Perryman, Fernando, and Tripathy 2016) other studies suggest that female executives take more risks (Berger, Kick, and Schaeck 2014). Hence, further empirical analysis is required to examine whether executives’ gender is related to the riskiness of the firm and its corporate policies.

Regarding age, several reasons have been proposed as to why managerial age can affect the riskiness of firms. Managerial age can affect managers’ own risk-tolerance, which is mirrored in the firm or, as rational, self-interested agents, their utility function can change with ageing, affecting the riskiness of the firm. On one hand, older executives, having established their reputation, may take more risks since they may perceive their reputation as a defence in the case of failure, and younger managers may avoid risks since they do not have a well-established reputation. On the other hand, younger executives may take more risks to signal their superior performance by taking aggressive steps. In this case, older managers have already proved themselves and consequently prefer to choose safer options in order to protect their self-ego. Several studies conclude that younger managers increase the riskiness of the firm (Bertrand and Schoar 2003; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), while others find evidence to the contrary (Iqbal 2013). Thus, the relationship between executives’ age and the riskiness of the firm and its corporate policies is not well understood, calling for further empirical work.

Further, another key argument of the UET relates to the unit of analysis. Hambrick and Manson (1984) stress the importance of examining managerial characteristics on the TMT level since CEOs tend to share their responsibilities with the rest of the team.

[32] Another strand of literature is motivated by the findings of Adams and Ferreira (2009), who document that female directors are better at monitoring. These studies posit that female directors may affect the riskiness of the firm in their quest to maximise the shareholders wealth. However, one may suggest that extending this argument from female directors to managers is theoretically difficult, given the different roles of managers and directors.

Indeed, Chava and Purnanandam (2010), among others, demonstrate that the influence of CFOs on certain policies is stronger than that of CEOs. Other studies suggest that the risk-aversion or overconfidence of one executive may influence the risk-tolerance of other members of the managerial team (Malmendier and Zheng 2013; Wallach, Kogan, and Bem 1962).

Notably, most of the finance literature is focused on CEOs rather than examining the central tendency of the top management team. This is surprising given the finding of Bertrand and Schoar (2003), who report that including other executives' fixed effect (other than the CEO and CFO) increases the explanatory power of their acquisition model. Further, Aggarwal and Samwick (2003) argue that COOs (chief operating officers) play a border role compared to executives with specific roles since they oversee the operations of the firm. Moreover, Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin (2014) and Perryman, Fernando, and Tripathy (2016) report that female representation on the TMT reduces the overall risk of the firm.

The findings of Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin (2014) and Perryman, Fernando, and Tripathy (2016) lead to the question of how the riskiness of the firm can be reduced. A possible answer is that higher female representation leads to more conservative corporate polices, reducing the overall risk of the firm, assuming that the riskiness of the firm is partially determined by such policies. This thesis contributes in this direction.

Moreover, with certain exceptions (Berger, Kick, and Schaeck 2014; Peltomäki, Swidler, and Vähämaa 2018)[33], no study has attempted to examine gender and age simultaneously, which is important for several reasons. First, Berger, Kick, and Schaeck (2014) note that a change in the female representation on the executive board is likely to lower the average executive age, since this replacement can be triggered by the retirement of another member. This argument can be extended to the TMT. In this case, examining one characteristic without at least controlling for the other can lead to biased results. Second, if there is a systematic difference between the age of female managers and that of male managers, the analysis of one characteristic without the other may produce

[33] Working paper

confounding results. Withisuphakorn and Jiraporn (2017) report that female CEOs are systematically younger than their male counterparts. In this case, studying one of these characteristics alone can pick up the effect of the other (i.e. a confounding effect). This thesis overcomes this drawback in prior studies by examining gender while controlling for age and *vice versa*.

In sum, since managerial gender and age can affect managers' risk-taking, which can influence the riskiness of corporate policies, this influence could potentially appear in corporate policies that are associated with risk. Therefore, this thesis is focused on cash holdings which are held for precautionary reasons (Chapter 3), R&D investments which entail highly uncertain payoffs with certain costs (Chapter 4), and payout policy which can be traded with investments and may demand future commitments (Chapter 5).

Chapter 3 Executives’ Characteristics and Cash Holdings [34]

JEL Classification: G40, G32, J10

Keywords: Gender, Age, Risk-Aversion, Overconfidence, TMT, CEO, CFO, Upper Echelons Theory, Corporate Governance, Cash Holding

[34] I presented this chapter at the Scottish BAFA 2015 and Scottish BAFA 2016, and won the "The Best Pitch Prize" in the pitching research competition. I am thankful for the feedback I received from the participants.

3.1. Introduction

There has been a trend towards stockpiling cash in corporations around the globe. In 2006, the average cash-to-assets for industrial companies in the US was twice what it was in 1980 (Bates, Kahle, and Stulz 2009). A more recent report indicates that this trend might be global by showing that corporate cash holdings in the US, UK and the rest of the Eurozone have more than doubled since 2000 (The Association of Corporate Treasurers 2014). Because holding cash entails opportunity costs – since cash provides at best a return in the form of interest that is lower than the required rate of return by investors, this trend represents a phenomenon that is not well understood.

This has elevated researchers' interest in investigating this phenomenon. Research in this area has two aims: understanding the determinants of cash holdings and examining the implications of cash holdings (Amess, Banerji, and Lampousis 2015). First, researchers look at firm and context-specifics to discover the determinants of cash holdings. Another strand of literature focuses on the effects of cash holdings on the firm (e.g. (Dittmar and Mahrt-Smith 2007; Mikkelson and Partch 2003)).

This chapter focuses on the influence of managerial characteristics on cash holdings. Prior studies propose several theories for holding cash. Companies may hold cash for precautionary reasons (Keynes 1936), transactional reasons (Miller and Orr 1966), agency conflicts (Jensen 1986), and tax motives (Foley et al. 2007). Researchers study these motives empirically and explain some of the variation in corporate cash holdings. Yet, there is a growing body of literature that investigates the role of managerial attributes in explaining the variations on corporate cash holdings. This literature suggests that managerial characteristics may alter the demand for cash holdings for precautionary reasons. For example, CEO optimism (Huang-Meier, Lambertides, and Steeley 2015), CEO previous experiences (Bernile, Bhagwat, and Rau 2017; Dittmar and Duchin 2016), and compensation (Chava and Purnanandam 2010) are related to cash holdings.

This literature improves our understanding of how managerial characteristics can influence cash holding. However, whether some of the variations in corporate cash holdings can be explained by managerial attributes needs further examination. Hambrick and Mason (1984) suggest that the outcome of the firm could be better explained by a combination of factors, including managerial characteristics. In fact, Amess, Banerji, and Lampousis (2015) review the cash holding literature and suggest that "Further research could analyse other individual characteristics. Does managers' risk preferences and risk perception impact on the precautionary motive for holding cash? Does religion and gender play a role in managers' preferences to hold cash?" (p.11). This chapter aims to contribute in this direction by examining if the gender and age of the top management team (TMT) can explain some of the variations in cash holdings.

Setting this goal is motivated by two main ideas. First, the literature suggests that socio-demographic factors such as gender and age are influential in determining individuals' risk-taking. Men take more risks than women due to male overconfidence or female risk-aversion (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009; Huang and Kisgen 2013), while age seems to influence risk-taking negatively (Li, Low, and Makhija 2017; Okun and Siegler 1976; Serfling 2014; Yim 2013). Since managers' risk preferences can influence their corporate decisions (Malmendier and Tate 2005), this strand of literature suggests that female managers and older managers may adopt more conservative corporate policies. Second, empirical studies provide evidence that cash is held for precautionary reasons (Bates, Kahle, and Stulz 2009; Opler et al. 1999). When external finance is unavailable or costly, increasing the cash holdings could protect firms from future distress and from forgoing attractive investment opportunities.

Given these two reasons, it is possible that females and older executives may hold more cash in order to hedge against future distress due to their higher risk-aversion and/or lower overconfidence compared to their male and younger counterparts. Particularly, I hypothesise that the percentage of female executives in the top management team (TMT) and the average age of the TMT are positively related to cash holdings. The TMT is used as a unit of analysis based on the Upper Echelons Theory (UET), which proposes that TMT characteristics (i.e. the group characteristics) are important in predicating corporate outcomes (Hambrick and Mason 1984). When studying the influence of observable managerial characteristics, the UET emphasises the importance of measuring these characteristics at the TMT level since CEOs share their responsibilities with the rest of the team.

Several findings have emerged. First, the results indicate that the proportion of females and cash holdings are positively related. Adhikari (2018) finds similar results and attributes these to female risk-aversion. While it is possible that TMTs with more females are more risk-averse and thus hold more cash for precautionary reasons, it is equally possible that TMTs with more males are more overconfident and underestimate the cash needed for precautionary reasons.[35] In an additional analysis, the role of CEOs and CFOs gender is examined. The results suggest that only female CEOs are positively related to cash holdings, in line with prior studies (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015).

Second, contrary to my prediction, I find that the average age of the TMT and cash holdings are negatively associated. Older teams hold less cash. The additional analysis shows that the ages of both CEOs and CFOs are negatively related to cash holdings. Potentially, younger managers, having more career concerns, adopt safer policies in order to reduce the riskiness of the firm (Serfling 2014; Yim 2013). Another possible explanation is that older people take more risks (Huang et al. 2013), leading older managers to hold less cash for precautionary reasons.

This chapter contributes to the literature in several ways. First, it provides the first comprehensive study of the impact of managerial gender and age on cash holdings at the TMT, CEO, and CFO levels. In doing so, this chapter adds to the literature investigating the determinants of cash holdings (Bates, Kahle, and Stulz 2009; Opler et al. 1999; Ozkan and Ozkan 2004). In particular, it shows that managerial characteristics at different levels play a role in explaining the cross-sectional variations in corporate cash holdings, in line with the UET's view that corporate outcomes could be better explained by a combination of frim and managerial characteristics.

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[35] I acknowledge another strand of literature that considers the free cash flow problem (Jensen 1986). In particular, cash could be held by the entrenched managers to be used for their own interests. However, the possibility that female managers increase cash holdings for this reason may not be valid for two reasons. First, it is difficult to establish that female managers are more entrenched to hold more cash. Second, studies on the determinants of cash holdings provide stronger support for the view that cash is held for precautionary reasons, while the evidence on the agency motive is mixed.

Second, it adds to the findings of Adhikari (2018)[36] by showing that the positive association between the proportion of female executives in the TMT and cash holdings holds, even after accounting for important factors, such as managerial age, tenure, and compensation. While Adhikari (2018) argues that female representation on the TMT is a proxy for managerial risk-aversion, I suggest that female representation may increase (decrease) TMT risk-aversion (overconfidence), leading to higher cash holdings. Moreover, this findings may provide an insight into the potential channels through which the proportion of female executives on the TMT reduces the riskiness of the firm (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin 2014; Perryman, Fernando, and Tripathy 2016).

Further, existing studies show that female CEOs and CFOs are positively related to cash holdings (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015). Using a larger dataset complemented with hand collection, this study shows that only female CEOs are positively related to cash holdings. These findings are consistent with the view that female managers are associated with more conservative policies, either because they are more risk-averse or less overconfident (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009; Huang and Kisgen 2013).

Third, existing studies provide mixed evidence on the relationship between managerial age and cash holdings. Studies have documented that age is associated with cash holdings both positively (Bertrand and Schoar 2003; Orens and Reheul 2013) and negatively (Peltomäki, Swidler, and Vähämaa 2018). Using a larger dataset, this chapter shows that the average age of the TMT and the ages of both the CEO and CFO are negatively related to cash holdings. Hence, it adds to the ongoing debate at the CEO and CFO levels, and provides the first evidence for a relationship between the average age of the TMT and cash holdings. In doing so, this chapter provides comprehensive evidence that managerial age is associated with a conservative cash holding policy.

[36] This paper was published late 2017, after completing this chapter in 2015. However, this chapter still differs from this paper in three ways. First, it considers the average age of the TMT as one of the observable characteristics that can affect managerial risk-taking. Second, the dataset is more comprehensive, since it covers the period from 1992 to 2013. Third, I carry the analysis at the CEO and CFO levels. Fourth, I provide an alternative explanation.

The rest of this chapter is structured as follows. Section 3.2 reviews the literature. Section 3.3 develops the hypotheses. Section 3.4 discusses the sample and the variables. Section 3.5 provides descriptive statistics for the data. Section 3.6 includes the analyses, and the last section concludes the chapter, followed by the tables and figures, and an appendix defining the variables used in this chapter.

3.2. Literature Review

This section reviews the theoretical motives for holding cash, the empirical evidence for these motives, and the literature on the relationship between managerial characteristics and cash holdings.

3.2.1. Theoretical Motives for Cash Holdings

3.2.1.1. Precautionary Motive

Keynes (1936) proposes that one of the major reasons for storing cash is to hedge against the risk of cash flow shortages, which can happen in many cases including the possibility of finding an attractive opportunity when other sources of funding are costly or unavailable or when the company is financially distressed (Brisker, Çolak, and Peterson 2013). Additionally, agency problem (Jensen and Meckling 1976) and information asymmetry (Myers and Majluf 1984) could also play a role in raising the cost of external funding compared to internal funds. Consequently, holding cash could reduce this risk. There is substantial evidence that cash is held for precautionary reasons.

For instance, Opler et al. (1999) provide evidence supporting the view that cash is held for precautionary reasons. Consistent with the precautionary hypothesis, firms that have good access to the capital market (large firms and firms with high credit ratings) tend to hold less cash. Also, smaller firms and firms with high market-to-book and risker operations hold more cash. Moreover, Bates, Kahle, and Stulz (2009) attribute the increase in the cash-to-assets ratio to the increasing risks associated with cash flows as well as to the changes in firm operations (lower levels of inventories and higher levels of R&D). The relationship between cash holding and the riskiness of firm is strongly supported in the literature (Han and Qiu 2007; Riddick and Whited 2009). Additionally, Brisker, Çolak, and Peterson (2013) find that the inclusion of firms on the S&P 500 index leads to a reduction in cash holdings by 32% due to an increase in their transparency, a reduction in their uncertainty, and an increase in their ability to raise external funds at a reasonable cost. Moreover, firms in countries with a culture of uncertainty avoidance hold more cash, suggesting that cash is held for precautionary reasons (Chen et al. 2015).

Further, the literature suggests that cash can also be held for speculative motives to take advantage of attractive opportunities (Brisker, Çolak, and Peterson 2013). When opportunities arise and the firm cannot access external capital at a reasonable cost, having a significant cash balance may reduce the risk of forgoing such opportunities. Harford (1999) finds that companies with higher cash balances are more likely to diversify by acquisition, despite the fact that these transactions appear to be value destroying. It is worth noting that the speculative motive can also be seen as part of the precautionary motive, given that it is driven by avoiding the risk of missing good opportunities. Overall, the empirical literature provides evidence supporting the view that cash is held for precautionary reasons.

3.2.1.2. Transaction Motive

Keynes (1936) suggests that firms need cash to maintain their usual activities and transactions. In many cases, there is a time lag between spending and generating cash, since firms tend to incur some expenses before selling their products or services. The cash shortage due to the time disparity between spending and collecting can be bridged by holding a suitable cash balance, borrowing the amount needed, and/or selling assets to raise the amount needed to finance these transactions. Myers and Majluf (1984) suggest that companies may rationally hold cash to finance their transactions, since liquidating assets to meet the short-term cash demand is more costly than holding cash. Miller and Orr (1966) provide evidence that the cost of liquidating assets may encourage firms to hold more cash. Also, the transactional demand for cash is less pronounced in larger companies, suggesting an economic of scale effect on the cash held for transactional reasons (Mulligan 1997).

3.2.1.3. Agency Motive

The separation of ownership and management leads to conflicts of interest (Jensen and Meckling 1976). One of these conflicts relates to cash holdings since managers are inclined to hoard cash even in the absence of attractive investment opportunities (Jensen

1986). The cash amount held for agency motives is the amount that exceeds the cash held for precautionary and transactional reasons (Bates, Kahle, and Stulz 2009).

The empirical evidence for the relationship between the agency problem and cash holdings is mixed. Dittmar, Mahrt-smith, and Servaes (2003) provide evidence that companies with a manifested agency problem seem to hold more cash. In contrast, Harford, Mansi, and Maxwell (2008) find that firms with stronger governance hold more cash. Also, Nikolov and Whited (2014) find that managerial perks' consumption, which is more pronounced in companies with lower institutional and large investors, is strongly related to cash holding. They also suggest that low managerial ownership is a critical reason for the increasing cash balances. Ozkan and Ozkan (2004) find that ownership structure affects cash holdings, with a non-monotonic relationship existing between managerial ownership and cash holdings. Cash is also found to have a lower value in companies with a strong agency problem (Dittmar and Mahrt-Smith 2007; Pinkowitz, Stulz, and Williamson 2006).

On the other hand, Bates, Kahle, and Stulz (2009) do not find supportive evidence for the argument that the agency problem plays a role in the recent cash stockpiling in the US. Also, Mikkelson and Partch (2003) find no evidence to support the view that cash holding is related to corporate governance structure.

3.2.1.4. Tax Motive

Multinational companies operate in different tax jurisdictions, subjecting these companies to different tax regimes. The accounting system produces a consolidated cash balance for multinational companies, although some parts of this balance might be subject to repatriation tax. Foley et al. (2007) suggest that these companies are subject to high repatriation tax with regard to cash generated abroad, encouraging them to store cash in their subsidiaries that operate in jurisdictions with lower tax rates. Therefore, multinational companies may hold cash to exploit the advantages of the various tax regimes. On the other hand, and to the extent that cash is negative debt, holding cash generates interest which is taxable, while debt bears interest that is tax deductible (Riddick and Whited 2009).

3.2.2. Determinants of Cash Holdings: Existing Evidence

Several studies seek to explain the variation in cash holdings by considering the different variables at the firm, industry, and country levels. These variables are motivated by the theoretical motives presented in the preceding section. This section summarises the cash holding determinants discussed in the literature, with the goal of controlling for these variables within the models used in this chapter.

3.2.2.1. Growth Opportunity

Firms that are valued largely by their growth potential face higher costs when raising external capital (Myers and Majluf 1984). This is because most of their value is based on their potential rather than tangible assets, which can be pledged as collateral. More, since the values of companies with high growth opportunities depend on their prospects rather than their tangible assets or actual cash flows, these companies may incur higher costs in the case of bankruptcy and financial distress (Shleifer and Vishny 1997). The high costs of the external capital sources give these companies an incentive to hold more cash for precautionary reasons. For instance, such companies are more likely to be cautious about not forgoing good investment opportunities when they fail to raise external capital at reasonable costs. Many empirical studies lend support to this notion by showing a positive relationship between market-to-book ratio and cash holding. For example, Guney, Ozkan, and Ozkan (2007) report evidance from a panal of developed countries; Harford (1999) from US firms; Kim, Mauer, and Sherman (1998) from US industrial firms; and Ozkan and Ozkan (2004) from UK firms.

3.2.2.2. Firm Size

Miller and Orr (1966) propose that smaller companies hold more cash (relative to their size) than larger ones due to the economics of scale regarding cash management. In other words, the absolute amount of cash could be larger for big companies, since they can better manage the firm with a lower percentage of cash to total assets. Additionally, larger companies have better access to external finance because they have more assets to pledge as collateral (Opler et al. 1999). Large companies are also more recognised in the market because they tend to have further coverage by stakeholders (e.g. analysts and news coverage), reducing the level of information asymmetry (Fazzari and Petersen 1993). Therefore, their precautionary demand for cash holdings is lower than that of smaller firms.

Drawing on previous work, Bates, Kahle, and Stulz (2009) suggest that there also exists a relationship between cash held for transactional motives and company size, and find evidence that this argument holds only in part for their study period. Despite this weak evidence, the argument that larger companies hold less cash finds strong support from literature, at least for precautionary motives. For example, Al-Najjar (2013) reports empirical evidance from emerging markets; Guney, Ozkan, and Ozkan (2007) from a panal of developed countries; Opler et al. (1999) and Harford, Mansi, and Maxwell (2008) from the US; and Ozkan and Ozkan (2004) from UK firms.

3.2.2.3. Cash Flow

Myers and Majluf (1984) theorise that profitable firms may hold more cash, given their model that companies follow a pecking order in which they prefer to use internal sources of fund, debt, and equity, respectively. Nonetheless, one could argue that companies with good performance may have better access to external funds at a reasonable cost, leading to a negative relationship. The empirical evidence is mixed.

Opler et al. (1999) suggest that firms that witness an increase in their cash flow are more likely to hold part of it to finance future investment opportunities and tackle the challenges when they face financial distress. This is because companies are more likely to prefer internal capital markets over external ones (Ozkan and Ozkan 2004), following a pecking order. Both studies provide results to support this argument. Almeida, Campello, and Weisbach (2004) also report that financially constrained firms hold more cash when their cash flow increases.

On the other hand, Almeida, Campello, and Weisbach (2004) also find that this relationship does not hold for companies that are in a better financial position. Similarly, Kim, Mauer, and Sherman (1998) report a negative relationship between cash flow and cash balance. They suggest that firms with high cash flows can maintain a lower level of cash and cash equivalents because they can use such cash flows to meet their future obligations and expenses. Overall, the relationship between cash flow and cash balances is not conclusive.

3.2.2.4. Cash Flow Volatility

Minton and Schrand (1999) show that cash flow volatility induces firms to forgo valuable investment opportunities because they may lack sufficient internal funds or cannot access the capital market at reasonable costs. Given that companies with high cash flow volatility face higher costs when dealing with the external capital markets, they are expected to hold higher levels of cash. Therefore, Ozkan and Ozkan (2004) propose that companies with more volatile cash flows are inclined to hold more cash to avoid forgoing valuable investment opportunities. However, they find no evidence supporting their prediction.

Similarly, Han and Qiu (2007) predict that cash flow volatility has a positive impact on cash balance. They suggest that financially constrained firms are expected to hold more cash when facing cash flow volatility. However, they find no systematic relationship between cash holding and cash flow volatility in unconstrained firms. Still, other studies provide evidence for a positive link between cash flow riskiness and cash balance, at least in the US (Bates, Kahle, and Stulz 2009; Opler et al. 1999; Brisker, Çolak, and Peterson 2013).

3.2.2.5. Net Working Capital

Net working capital (net of cash) can be seen as a substitute for cash (Bates, Kahle, and Stulz 2009; Opler et al. 1999). This is because companies can transfer their current assets into cash without incurring substantial costs (Ozkan and Ozkan 2004). Therefore, this is part of liquidity in its broader definition. Their finding suggests that net working capital is indeed a substitute for cash as they document that companies tend to hold fewer inventories and receivables and more cash over time.

Empirically, Opler et al. 1999; Yung and Nafar 2014; Dittmar, Mahrt-smith, and Servaes (2003) find a negative relationship between net working capital and cash holding, supporting the substitution argument. In the same way, Bigelli and Sánchez-Vidal (2012) find similar results in private firms and argue that net working capital provides a good cash substitute.

3.2.2.6. Payout

Al-Najjar (2013) draws on the trade-off theory and suggests that dividend payments and cash holdings should be negatively related, given that companies could trade-off the costs of holding cash by reducing their payments.[37] Opler et al. (1999) and Ozkan and Ozkan (2004) construct similar arguments and lend empirical support to the existence of a negative relationship between cash holdings and payout. In other words, companies can avoid raising external capital by reducing their payouts. Adopting a different view, Bates, Kahle, and Stulz (2009) provide similar predictions and suggest that dividend-paying firms are more likely to have better access to the capital market and face lower risks, suggesting a negative relationship between cash holding and payout.

On the other hand, Ozkan and Ozkan (2004) point out that it is possible to observe a positive relationship between dividend and cash balance. This is because companies that pay dividends are likely to avoid a shortage in cash that may lead to a reduction in dividends. That is; their dividend commitments will induce them to hold more cash so that they do not have to reduce their dividends in the future. However, they do not find a systematic relationship between dividend policy and cash holdings. This is consistent with the argument that a payout is merely a distribution of excess cash flows to investors (Faleye 2004). Overall, the empirical evidence seems to provide support for a negative relationship between dividends and cash holdings.

3.2.2.7. Research and Development Investments

Research and development expense has been established as a determinant of cash holding. Companies that are R&D intensive are prone to hold high levels of cash. This is because, when companies face a shortage of cash, they are reluctant to adjust their R&D investment, since most of the spending is related to wages, making the adjustment cost very high (Brown and Petersen 2011). Cutting R&D spending may require dismissing researchers, exposing the firm to substantial rehiring costs. Thus, firms that invest in R&D may hold more cash in order to smooth their R&D investments. Similarly, Qiu and Wan (2015) propose that companies with high R&D spending are expected to hold more cash since most of their value is attributed to their human capital, which cannot be pledged as collateral. Further, Opler et al. (1999) propose that, given that the information asymmetry is large around R&D investments, companies with high

[37] This argument assumes that both cash holding and payout are conservative choices. Cash can be held for precautionary reasons, while payout provides the firm with the choice to reduce the payments when the need arises or as an alternative to investments, which are risker.

R&D investments are expected to hold more cash since the cost of financial distress for such companies is higher. From a different perspective, Bates, Kahle, and Stulz (2009) suggest that R&D proxies for growth opportunity. They also propose that companies with high levels of R&D face higher costs related to financial distress. Consequently, they expect a positive relationship between cash holding and R&D.

Opler et al. (1999) and Bates, Kahle, and Stulz (2009) provide empirical evidence for a positive relationship between R&D and cash holdings. Overall, the existing evidence shows a positive association between R&D investments and cash holdings.

3.2.2.8. Capital Expenditure

Bates, Kahle, and Stulz (2009) argue that, since capital expenditure leads to higher levels of assets that can be pledged as collateral for lenders, companies with higher capital expenditure are expected to hold less cash as they increase their debt capacity. They also offer a competing argument and suggest that capital expenditure could indicate higher financial distress and/or higher growth opportunities, leading to a higher cash balance. Further, because there is a negative relationship between investments and cash holding, companies with higher capital expenditure may hold more cash since CAPEX is a form of investment (Harford, Klasa, and Maxwell 2014). The empirical evidence in this regard is mixed. For example, while Bates, Kahle, and Stulz (2009) and Guney, Ozkan, and Ozkan (2007) report a negative relationship between capital expenditure and cash holdings for US and UK firms respectively, Opler et al. (1999) find the opposite to be the case for a set of US data.

In a similar way, Bates, Kahle, and Stulz (2009) propose that acquisitions are substitutes for capital expenditure, and accordingly predict a similar relationship between acquisition and cash holding to that between capital expenditure and cash holding. Also, companies that make acquisitions are expected to hold smaller cash balances since acquisitions can fully or partially be financed by cash. Equally, the acquired firms may have assets that can be used as collateral. Their results, along with the findings of Opler et al. (1999) , are consistent with their predictions.

3.2.2.9. Leverage

Guney, Ozkan, and Ozkan (2007) draw on the literature and conjecture that leverage affects cash holding, but in a nonlinear way. They argue that there is a positive relationship between leverage and cash holding as long as leverage proxies for the ability to issue debt, representing a cash substitute. Yet, as leverage increases and the risk of financial distress and incurring costly bankruptcy costs rises, a positive relationship between leverage and cash holding emerges due to the precautionary demand for cash holdings. They find strong empirical support for their argument.

Ozkan and Ozkan (2004) note the possibility that, because highly leveraged firms are more likely to experience financial distress, companies with higher leverage might be expected to increase their cash holding (i.e. for precautionary reasons). Nonetheless, they present a counter argument for the negative relationship between leverage and cash, given the previous finding that the cost of holding liquid assets increases as companies employ more debt (Baskin 1987). Also, Bates, Kahle, and Stulz (2009) provide theoretical reasons for both a negative and positive relationship between leverage and cash holding. The empirical evidence seem to support the negative relationship (Bates, Kahle, and Stulz 2009; Harford, Mansi, and Maxwell 2008; Ozkan and Ozkan 2004).

3.2.2.10. Industry

The UET emphasises the importance of the industry when studying the effect of managerial characteristics on corporate policies (Hambrick and Mason 1984). That is; managerial characteristics may influence corporate policies in different industries in different ways. In addition, most of the literature suggests that cash is industry-specific. This is because different industries have different business models, and consequently require different financial policies. For instance, risker industries may hold more cash for precautionary motives, and industries whose cash conversion cycles are longer may require more cash for transactional motives. Empirical evidence suggests that cash is industry-specific (Bates, Kahle, and Stulz 2009; Harford, Mansi, and Maxwell 2008).

The following section reviews the literature on the relationship between cash holdings and managerial characteristics.

3.2.3. Executives' Characteristics and Cash Holdings

In addition to firm characteristics as determinants of cash holding, scholars have investigated the role of several executives' characteristics on cash holdings. These studies generally adopt the argument that cash is held for precautionary reasons, in light of the theoretical reasoning and empirical evidence supporting this motive to hold cash (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999). For example, Huang-Meier, Lambertides, and Steeley (2015) find that optimistic CEOs hold less cash for precautionary reasons. Dittmar and Duchin (2016) report that CEOs who experienced distress adopt conservative policies, such as holding more cash. Moreover, CEOs' insider debt (deferred compensation and pension plans) are found to positively affect cash holdings (Cassell et al. 2012; Yixin Liu, Mauer, and Zhang 2014). Feng and Rao (2018) report that executives with risk-taking incentives invest more in R&D (a risky asset) while holding more cash to reduce their undiversified risks within the company. This relationship is stronger when managers are risk-averse, indicating that such managers hold more cash to reduce the riskiness of the firm. Further, CEOs who have witnessed fatal disasters with extreme negative consequences adopt more conservative policies, such as holding more cash (Bernile, Bhagwat, and Rau 2017). More broadly, a national culture related to uncertainty avoidance and individualism explains some of the variations in cash holdings across and within countries (Chen et al. 2015). These findings suggest that executives' preferences on risk-taking – influenced by their levels of optimism, compensation structure, or culture – play a role in determining corporate cash holdings.

Some studies that examine the broader relationship between gender, age and the riskiness of the firm have incorporated cash holdings into their analysis. For instance, Bertrand and Schoar (2003) find a positive relationship between CEO age and cash holdings. They suggest that their findings could be explained by the conservativeness or lack of sophistication of the older generation. In a working paper, Peltomäki, Swidler, and Vähämaa (2018) use a sample of American CEOs and CFOs for the period 2006 to 2014 to study the influence of their gender and age on the riskiness of the firm. In their additional analysis, they find that CEO and CFO ages are negatively associated with cash holdings, and that female CEOs and CFOs are positively associated with cash holdings. However, these studies did not focus on cash holding. Also, Peltomäki, Swidler, and Vähämaa (2018) do not control for executives' tenure, which has been identified as an important control when examining the relationship between executives' age and the riskiness of the firm (Serfling 2014; Yim 2013). For instance, Yim (2013) argues that, since age and tenure might be positively related and could relate to the riskiness of the firm in different directions, it is crucial that we control for tenure when studying age.

Elsaid and Ursel (2011) use a sample of American firms from 1992 to 2005 to investigate the impact of the gender composition of the board of directors on the gender of the CEO whom they appoint, and how this CEO's gender can affect the riskiness of the firm. Within this framework, they report that a change from male to female CEO is associated with an increase in cash holdings.

While these studies do not focus on cash holding, some studies are dedicated to understanding the influence of executives' gender and age on cash holding. For example, Orens and Reheul (2013) study a sample of 203 observations from private SMEs in the Belgian context to investigate whether CEO demographics influence cash holding. They focus on age, tenure, experience, and education, and report a positive association between CEO age and cash holding. They attribute their findings to the tendency among older executives to be more risk-averse due to their shorter career horizon.

Similarly, Zeng and Wang (2015) study the effect of CEO gender on corporate cash holdings and on the over investment of free cash flow (FCF) in the Chinese context. They hypothesise that female CEOs hold more cash than their male counterparts. To test their proposal, they draw a sample of 2142 firms from the Shanghai Stock Exchange for the period 2007-2011. Female CEOs represent 5.65% of the sample, resulting in 468 firm-year observations (full sample = 8,228 firm-year). The results show that the female CEOs hold more cash than the male ones. They attribute this finding to female risk-aversion.

These studies have enhanced our understanding of the influence of executives' characteristics on cash holding. However, in a recent paper, (Amess, Banerji, and

Lampousis 2015) review the cash holding literature and suggest that individual characteristics could play a role in determining cash holdings. Specifically, they question whether managers' risk preferences influence the precautionary motive of holding cash since gender and religion could impact on the managerial preferences regarding holding cash.

Notably, most of the existing literature focuses on the influence of CEO gender and age on corporate cash holdings. However, Hambrick and Mason (1984) argue that it is important to examine the managerial characteristics at the TMT level since CEOs tend to share their responsibilities with other executives. For example, CFOs and COOs may have a strong influence over some of the corporate policies (Aggarwal and Samwick 2003; Chava and Purnanandam 2010). Also, the risk tolerance level of one group member could be influenced by that of other members within the group (Wallach, Kogan, and Bem 1962). For example, the addition of an overconfident manager to the TMT may result in an increase in risk-taking behaviour among the rest of the team. For this reason, it is important to expand the study of the influence of managerial characteristics on cash holdings to include other members of the TMT, in line with the UET (Hambrick and Mason 1984).

Recently, Adhikari (2018) postulates that firms with risk-averse managers maintain larger cash balances proportionate to their total assets for precautionary reasons. Since managers' level of risk-aversion is unobservable, he argues that the number of women in the TMT may serve as a proxy for the team’s level of risk-aversion. Using a sample of US data spanning the period 1995-2010, he reports that firms with more women in the TMT hold more cash relative to the size of their assets, concluding that managerial risk-aversion is positively related to cash holdings. However, Adhikari (2018) did not study the influence of TMT age. This is a drawback since female executives are systematically younger than male ones (Withisuphakorn and Jiraporn 2017), possibly leading to confounding effects (Peltomäki, Swidler, and Vähämaa 2018).

This chapter aims to contribute to this literature by addressing some of its shortcomings and bridging some of its gaps. First, in contrast to prior studies, this study expands the analysis to the TMT level, while conducting further analysis on the CEO and CFO. Second, since managerial characteristics vary slowly over time and female representation on TMTs remains limited, examining this relationship using a large dataset is important. This study uses a large dataset with hand collection from 1992 to 2013 of the gender and age of the TMT, CEO, and CFO. Therefore, this is the first comprehensive study to examine the relationship between managerial gender and age and cash holdings. Third, this chapter studies both managerial gender and age while controlling for managerial tenure, addressing some of the concerns associated with prior studies. Fourth, this chapter forms part of a comprehensive study examining the relationship between corporate policies and managerial gender and age, thereby allowing for a better understanding on how gender and age can affect corporate policies.

The following section draws on the literature presented both in this chapter and in Chapter 2 to propose two hypotheses regarding the relationship between TMT characteristics and cash holdings.

3.3. Hypotheses Development

The existing literature provides theoretical reasoning and empirical evidence to support the argument that cash is held for precautionary motives (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999). Firms hold cash in order to possess sufficient resources to withstand downturns or invest in future opportunities when external financing is unavailable or costly. Anecdotal evidence supports this argument, too. For example, Steve Jobs used to hoard cash upon his return to Apple in 1997, when the company was three months from bankruptcy. Jobs asserts: "The cash in the bank gives us tremendous security and flexibility" (Fortune (Aug 13,2010), as cited in (Adhikari 2018)).

Several studies adopt this argument when examining the influence of executives' characteristics on the riskiness of the firm. For example, Chava and Purnanandam (2010) draw on the literature and suggest that cash could be viewed as a negative debt, hedging activity, or an item that reduces dependency on external funds. If a higher level of debt is a risky policy, and cash can be seen as negative debt, one may argue that holding more cash is a conservative policy. Similar to hedging activities, holding more cash can protect firms when undesired events occur. When external funds are costly or unavailable, firms with sufficient cash holdings can continue to invest in attractive opportunities, when they arise. In a similar way, other scholars have argued that holding more liquid assets is a conservative policy (Cassell et al. 2012; Ferris, Javakhadze, and Rajkovic 2017). These arguments lend support to the notion that cash is held for precautionary reasons.

Further, managerial risk preferences play a role in determining the outcome of the firm. Hambrick and Mason (1984) argue that, under the bounded rationality assumption, executives' risk preferences could affect the riskiness of the firm. Several empirical studies support this argument. Bertrand and Schoar (2003) provide evidence that supports the view that managers have a fixed effect on the firm, and on cash holding policy in particular. Cronqvist, Makhija, and Yonker (2012) find that CEO personal leverage influences the capital structure of the firm. These findings suggest that corporate policies are not only determined by firm and industry characteristics, but also by managerial preferences.

Since cash is held for precautionary motives and executives' risk-preferences affect the outcome of the firm, one may predict that executives with characteristics that are associated with risk-aversion (overconfidence) hold more (less) cash. This chapter focuses on two characteristics that have been linked to risk-taking behaviour; namely, gender and age.

First, the relationship between gender and risk-taking is studied in depth in the psychology literature (see chapter 2). Most studies conclude that females take less risks compared to males, due to female risk-aversion or male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). Studies examining gender differences at the executive level question whether the gender-based difference in risk-taking continues to exist at the executive level beyond the glass ceiling (Faccio, Marchica, and Mura 2016). Several studies at the executive levels conclude that female executives take less risks, either because of female risk-aversion or male overconfidence (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013). Similarly, Perryman, Fernando, and Tripathy (2016) show that the proportion of female executives on the TMT is negatively associated with firms' total risks. These arguments generate two empirical predictions. On one hand, it is possible that gender is irrelevant beyond a certain managerial level, leading to no meaningful relationship between managerial gender and cash holding. Alternatively, and given the precautionary motive for holding cash, it is possible that female executives are associated with higher cash holdings.

Second, the relationship between age and risk-taking has been investigated in the psychology literature (see chapter 2), but the findings within this literature are mixed (Bonem, Ellsworth, and Gonzalez 2015).[38] At the executive level, scholars have offered several propositions regarding the idea that older executives could favour conservative policies (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). First, because their career horizon is shorter, older executives may prefer safer polices over risker ones,

[38] One challenge associated with transferring findings from the psychology literature to the corporate context relates to the different sample characteristics. Managers' age may not vary substantially or cover a very wide range. However, the literature review (chapter 2) shows that most of the psychology literature draws its conclusions from two groups that differ substantially in terms of their age. For instance, Rolison, Hanoch, and Wood (2012) divide their sample into two groups with an average age of 19 and 44 years, respectively.

whose benefits appear in the future (e.g. investments). Second, since younger executives need to establish a reputation, they may adopt risker policies to signal their superior performance. Also, Hambrick and Mason (1984) posit that this could also result from a reduction in mental and physical stamina, greater commitment to the *status quo* of the firm, and an emphasis on their own financial security, given their additional social commitments. These arguments predict a positive association between cash holdings and managerial age, given the precautionary motive for holding cash.

However, it is conceivable that any negative relationship between ageing and risk-taking may be interrupted by the experience that older managers have gained. Since experience might be positively associated with risk-taking, given that it increases confidence, while ageing may decrease risk-taking (Worthy et al. 2011), it is theoretically plausible that older managers are no different from their younger counterparts. Based on this view, observing a systematic relationship between managerial age and cash holdings may be impossible.

On the other hand, older executives may rely on their well-established reputation to protect them when they fail, giving them more confidence to take more risks (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Further, Jian and Lee (2011) find a better market reaction to investments made by CEOs with better reputations. To the extent that older managers have better reputations, these findings support the possibility that older managers may take more risks. This argument generates the empirical predication that managerial age and cash holdings are negatively associated. With some exceptions (Iqbal 2013), the existing evidence within the accounting and finance literature tends to suggest that older executives are more conservative (Bertrand and Schoar 2003; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). These findings suggest that older executives might be associated with higher cash holdings, given that cash is held for precautionary reasons.

In addition, Hambrick and Mason (1984) advance the Upper Echelons Theory (UET), which suggests that studying the characteristics of the team as whole (TMT) is expected to improve the predictions of theoretical arguments pertaining to managerial effects. This is due to the tendency of CEOs to share some of their tasks with their fellow executives. This implies that, even when the CEO is the most influential executive in terms of setting the financial policies of the firm, the level of risk-tolerance among their colleagues within the TMT may affect their risk-taking behaviour. The accounting and finance literature shows that executives other than the CEO have been shown to influence the outcome of the firm (Aggarwal and Samwick 2003; Bertrand and Schoar 2003; Chava and Purnanandam 2010). Furthermore, there is evidence within the psychology literature that group decision-making is influenced by the group members' levels of risk-aversion (Wallach, Kogan, and Bem 1962).

If managers take some of their decisions together with their peers, it is expected that their peers' levels of risk tolerance will exert some degree of influence on these decisions. The theoretical arguments of the UET and the empirical evidence on the importance of other executives in setting corporate policies point to the importance of examining executives' characteristics at the TMT level.

Based on the abovementioned arguments, this study proposes two hypotheses. The first predicts the relationship between the proportion of female executives on the TMT and cash holdings:

H1: The proportion of female executives in the top management team and cash holdings are positively related.

The second hypothesis relates to the relationship between the average age of the executives on the TMT and cash holdings:

H2: *The age average of the top management team and cash holdings are positively related.*

The following section discusses the data and variables used in this chapter to test these hypotheses empirically.

3.4. Data and Variables[39]

To test the hypotheses, I start by collecting executive data from ExecuComp, which provides data on the top five executives from 3,300 companies on the S&P 1500 from 1992 to 2013.[40] S&P 1500 covers approximately 90% of the US market[41] capitalisation.[42] As a result, the data are skewed towards larger firms. I then match the executive data with the financial data reported in Compustat, based on the year and the unique identifier of the company (GVKEY). As customary in the literature, I eliminate companies from two sectors: the financial sector and the utility sector, as defined by SIC (6000-6999, 4900-4999). This is because of the different business nature of financial companies and the regulatory environment for utility companies, which can influence their policies (Bates, Kahle, and Stulz 2009).

In ExecuComp, I find 242,079 executive-years for the period 1992-2013 for 3,452 unique companies (41,808 firm years). This is because some companies no longer belong to the S&P 1500 while others were included on the list during the sample period. I collect data on their gender, age, and position (CEO, CFO, Other). The ages of only 135,388 executives' years are available, while gender is available for all executives. Also, Table 3.1 shows that, after excluding the utility and financial firms, I am left with unbalanced panel data for 32,831 firm year observations. The sample size seems to be evenly distributed throughout the period, as shown in Table 3.2. It is worth noting that some of the tests are not performed across the full sample because of missing values for some observations. In any case, all analyses include all available observations.

Moreover, Fama and French five industry grouping is used in this research.[43] The groups are described in detail later in this section. Figure 3.1 shows that, throughout the sample period, 26% of the companies are classified as Consumers, 26% as being from the HiTec industry, 24% from the Manufacturing industry, 14% from other industries, and

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[39] All variables are summarised in the appendix.
[40] The sample ends in 2013 because this was the last available year during the data collection period.
[41] The US context is a good candidate for examining the UET, since American executives have substantial discretion over the firm (Hambrick 2007), enabling the firm's outcome to reflect their risk preferences.
[42] S&P 1500 fact sheet.
[43] I use this classification for descriptive statistics since it divides the sample into a reasonable number of industries. However, I use the SIC two digits for multivariate analyses, resulting into 58 unique industries within the sample.

10% from the Health industry. With the exception of the HiTec companies, the representation and rank for each industry group remains relatively stable throughout the sample period, as shown in Figure 3.2.

3.4.1. Dependent Variables: Cash Holdings

The dependent variable in this study is cash holding. *Cash1* (CHE/AT) is calculated by scaling the cash and short term investments by total assets. Short term investments are included because they are cash equivalents that are highly liquid with high credit quality. Total assets serve as a proper deflator since cash cannot be taken in absolute figures but in relationship to the size of the firm (Al-Najjar 2013; Bates, Kahle, and Stulz 2009; Brisker, Çolak, and Peterson 2013; Opler et al. 1999; Ozkan and Ozkan 2004). For robustness checks, *Log_CHE* is the natural logarithm of cash and short term investments.

3.4.2. Explanatory Variables: Determinants of Cash Holdings

Two groups of explanatory variables are used throughout this chapter. The first group includes the variables of interest, which are managerial gender and age. The second group includes a set of controls that have been identified as influencing cash holdings. As indicated early in this thesis, the main unit of analysis is the top management team (TMT), as suggested by the UET (Hambrick 2007; Hambrick and Mason 1984). Nonetheless, the study includes an additional analysis in which the influence of CEO and CFO characteristics are investigated. Therefore, managerial variables are measured at the TMT, CEO, and CFO levels, as follows.

3.4.2.1. Variables of Interest

Managerial Gender

The first variable of interest is executives' gender. The argument presented earlier predicts that female managers are more conservative and take less risks compared to their male counterparts. Since cash is held for precautionary reasons, I predict a positive relationship between female executives and *Cash1*. In this chapter, the managerial variables are measured at three different levels; namely, the TMT, CEO, and CFO levels.

Top Management Teams

Consistent with the UET (Hambrick and Mason 1984), the first TMT measure is *PcFemale,* which is defined as the percentage of female managers on the TMT for every firm-year, based on the data available from ExecuComp (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin 2014; Perryman, Fernando, and Tripathy 2016). Second, *HighFemale* is a dummy variable that takes the value of 1 if the percentage of females on the top management team for a firm year is higher than 50%, and zero otherwise. Third, *MaleFemaleTeam* is a dummy variable that takes the value of 1 if the management team for a firm year has at least one female manager, and zero if the TMT is completely male. These variables are based on "GENDER", which is an ExecuComp data item that lists the gender of all executives.

CEO

I begin by identifying the CEO in ExecuComp based on "CEOANN", a data item that flags the CEO for that year (Huang and Kisgen 2013; Jiang, Petroni, and Wang 2010; Serfling 2014). Once the CEO has been identified, *CEO_Female* is used as the dummy variable, which takes the value of 1 if the gender of the CEO is female, and zero if the CEO is male.

CFO

Identifying CFOs is challenging since the variable flagging the CFO of the firm in the observed year, "CFOANN", is unavailable prior to 2006. For this reason, existing studies investigating CFO gender and age limit their analysis to periods after 2006 (Peltomäki, Swidler, and Vähämaa 2018).

However, I follow Jiang, Petroni, and Wang (2010) and Kim, Li, and Zhang (2011) in hand-collecting data on CFOs whose "CFOANN" is missing. When the "CFOANN" is missing, I rely on "TITLEANN", which lists the titles of the executive for the observed firm-year. I search for the following keywords "CFO, chief financial officer, treasurer, controller, finance, and vice president-finance". In rare cases, this procedure results in two CFOs. In such cases, I follow Chava and Purnanandam (2010) and choose the one with the highest compensation (excluding CEOs).

After identifying the CFOs, *CFO_Female* is used as a dummy variable that takes the value of 1 if the CFO is female, and zero otherwise.

Managerial Age

The second variable of interest is executives' age. The hypothesis developed earlier generates the prediction that older executives are more conservative regarding their financial policies compared with younger managers. Given that cash can be held for precautionary reasons, a positive relationship between executives' age and *Cash1* is predicted.

Top Management Teams

Adopting the UET (Hambrick and Mason 1984), the first TMT level measure is *AvgAge*, which is defined as the average age of all executives in a firm year, based on "AGE" from ExecuComp, as reported in the annual proxy statement.[44] For the regressions, I use the natural logarithm of the variable (Serfling 2014), denoted as *AvgAge1*.

Further, *HighAge* is a dummy variable denoting teams whose average age is above that of the entire sample. If the *AvgAge* for a specific firm year is higher than the *AvgAge* for the entire sample, *HighAge* takes the value of 1, and zero otherwise. This variable is set to missing when the *AvgAge* is missing.

CEO

Once the CEO has been identified, as outlined above, the corresponding age variable "AGE" is considered to be the age of the CEO, *CEO_Age*. For the regressions, I use the natural logarithm of age, *Log_CEO_Age* (Serfling 2014).

CFO

After identifying the CFO as described above, the "AGE" is set to be *CFO_Age*. All regressions include the natural logarithm of this variable, *Log_CFO_Age* (Serfling 2014).

3.4.2.2. Control Variables

[44] In some cases, some executives' ages are reported while others are not within the same firm-year. In that case, the average is the sum of the available executives' ages within a firm-year, scaled by the number of executives whose age is reported in that firm-year. It is worth noting that the "AGE" of the CEO represents approximately a third of the executives' ages used to calculate the *AvgAge* variable due to missing data. However, I do not have access to any other database in order to complement my observations made based on the ExecuComp database.

I control for managerial tenure, and follow the literature in determining the control variables that have been shown or theorised to determine cash holdings (Bates, Kahle, and Stulz 2009; Opler et al. 1999; Ozkan and Ozkan 2004). Specifically, I control for growth opportunity, firm size, cash flow, performance, cash flow uncertainty, cash substitutes, payout, research and development, and capital expenditure.

Managerial Tenure

When examining the influence of managerial characteristics on corporate policies, it is important to control for tenure, especially when investigating managerial age. Yim (2013) draws on the literature and suggests that managerial tenure could proxy for ability, since bad managers are dismissed earlier, and hence tenured managers might be more powerful. She further argues that, while tenure and age could be positively correlated, they may have the opposite influence on acquisition activities (risky investment). Since tenure could proxy for managerial ability or entrenchment, it is possible that tenured executives will conduct more acquisitions while older executives will undertake fewer ones. In the context of this chapter, and given these arguments, it is possible that managerial tenure is positively associated with cash holdings since entrenched managers may accumulate more cash for agency motives. Also, tenured managers are less open to change and new ideas and hence tend to identify fewer investment opportunities. Thus, it is possible that tenured managers are less concerned with the opportunity cost associated with holding cash, inducing them to hold more cash (Orens and Reheul 2013).

Also, Li, Low, and Makhija (2017) discuss the possibility of managerial age picking up the effect of managerial tenure. They assert that tenure may proxy for different constructs, such as experience and entrenchment, which may reduce managerial career concerns.[45] Therefore, it is also possible that managerial tenure is negatively associated with cash holdings, since managers with lower levels of career concerns may not need to signal their superior performance by adopting risker policies, such as maintaining lower cash levels.

Top Management Teams

[45] Managerial career concerns could be influenced by their age and tenure (Li, Low, and Makhija 2017).

In line with the UET (Hambrick and Mason 1984), I measure TMT tenure as the average tenure of the TMT members, *Avg_Tenure*. Tenure is identified based on the ExecuComp data item "JOINED_CO", which states the year in which the executive joined the firm. When this item is unavailable, I assume the first year when the executive appeared in the firm to be the joining year. This procedure is similar to Serfling (2014)'s treatment of CEOs whose tenure is missing.

In all regressions, I use the natural logarithm of *Avg_Tenure*, denoted as *Log_Avg_Tenure*.

CEO

CEO_Tenure is the number of years for which the CEO has been in position. Following the identification of the CEO, described above, the *CEO_Tenure* variable is based on the "BECAMECEO", which states the year in which a CEO took the position. Nonetheless, the "BECAMECEO" is missing or negative for less than 4% of the observations. In these cases, I follow Serfling (2014) and set the year of becoming CEO as the first year that the executive appeared in ExecuComp as a CEO of the observed firm.

In all regressions, I use *Log_CEO_Tenure*, which is the natural logarithm of *CEO_Tenure*.

CFO

While ExecuComp provides data regarding the date on which the individual became CEO (i.e. "BECAMECEO"), it does not provide such data for CFOs. Therefore, *CFO_Tenure* is a proxy for the number of years for which the CFO has been in position. After identifying the CFOs, as described above, the *CFO_Tenure* variable is based on the first year that the CFO joined the firm, "JOINED_CO". When this variable is missing, I use the first year when the executive appeared in the database as the joining year.[46]

[46] I recognise the limitation that this variable may be inconsistent with that of the CEO. However, it is difficult to make an inference regarding age, a variable of interest in this study, without controlling for tenure (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Given the data limitation, this might be a reasonable proxy that reduces the risk of making a false statistical inference regarding CFO age.

For the regressions, I use *Log_CFO_Tenure*, which is the natural logarithm of *CFO_Tenure*.

Growth Opportunity

Companies that are valued by their growth opportunities are induced to hold more cash for precautionary reasons. This is because growth firms face higher costs when raising external capital (Myers and Majluf 1984). Following the literature, I use the market-to-book ratio as a proxy for growth opportunity. The *MtB* is calculated as the book value of assets minus the book value of equity plus the market value of equity, all scaled by total assets. In Compustat, *MtB* = [(AT + CSHO*PRCC – CEQ)/AT] (Bates, Kahle, and Stulz 2009). A positive relationship between *MtB* and *Cash1* is predicted.

Firm Size

Larger companies are inclined to hold less cash (Miller and Orr 1966), given their ability to access the financial market, the economics of scale related to managing cash, and the reduction in information asymmetry. Following the literature, *Size* is a variable that measures the size of the company and is calculated by taking the natural logarithm of total assets. For robustness, I use *Log_Sale*, which is the natural logarithm of sales. A negative relationship between *Size* and *Cash1* is predicted.

Cash Flow

Companies might hold more cash if they have better cash flows, following a pecking order (Myers and Majluf 1984). Alternatively, companies with high cash flows may have better access to the financial markets, thereby reducing their need to hold cash (Almeida, Campello, and Weisbach 2004). *CashFlow* is calculated by scaling the operating income before depreciation, but after interest, income tax, and dividend by the total assets. In Compustat, *CashFlow* = (OIBDP-XINT-TXT-DVC)/AT (Bates, Kahle, and Stulz 2009). I predict a positive relationship between *CashFlow* and *Cash1*.

Performance

Firms with better performance are better placed to accumulate cash. I measure performance by the return on assets, *ROA* (accounting measure). In Compustat, *ROA* = IB/AT. Performance and *Cash1* are predicted to be positively associated.

Cash Flow Uncertainty

Companies with risky cash flows are expected to hold more cash for precautionary reasons, so that they can avoid forgoing profitable investment opportunities (Ozkan and Ozkan 2004). *CashFlowSD_10* proxies for cash flow riskiness/uncertainty by measuring the volatility of firms' cash flows. I calculate a rolling standard deviation for the annual cash flows in the previous ten years. I demand the availability of three observations at least. If these are unavailable, I record this variable as missing. For robustness, I measure the volatility of the annual cash flows for the past five years, requiring the availability of three observations at least. This variable is denoted as *CashFlowSD_5*. *CashFlowSD_10* and *Cash1* are expected to be positively associated.

Liquidity Substitute

Net working capital (net of cash) can substitute for cash since it can be converted into cash in the short term (Bates, Kahle, and Stulz 2009). *NWC* is the working capital, net of cash, scaled by total assets. In Compustat, *NWC* = (WCAP-CHE)/AT. To the extent that working capital can be seen as a substitute for cash, a negative relationship between *NWC* and cash holding is expected.

Payout

Dividends payers are reluctant to cut their dividends, and therefore may accumulate more cash to reduce the risk of this possibility (Ozkan and Ozkan 2004). Alternatively, firms that pay dividends might have better access to capital markets and are less risky, reducing the precautionary demand for holding cash (Bates, Kahle, and Stulz 2009). *Div_Payer* is a dummy variable that takes the value of 1 if the firm is a dividend payer, and zero otherwise. When the dividend variable (DVC in Compustat) is missing, I set DVC to zero (Bates, Kahle, and Stulz 2009). A negative relationship between *Div_Payer* and *Cash1* is predicted.

Research and Development

Research and development (R&D) can proxy for information asymmetry and growth opportunity. Firms with high information asymmetry may hold more cash to avoid costly external finance (Opler et al. 1999), and firms with high growth potential may maintain a larger cash balance to invest in future projects (Bates, Kahle, and Stulz 2009). Further, R&D investments are risky (Hirshleifer, Low, and Teoh 2012) and therefore might be difficult to finance externally. *RD1* is the research and development expense scaled by total assets (*RD1*= XRD/AT). Following the literature, *RD1* is set to zero when XRD is missing. A positive relationship is expected between R&D measures and cash holding.

Capital Expenditure

Firms accumulate assets as they direct their funds towards capital expenditure, allowing them to pledge more collateral. Therefore, firms with high capital expenditure may hold less cash due to their ability to raise external funds (Bates, Kahle, and Stulz 2009). Capital expenditure is measured by scaling the capital expenditure by total assets. Any missing value is set to zero. In Compustat, *CAPEX* = CAPX/AT. *CAPEX* and *Cash1* are expected to be negatively associated.

Acquisitions

Firms can increase their investments through capital expenditure or acquisition. This increase creates more collateral that can be pledged towards raising external funds (Bates, Kahle, and Stulz 2009). *AQ* is measured by scaling the total acquisitions by the total assets. In Compustat, *AQ* = (AQC/AT). Any missing value is set to zero. Since acquisitions may substitute for capital expenditure, I expect a similar relationship between *AQ* and *Cash1* to that between *CAPEX* and *Cash1* (negative).

Leverage

The cost of holding cash increases as leverage increases, leading to a negative relationship between leverage and cash holdings (Baskin 1987; Bates, Kahle, and Stulz 2009). However, constrained firms might seek to accumulate more cash, resulting in a positive relationship between leverage and cash holding (Almeida, Campello, and Weisbach 2004). Leverage, *Lev*, is calculated as the sum of the long and short term debt scaled by the total assets. In Compustat, *Lev* = (DLTT+DLC)/AT. Based on the first argument, I predict a negative relationship between *Lev* and *Cash1*.

Assets' Intangibility

Intangible assets are not usually used as a collateral. As a result, companies with more intangible assets have fewer assets to pledge as collateral, thereby reducing their ability to raise external fund (Falato, Kadyrzhanova, and Sim 2013). Also, information asymmetry manifests in firms with more intangible assets, given the difficulty of valuing these. Thus, a positive relationship between cash holding and intangible assets is possible. I calculate the intangibility level by *Intang*. In Compustat, *Intang* = INTAN/AT. Any missing values are set to zero.

Industry[47]

Cash holding and the explanatory variables might all be industry-specific. Fama and French propose eight industry classifications, ranging from five to 49 industries, based on SIC codes. The five-group classification is used for descriptive statistics.

These groups are defined as follows. The first group is Consumers, which includes companies that work in "Consumer Durables, NonDurables, Wholesale, Retail, and Some Services (Laundries, Repair Shops)". The second group is Manufacturing, which includes “Manufacturing, Energy, and Utilities". Nonetheless, utility companies are excluded as discussed before. The third group is High-Technology (HiTec), which consists of firms working in "Business Equipment, Telephone and Television Transmission". The fourth group is Health, including companies classified under “Healthcare, Medical Equipment, and Drugs". Lastly, firms are classified as Other if they operate in “Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance". However, financial firms are excluded in this thesis. Moreover, it is worth noting that, when I include industry fixed effects on regressions, I use SIC two digits classifications (Bates, Kahle, and Stulz 2009), resulting in 58 unique industries in the sample.

All of the variables are summarised in the appendix at the end of the chapter. The following section provides descriptive statistics for the variables defined in this section.

[47] The classification is available for download from the Kenneth French website via the following link. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

3.5. Descriptive Statistics

This section summarises and describes the key features of the variables used in this chapter. Given the importance of the industry in determining cash holding and managerial characteristics, this section aims to summarise and describe the data for the full sample, as well as for the subsamples, based on Fama and French five industry groups.

3.5.1. Trends in Cash Holdings

Table 3.3 shows that, between 1992 and 2013, cash holding (*Cash1*) increased from 13.4% to 16.5%. While the magnitude differs, this trend is in line with prior studies reporting an increase in cash holding. For example, Bates, Kahle, and Stulz (2009) report *Cash1* to equal to 16.3% in 1992 compared to 13.4% for the sample used in this study. This is because their sample includes all companies in Compustat (N = 117,438) while the sample in this chapter is limited to S&P 1500 companies (N = 32,831). Given that the sample is skewed towards larger firms, it is expected to observe lower cash holding, on average, since larger firms hold less cash (Miller and Orr 1966).

Decomposing *Cash1* into cash and short term investments (CHE) and total assets, Table 3.3 shows that both cash and total assets have been increasing over time. These trends are illustrated in Figures 3.3 and 3.4. Interestingly, at the beginning of the financial crisis in 2007, the increase in cash holding was faster than that of total assets. As a result, *Cash1* reached a peak in 2009, when firms held 18.81% of their assets in cash, as shown in Table 3.3. If firms hold cash for precautionary reasons, then it is possible that they will increase their cash holding while the thought of financial distress is still vivid.

Moreover, Figure 3.5 depicts *Cash1* for the full sample and the subsamples, based on Fama and French's five industry classifications. Over time, both the HiTec and Health industries appear persistently to hold more cash than firms in other industries. A possible reason for this is that these firms are risker due to the nature of their investments (e.g. R&D investments), and therefore require more cash to withstand future distress or invest in future opportunities that might be risky. Similarly, both Consumers and Manufacturing firms persistently hold less cash than the rest of the sample. This is in line with studies suggesting the cash holding is influenced by the industry within which a firm operates (Bates, Kahle, and Stulz 2009 and Harford, Mansi, and Maxwell 2008).

Also, Table 3.4 reports the descriptive statistics for cash holdings. *Cash1* is available for most of the sample (32,646 out of 32,831 observations). The mean stands at 16% compared to the median of 9%. The standard deviation is 18%. These figures suggest that cash holdings vary widely across firms.

3.5.2. Executives' Gender and Cash Holdings

Figure 3.6 shows that the proportion of female executives to all executives in a firm year, *PcFemale*, has dramatically changed during the sample period. It increased from 1.6% in 1992 to 8.2% in 2010, and then declined sharply to 6% in 2013. Further, Table 3.4 shows the descriptive statistics for *PcFemale*. While the average is 5.85% for the full sample, the median is 0. This indicates that at least half of the sampled firm-years do not employ female executives. These findings are close to those reported by prior studies. For instance, Perryman, Fernando, and Tripathy (2016) report an average of 5.2% for the proportion of female executives on the TMT and a median of 0. A possible reason for this difference might be the difference in the sampled periods. While Perryman, Fernando, and Tripathy (2016) collect ExecuComp data from 1992 to 2012, the existing study uses data from 1992 to 2013.[48]

Industry-wise, Figure 3.6 shows that the Consumers group continues to have the highest level of female executives, at an average of 7.7% during the sample period, followed by Health at 6.9%, Others at 5.8%, HiTec at 5.1%, and Manufacturing at 3.8%. These industry averages are illustrated in Figure 3.7. Interestingly, the firms in these different industries seem to follow a similar pattern over time. For example, in 2011 and 2012, *PcFemale* declined across all industries.

Notably, Figure 3.8 shows the *Cash1* for firms with different numbers of female executives on the TMT. The graph suggests that firms with more female executives hold more cash. Additionally, Table 3.5 reports the correlations among the main variables used

[48] Another potential reason may relate to the criteria used for excluding the utility and financial firms. While I follow Bates, Kahle, and Stulz (2009) and exclude firms with SIC (6000-6999, 4900-4999), Perryman, Fernando, and Tripathy (2016) do not report their exclusion criteria.

in this study. The correlation between *PcFemale* and *Cash1* is positive. Both Figure 3.6 and Table 3.5 are consistent with *H1*, which predicts a positive association between the percentage of female managers and cash holding.

Additionally, Table 3.4 reports the descriptive statistics for the genders of both the CEOs and CFOs. Based on the procedure outlined in the previous section, 29,542 CEOs were identified. Of these CEOs, only 2.2% are female. In contrast, female CEOs accounted for 5.65% of a Chinese sample between 2007 and 2011 (Zeng and Wang 2015). Although a different context, some of the difference can be explained by time, which seems to be positively related to female participation within upper management. While this sample starts from 1992, theirs starts from 2007. Further, Peltomäki, Swidler, and Vähämaa (2018) uses a sample of S&P1500 firms from 2006-2014 and report that 3% of all CEOs were female.

Moreover, I identify 25,064 CFOs-years, 7.2% of whom are female. Peltomäki, Swidler, and Vähämaa (2018) find that 9% of the CFOs-years are female. The difference might be related to the sample periods. Table 3.5 shows that both *CEO_Female* and *CFO_Female* are positively correlated with *Cash1*, which is in line with the positive correlation between *PcFemale* and *Cash1*.

3.5.3. Executives' Age and Cash Holdings

Figure 3.9 shows that the average ages of the top executives per firm year (*AvgAge*) was close to the average of 53.3 years during the sample period. Nevertheless, between 2006 and 2007, there is a substantial drop of 3.4 years. This might be due to executives' replacement following the financial crisis, and those executives seem to have been replaced by younger ones. Since 2007, the *AvgAge* increased and reached levels close to those in 2006. It is plausible to suggest that this increase is due to managerial tenure, given the absence of any major shocks that might have caused this managerial replacement. In addition, Table 3.4 reports the summary statistics for *AvgAge*. The median and mean are both 53 years, with a standard deviation of 6 years. Importantly, the number of observations is 29,119 firm-years compared to the full sample of 32,831. This is because the data from ExecuComp for *AvgAge* is incomplete, as indicated in Section 3.4.

Looking at the industry groups, Figure 3.9 shows that most of the industries maintained their rank compared to other industries. For example, the Manufacturing group has the highest *AvgAge* during the sample period, while HiTec firms have been reporting the lowest *AvgAge* since 1996. The averages for the full sample across the industries are illustrated in Figure 3.10. This supports the argument proposed by Hambrick and Mason (1984), who suggest that managerial characteristics are not randomly distributed across industries. Similar to the trends in executives' gender, the different industry groups are somehow growing closer over time in terms of executive age.

Remarkably, Figure 3.11 depicts the *Cash1* for TMTs with different age quintiles. TMTs in the first quintile (*AvgAge* = 46 years) report an average *Cash1* of 20.9% compared to 12.3% for those in the fourth quintile (*AvgAge* = 60 years). Also, the *AvgAge* and *Cash1* are negatively correlated, as shown in table 3.5. Both Figure 3.11 and Table 3.5 suggest a negative relationship between the average age of the executives on the TMT and cash holding, challenging H2, which proposes a positive relationship between the age of the TMT and their cash holding.

Looking at CEOs and CFOs, Table 3.4 shows a large number of missing observations. While the number of identified CEOs is 29,542 CEO-years, the ages of only 28,232 CEOs are available. The issue of missing data is more pronounced in the case of CFOs. *CFO_Age* is only available for 15,524 CFO-years compared to 25,064 identified CFO-years.

Moreover, the average of *CEO_Age* is 55.46 years old, while the median is 55 years old. These findings are comparable to those of Serfling (2014), who reports an average of 55.22 and a median of 55 for a sample of S&P 1500 firms from 1992 to 2010. Further, the CFOs are younger than the CEOs. The average *CFO_Age* is 50.41 years while the median is 50. These findings are comparable to those of Peltomäki, Swidler, and Vähämaa (2018), who report an average of 50.65 years and a median of 51 years for a sample of S&P 1500 firms from 2006 to 2014. Lastly, Table 3.5 shows that the ages of both the CEOs and CFOs are negatively correlated to the *Cash1*. This is consistent with the negative correlation between the average age of the TMT and the *Cash1*, and continues to challenge *H2*.

3.5.4. Control Variables

Table 3.4 summarises the variables used in this study, while Table 3.5 reports the correlations among the variables. As discussed before, the full sample consists of 32,831 firm-year observations. Some of the variables have fewer observations due to data limitations. In all of the tests presented in this study, I use the maximum available number of observations.

Avg_Tenure is the number of years for which the TMT members have served the firm, on average. The average for *Avg_Tenure* is 4.61 years, while the median is 4.17 years, with a standard deviation of 2.63 years. *CEO_Tenure* is the number of years for which the CEO has been in position. The average CEO has been in position for 7.06 years, while the median is 5 years, with a large standard deviation of 7.35 years. This is similar to the findings of Serfling (2014), who reports an average of 7.36 years and median of 5.06 years for a sample of S&P1500 firms from 1992 to 2010. This slight difference could be attributed to the sample period or to winzorisation. On the other hand, the average for *CFO_Tenure* is 4.13 years, while the median is 3 years, with a standard deviation of 5.15 years. Both *Avg_Tenure* and *CFO_Tenure* are negatively correlated with *Cash1*, in line with the career concern argument (Li, Low, and Makhija 2017). However, *CEO_Tenure* is positively correlated to *Cash1*, consistent with the view of Yim (2013).

MtB is the market to book ratio and has a mean of 2.22 and median of 1.64, with a standard deviation that is higher than the mean, indicating that the sampled firms vary in terms of growth potential. The correlation between *MtB* and *Cash1* is positive, in line with the argument that growth firms hold more cash for precautionary reasons. Moreover, assets are expressed in millions of dollars. Firms have average assets of 5.4 billion, with a substantial variation, as evident from the standard deviation of 23 billion. Larger firms are expected to hold less cash, given their ability to access external capital (Miller and Orr 1966). Indeed, the correlation between *Size* (the natural logarithm of assets) and *Cash1* is negative.

The average firm has a *CashFlow* of 7%, while the median firm has one of 9%. The standard deviation is 67%, suggesting that firms differ in terms of their cash flow. Table 3.5 shows a negative correlation between *CashFlow* and *Cash1*. This is consistent with the view that firms with a robust cash flow have better access to the capital market, and therefore lower precautionary needs (Almeida, Campello, and Weisbach 2004). Moreover, *ROA* is the return on assets, and captures the performance of the firm. The average is 3%, while the median is 5%. The sampled firms vary substantially, as evident from the large standard deviation of 70%. The prediction of this chapter is that firms with better performance can accumulate more cash. Indeed, the correlation between *ROA* and *Cash1* is positive.

CashFlowSD_10 measures the uncertainty of the cash flow over the past ten years. Its average is 7% while its median is 4%, with substantial differences between firms (SD= 54%). Firms with uncertain cash flows may hold more cash for precautionary reasons (Bates, Kahle, and Stulz 2009; Ozkan and Ozkan 2004). In line with this argument, the correlation between *CashFlowSD_10* and *Cash1* is positive, in line with this prediction.

NWC (net working capital) has an average and median of 7%, with a large standard deviation of 93%. *NWC* is a cash substitute and therefore may be negatively related to cash holding (Bates, Kahle, and Stulz 2009). Indeed, the correlation between *Cash1* and *NWC* is negative.

Div_Payer is a dummy variable, denoting firms that make a dividend payment during the year. The average is 0.46, while the median is 0.00, indicating that less than half of the sampled firm-years engaged in a dividend payout. *Div_Payer* and *Cash1* are negatively correlated, which is consistent with the view that dividend payers have better access to the capital market and therefore require less cash for precautionary motives (Bates, Kahle, and Stulz 2009).

RD1 is the total R&D investments scaled by the total assets. The average firm spends 3.69% of its assets on R&D, while the median is zero. This indicates that at least half of the sampled firm-years do not invest in R&D. R&D can proxy for growth opportunity and information asymmetry, both of which lead the firm to hold more cash (Opler et al. 1999). The correlation between *Cash1* and *RD1* is positive, in line with this argument.

CAPEX is capital expenditure to total assets. Its average is 6% while its mean is 4%, suggesting that the average is driven by *CAPEX*-intense firms. The standard deviation is 6%. Higher *CAPEX* results in more assets that can be pledged as collateral when seeking external funds, leading to lower cash needs for precautionary reasons (Bates, Kahle, and Stulz 2009). In line with this prediction, the correlation between *Cash1* and *CAPEX* is negative.

AQ, total acquisitions scaled by total assets, is 3%, on average, while the median is zero. The standard deviation is more than twice the average. Since acquisitions increase assets that can be used as collateral when raising debt, a negative relationship is expected (Bates, Kahle, and Stulz 2009). The correlation between *AQ* and *Cash1* is negative as predicted.

Lev is the total debt to the total assets. The average firm finances 23% of its assets through debt, while the median is 20%. The standard deviation is more than three times the average, indicating that the capital structure of these firms differs substantially. *Lev* and *Cash1* are negatively correlated, consistent with the view that the cost of holding cash increases with higher leverage, leading to a reduction in cash holding (Bates, Kahle, and Stulz 2009).

Intang (intangible assets to total assets) has an average of 15% and a median of 8%. As expected, the standard deviation is high. Firms that have more intangible assets are expected to hold more cash, since they have fewer assets to pledge as collateral. Nevertheless, the correlation between *Intang* and *Cash1* is negative.

Lastly, I check the correlation among the variables used in this chapter to reduce the risk of multicollinearity when conducting the multivariate analyses. Interestingly *Lev* and *NWC* have a close to perfect negative correlation (-0.98). Hence, I orthogonalise these two variables and denote them as *Lev_Orth* and *NWC_Orth*.[49] These variables are used in the multivariate analyses.

The following section presents the analysis of the data.

[49] Further, I perform VIF tests after every regression, when appropriate, to test for multicollinearity.

3.6. Analyses and Results

Section 3.3 developed two hypotheses with respect to the relationships between cash holding and managerial gender and age within the TMT. This section uses the data described in the previous sections to investigate whether managerial gender and age are systematically related to cash holding. The results are obtained via univariate and multivariate analyses.

3.6.1. Univariate Analysis

Table 3.6 tests whether the means of *Cash1* differ for companies with different managerial characteristics. The sample is divided based on managerial characteristics to investigate whether *Cash1* differs systematically between these groups. Every test splits the sample into two subsamples, and a two-sample t-test for equal means is performed.

Firms with *HighFemale* (i.e. *PcFemale* is greater than 50%) hold 20.9% of their assets in cash, compared to 15.7% for firms with lower female representation. This difference is significant, with a t-statistic of -4.8. Also, *MaleFemaleTeam* denotes TMTs with female representation. Firms with at least one female on the TMT hold 17.5% of their assets in cash compared to 15.10% for other firms. This difference is statistically significant, with a t-statistic of 10.5. This is consistent with *H1*, which suggests that firms with more female managers on the TMT are associated with more cash holdings.

Similarly, firms with female CEOs hold 18.8% of their assets in cash, compared to 15.3% for the firms run by males (t-statistic = -4.98). Firms with a female CFO report an average *Cash1* of 18.6% compared to 15.6% for the firms with male CFOs. This difference in means is statistically significant, with a t-statistic of -6.91. This is consistent with the view of Hambrick and Mason (1984) that executives other than the CEO exercise influence over corporate policies.

Moreover, firms with older TMTs (i.e. whose *AvgAge* is greater than the average TMT) hold 12.72% of their assets in cash compared to 18.1% for firms with younger TMTs. This difference is statistically significant (t-statistic= 26). This finding contradicts *H2*, which predicts a positive association between *AvgAge* and *Cash1*.

It might be the case that both gender and age are not randomly distributed across the industries. For example, industries that require more risk-taking may hire managers who are more likely to take risks or firms with a female customer base may hire more females. Therefore, I test whether *PcFemale* differs systematically across industries, by examining the difference in the means for *PcFemale* across Fama and French's five industry classifications.

Table 3.7 shows that, with the exception of the Other group, all of the industries differ systematically in terms of the gender composition of their TMTs. This is consistent with the trends reported in Figure 3.6. Similarly, Table 3.8 tests whether *AvgAge* differs across industries. Indeed, the difference in the TMTs' age across industries is statistically significant, with the exception of the Other group. These findings are unsurprising, given the trends illustrated in Figure 3.9. They are also consistent with the view of Hambrick and Mason (1984) that managerial characteristics are not randomly distributed across industries.

Moreover, I examine if the dependent variable (*Cash1*) systematically differs across industries. Table 3.9 shows that all industries report a statistical difference in *Cash1* compared with the rest of the sample. Hence, the cash holding behaviour is industry-specific.

These findings point to the importance of the industry when studying the influence of managerial characteristics on cash holding. For example, while the Consumers industry hires significantly more female managers compared to male ones, as reported in Table 3.7, they simultaneously hold less cash, as reported in Table 3.9. This may lead to a negative correlation between *PcFemale* and *Cash1* that is caused by the industry's influence on both gender and cash holdings. Therefore, I divide the sample into five subsamples, based on Fama and French's five industry groups, and examine whether firms with different TMT characteristics differ systematically in terms of their cash holdings. These results are reported in Table 3.10.

Firms with *HighFemale* systematically hold more cash in three industries. However, there is no systematic difference between *Cash1* for firms with *HighFemale* in the HiTec and Manufacturing industries. Also, firms with *MaleFemaleTeam*, which indicates a TMT with at least one female manager, systematically hold more cash across all industries. These findings lend support to *H1* by showing that the positive association between female representation on the TMT and *Cash1* is not driven by industry.

Turning to executives' age, firms with TMTs whose *AvgAge* is higher than the sample average (i.e. *HighAge* = 1) hold less cash across all industries. The within industry differences for *Cash1* based on TMT age are statistically significant across all industries. This is consistent with the results reported in Table 3.6, and continues to contrast with *H2* by demonstrating a negative association between TMT average age and cash holdings, even within industries.

Further, Table 3.11 examines whether *Cash1* differs for firms with different characteristics. Firms that conduct a dividend payout (i.e. payers) have significantly less cash than non-payers, and this difference is statistically significant (t-statistic = 56). This conflicts with the prediction that firms that conduct a payout hold more cash to avoid cutting their payouts in the future (Ozkan and Ozkan 2004), while confirming the view that dividend payers can approach the market to raise capital (Bates, Kahle, and Stulz 2009).

Also, R&D investors hold 20.7% of their assets in cash, compared to 10.33% for firms without R&D activities. This difference is statistically significant, with a t-statistic of -31. This is in line with the predicted relationship that R&D investments and cash holdings are positively associated due to an increase in information asymmetry and a decrease in assets that can be pledged as collateral (Bates, Kahle, and Stulz 2009; Opler et al. 1999). Moreover, firms that conduct acquisitions hold less cash than non-acquirers, and this difference is systematic (t-statistic = 29). Acquisitions increase assets that can be pledged as collateral, reducing the need to hold cash for precautionary reasons (Bates, Kahle, and Stulz 2009).

Overall, the univariate analysis provides valuable insights. First, it provides evidence that female representation on the TMT is positively associated with cash holdings, and this positive association is not driven by industry (i.e. the difference holds in industry-based subsamples). This is in line with the predictions of *H1*. A possible explanation may relate to the systematic difference between males and females with regard to risk-taking behaviour (Barber and Odean 2001; Charness and Gneezy 2012). Second, older TMTs are associated with lower levels of cash holdings, contrasting the proposition of *H2* that TMT age and cash holdings are positively associated. Possibly, older managers might be less concerned about their career, given their experience and well-established reputation, and therefore tolerate more risks (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Alternatively, it might be the case that older people take more risks (Huang et al. 2013). Third, firms' characteristics are influential in determining cash holdings. Lastly, this analysis shows the importance of considering the industry when studying the relationship between managerial characteristics and cash holdings.

These insights are taken into consideration in the following subsection, in which a multivariate analysis is conducted.

3.6.2. Multivariate Analysis

This section presents the empirical results using a multivariate analysis. Because cash holdings are influenced by more than one variable, as suggested by the literature and found in the preceding analysis, it is important to incorporate these variables when examining the determinants of cash holdings.

3.6.2.1. Main Results

The hypotheses of this chapter are as follows. *H1* proposes that the proportion of female managers in the TMT and cash holdings are positively associated. The univariate analysis provides evidence for this relationship. Additionally, *H2* proposes that the average age of the TMT and cash holdings are positively related. The previous section shows evidence to the contrary. These hypotheses are examined while controlling for other variables that have been found to influence cash holdings**.**

The determinants of *Cash1* are estimated using a pooled Ordinary Least Square estimator. This estimation method is used in the literature that examines cash holdings (Bates, Kahle, and Stulz 2009; Dittmar and Mahrt-Smith 2007). In addition, studies that examine female representation on the TMT in particular have employed this estimator (e.g. (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin 2014);(Perryman, Fernando, and Tripathy 2016)). Moreover, since managerial characteristics do not vary significantly over time (i.e. they are time-invariant), employing a firm fixed effect model may bias the results. If managerial characteristics do not vary over time, firms' controls may pick up the effect of the managers too (Zhou 2001). However, models with industry and year fixed effects have been used in this literature. A within-industry estimator captures the industry effect that can bias the results, as indicated in the univariate analysis. At the same time, managerial characteristics are more likely to vary within industry than within firm, mitigating the concerns regarding omitted variable bias, discussed in (Zhou 2001).[50]

In addition, since this is a panel dataset, the residuals might be highly correlated across its two dimensions. Thus, the Huber-White standard errors are estimated to correct for heteroscedasticity, in line with similar studies (e.g. (Huang and Kisgen 2013))

Table 3.12 reports the results on the determinants of cash holdings. In all models, the dependent variable is *Cash1*. The difference between the two models relates to the inclusion of the industry and year fixed effects. Controlling for industry and year effects is important. First, the previous section provides evidence that both managerial characteristics and cash holdings are not randomly distributed across industries. Therefore, it is possible for managers and cash holdings to be jointly influenced by the industry. As a result, model 2 controls for the industry, based on the SIC two digits classification, controlling for the unobserved heterogeneity between industries (Bates, Kahle, and Stulz 2009). In addition, using a year fixed estimator controls for possible time-specific effects that are not captured by the independent variables (e.g. financial crises, changes in regulations) (Bates, Kahle, and Stulz 2009; Perryman, Fernando, and Tripathy 2016).

The coefficient of *PcFemale* is positive and significant at the 1% level, indicating that the proportion of female managers is positively associated with cash holdings. These results hold in the cross-section after controlling for firm characteristics that have been shown to influence cash holdings (Model 1), and also for year and industry time-invariant characteristics (Model 2). These results are consistent with the results of both the univariate analysis and those documented in prior studies. For instance, Adhikari (2018) finds a positive association between the number of female executives on the TMT and cash holdings, and attributes this finding to female risk-aversion. Similarly, existing studies show that female CEOs and female CFOs are both associated with cash holdings (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015).

[50] Zhou (2001) states, “In panel data with firm fixed effects it would be hard to find a meaningful relationship between ownership and performance even if one existed” (p.560). Hence, Zhou (200) argues against using firm fixed effects in similar settings. Indeed, recent studies adopt this argument. For example, Chen, Leung, and Evans (2018) assert: "The lack of within-firm variation works against finding a significant relation between female board representation and innovation in firm fixed effects regressions” (Zhou, 2001). For these reasons, we estimate OLS regressions to capture the female- representation-innovation relation" (p.240).

With the exception of Peltomäki, Swidler, and Vähämaa (2018),[51] these studies attribute their findings to female risk-aversion.

A potential explanation for these findings is presented in the hypothesis. Prior studies show that cash is held for precautionary motives (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999) and that managerial characteristics and attitude towards risks influence their cash holdings (e.g. (Dittmar and Duchin 2016; Feng and Rao 2018)). Moreover, Hambrick and Mason (1984) suggest that managers act as a team, and that the central tendency of the TMT can be captured by their observable characteristics. Additionally, Wallach, Kogan, and Bem (1962) suggest that the risk-tolerance of one group member can influence that of the rest of the group.

In turn, prior studies demonstrate that female managers are systematically associated with more conservative policies due to female risk-aversion or male overconfidence (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013). Hence, it is possible that the positive association between the proportion of female executives on the TMT and cash holdings is due to female risk-aversion, which can lead to overemphasising the need to hold cash for precautionary reasons. Prior studies attributed similar findings to female risk-aversion (Adhikari 2018; Elsaid and Ursel 2011; Zeng and Wang 2015). Given the possibility that women are more risk-averse because of their higher expectations of negative outcomes (Fehr-Duda, De-Gennaro, and Schubert 2006; Harris, Jenkins, and Glaser 2006), they may require more cash to withstand future distress, assuming that they expect unfavourable events to be more likely to happen.

However, these findings can also be explained by male overconfidence (Barber and Odean 2001; Huang and Kisgen 2013), which may lead the TMT to underestimate the need to hold cash for precautionary reasons, given that overconfident managers might overestimate their abilities and underestimate the probability of negative events (Hirshleifer, Low, and Teoh 2012; Malmendier and Tate 2005a).[52] In that case, it is

[51] In their working papers, despite their cash holdings' results, their findings generally contrast with those of prior studies and show a positive association between female executives (CEO and CFOs) and firm risk, especially CFOs. They assert, "We also document that female executives, on average, are younger than their male counterparts, and furthermore, that the positive association between female executives and risk-taking is induced by firms with younger top executives. This suggests that the influence of executive gender on firm risk may be confounded by age-effects" (p.36). However, age is a variable of interest for this study.

[52] As shown in the literature review above, there are other motives for holding cash, such as agency (Jensen 1986) and tax motives (Riddick and Whited 2009). For these theories to explain these findings, one may need to assume that the proportion of female managers induces TMTs to be more entrenched to hold more cash for agency motives, or be less aware of, or act differently towards, the tax regimes. Yet, establishing

possible that TMTs with fewer females will be more overconfident and therefore overestimate their ability to withstand financial distress, thereby reducing the cash held for precautionary reasons.

Turning to the average age of the TMT, Table 3.12 reports the coefficients of the natural logarithm of *AvgAge* (*AvgAge1*). In all models, the coefficient of *AvgAge1* is negative and significant at the 1% level. These results are consistent with the findings from the univariate analysis. That is; TMT average age is negatively associated with cash holdings, and these results continue to hold in the cross-section after controlling for several firm characteristics (Model 1), and accounting for the industry and year fixed effects (Model 2). While the relationship between TMT average age and cash holdings has not been studied previously,[53] prior studies provide mixed evidence at the CEO and CFO levels. For instance, Bertrand and Schoar (2003) and Orens and Reheul (2013) find a positive relationship between CEO age and cash holding. These studies attribute their findings to older executives being more risk-averse, having a shorter career horizon, and lacking the sophistication of younger executives. Conversely, Peltomäki, Swidler, and Vähämaa (2018) report a negative relationship between CEO and CFO age and cash holding.[54] The results so far suggest that the average age of the TMT as one unit is negatively related to cash holding.

A possible explanation of these findings is discussed in the hypotheses development section. Prior studies presented the notion that older executives may adopt risker policies (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Since reputation could be positively associated with ageing, older executives are in a better position to risk failure, since their successful records may protect them if they fail.[55] If cash is held for precautionary reasons (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999) and managerial characteristics influence cash holdings (Dittmar and Duchin 2016; Feng and Rao 2018), it is possible that the negative relationship between TMT average age and

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these assumptions is difficult. In turn, the precautionary motive for cash and gender-based differences in risk-taking are well-established in the literature, as shown in the literature review above and in Chapter 2.

[53] To the best of my knowledge.

[54] In their working paper, they conclude that older executives constrain excessive risks, arguing that this is achieved through lower R&D investments and cash holding. In doing so, they assume that holding more cash is a risker choice. While they do not provide theoretical reasoning, they build their argument on prior studies reporting a positive association between cash holding and R&D intensity, the riskiness of cash flows, and value-destroying acquisitions.

[55] As shown in Chapter 2, the evidence on the relationship between age and risk-taking is mixed. Yet, some studies find a positive relationship between ageing and risk-taking (Huang et al. 2013).

cash holdings is due to the reputation that older managers enjoy, leading them to adopt risker policies such as holding less cash for precautionary motives.[56]

All in all, these findings are consistent with those of the univariate analysis and further support *H1*: *The proportion of female executives in the top management team and cash holdings are positively related.* A potential explanation for these findings may relate to female risk-aversion (Charness and Gneezy 2012) or male overconfidence (Barber and Odean 2001; Huang and Kisgen 2013). Further, the results are consistent with the univariate analysis and continue to reject *H2*: *The age average of the top management team and cash holdings are positively related.* Rather, the results show a negative association between TMT average age and cash holding. These results are in line with the view that older managers take more risks.

I now turn to discuss the findings on the control variables, before checking the robustness of the findings in this subsection.

3.6.2.2. Control Variables

The results on the control variables are discussed based on Model 2 in Table 3.12, in which the industry and year fixed effects are included to minimise the influence of the industry and year. The coefficient of *Log_Avg_Tenure* is negative and significant at the 1% level.[57] These results are consistent with the view that managerial tenure reduces career concerns (Li, Low, and Makhija 2017), and therefore allows tenured TMTs to reduce the cash holdings. That is: tenured TMTs may hold less cash for precautionary motives.

The coefficient of *MtB* is positive and significant at the 1% level, similar to the findings of Ozkan, and Ozkan (2004) and Harford (1999). This confirms the predictions of Myers and Majluf (1984) that growth firms may hold more cash because they face

[56] Linking managerial age to other cash holdings motives, such as agency and tax, is equally difficult from a theoretical point of view. Interpreting the negative association between managerial age and cash holdings based on these two motives requires assuming that older managers are less entrenched (to hold less cash for agency motives) or less aware/sensitive to tax changes. While such assumptions may not hold, I do not exclude these potential alterative explanations.

[57] Note that the coefficient of *Log_Avg_Tenure* shifts signs when considering the influence of industry and year. As discussed in this section, controlling for industry and year effects is necessary to account for that fact that industry effect may potentially influence managerial characteristics and cash holdings simultaneously.

higher costs when raising external capital. In other words, they hold more cash for precautionary reasons so that profitable future opportunities will not be missed.

Moreover, Miller and Orr (1966) predict that larger firms can hold less cash, given their ability to access external finance, their economics of scales, and their lower levels of information asymmetry. Indeed, the coefficient of *Size* is negative and significant at the 1% level. Al-Najjar (2013), Opler et al. (1999), and Harford, Mansi, and Maxwell (2008) report similar results.

The coefficient of *CashFlow* is positive and significant at the 1% level. The positive relationship is in line with the peaking order theory, which predicts a positive relationship between cash flows and cash holdings. Opler et al. (1999), and Ozkan and Ozkan (2004) find a similar relationship between cash flow and cash holding.

Furthermore, the coefficient of *ROA* is positive and significant at the 1% level. This is in line with the prediction that firms with better performance can hold more cash. Adhikari (2018) finds similar results and report a positive relationship between Tobin's Q, another proxy for performance, and cash holding.[58]

The coefficient of *CashFlowSD_10* is positive but not statistically significant. Ozkan and Ozkan (2004) and Han and Qiu (2007) report similar results. These findings are interesting since prior studies provide strong evidence for a positive relationship between cash flow volatility and cash holding (Bates, Kahle, and Stulz 2009; Opler et al. 1999; Brisker, Çolak, and Peterson 2013).[59]

Further, Bates, Kahle, and Stulz (2009) suggest that net working capital can substitute for cash holdings since it can be converted into cash in the short-term. Their

[58] In an un-tabulated test, I replaced *ROA* with *TobinsQ* as an alternative proxy for performance. Performance continues to be positive and significant, and the variables of interest continue to show similar results.
[59] For this reason, I introduce *CashFlowSD_5* when I investigate the sensitivity of the findings to different controls. However, it is positive and significant in other models presented for robustness (see Tables 3.16-18).

results are consistent with this view. I find similar results, as evident from the negative coefficient of *NWC_Orth*, which is significant at the 1% level.[60]

The coefficient of *Div_Payer* is negative and significant at the 1% level. These findings are in line with the univariate results reported in Table 3.11, which shows that payers hold less cash than non-payers. Prior studies reveal mixed evidence. For instance, studies report that the relationship between the dividend dummy and cash holdings is negative (Opler et al. 1999) and positive (Bates, Kahle, and Stulz 2009). However, the negative relationship is consistent with the view that dividend payers have better access to the capital market and therefore a lower need to hold cash for precautionary reasons (Bates, Kahle, and Stulz 2009).

The coefficient of *RD1* is positive and significant at the 1% level. This is in line with the arguments and findings in the literature. On one hand, R&D investments increase information asymmetry which leads to holding more cash due to higher costs of external financing (Opler et al. 1999). Similarly, R&D investments may capture growth potential, which requires larger cash holdings to finance future growth opportunities (Bates, Kahle, and Stulz 2009).

Additionally, firms with more capital expenditure accumulate more assets that can be used as collateral, facilitating external funds and reducing the need for cash holdings (Bates, Kahle, and Stulz 2009). The results are in line with this prediction, as the coefficient of *CAPEX* is negative and significant at the 1% level. Also, the coefficient of *AQ* is negative and significant at the 1% level. This negative relationship is consistent with prior studies. Bates, Kahle, and Stulz (2009) further argue that acquisitions also create more assets that can be used as collateral, thereby decreasing the need to hold more cash.

The coefficient of *Lev_Orth* is negative and significant at the 1% level. This is in line with the argument that higher leverage increases the cost of holding cash (Baskin

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[60] Because of the high correlation between NWC and Lev, the model suffered from multicollinearity, as evident from the high VIF score. To correct for this, the models include the orthognlised values for *NWC* (*NWC_Orth*) and *Lev* (*Lev_Orth*). When two variables are orthogonal, adding them to a single model does not bias the coefficients of the other variables (Brooks 2007). Following this process, the VIF test is less than five, indicating that the models no longer suffer from multicollinearity.

1987), and consistent with the empirical findings (Bates, Kahle, and Stulz 2009; Harford, Mansi, and Maxwell 2008; Ozkan and Ozkan 2004). Lastly, the coefficient of *Intang* is negative and significant at the 1% level. This negative relationship rejects the predictions in this chapter.

3.6.2.3. Robustness Checks

This section examines the reliability of the results in the main analysis by conducting several robustness checks. First, I investigate the sensitivity of the results to the proxies used for the control variables. To do so, I replace *Size* with *Log_Sale* and *CashFlowSD_10* with *CashFlowSD_5*. These two variables are replaced to account for mechanical issues resulting from the dependent variable being scaled by total assets, while controlling for firm size using total assets.[61] Additionally, *CashFlowSD_10* is constructed using an arbitrary cut-off (i.e. 10 years) without theoretical reasoning, so it is replaced with *CashFlowSD_5* which uses five years as an alternative cut-off. The results of this analysis are consistent with the main analysis presented in Table 3.13. In particular, the coefficient of *PcFemale* continues to be positive and significant at the 1% level, thereby supporting *H1*. Also, the coefficient of *AvgAge1* is negative and significant at the 1% level, further rejecting *H2* and demonstrating a negative relationship between the average age of the TMT and cash holding.

Second, I examine whether the results are sensitive to the measurement of the dependent variable. The main analysis includes *Cash1*, which is cash and short-term investments scaled by the total assets. In Table 3.14, I replace *Cash1* with *Log_CHE*, which is the natural logarithm of the cash balance (log (1+CHE)). The results are consistent with the main analysis. The coefficient of *PcFemale* remains positive and significant at the 1% level, which is in line with *H1*. Similarly, the coefficient of *AvgAge1* is negative and significant at the 1% level, contrasting with *H2* and further supporting the negative relationship between TMT average age and cash holding.

The third analysis checks whether the results of the main analysis are sensitive to the measurement of female representation on the TMT and managerial age. Specifically,

[61] I received this comment when presenting my results. However, scaling the dependent variable by the total assets while including the natural logarithm of assets on the right hand side is common in the literature (e.g. (Bates, Kahle, and Stulz 2009)).

PcFemale is replaced with *Log_No_Female*, which is the natural logarithm of the number of female executives on the TMT. Also, *AvgAge1* is replaced with *HighAge*, which is a dummy variable that takes the value of 1 if *AvgAge* is greater than its average for the full sample. The results continue to support the findings of the main analysis. Table 3.15 shows that the coefficient of *Log_No_Female* is positive and significant at the 1% level, which is consistent with *H1*. In the same way, the coefficient of *HighAge* is negative and significant at the 1% level, rejecting *H2* and lending additional support to the negative association between TMT average age and cash holdings.

Fourth, I investigate whether my results are driven by outliers, and consequently winzorise all non-dummy variables at the 1st and 99th percentiles (Serfling 2014). In doing so, the values at the lowest and highest percentiles are replaced with their closest values outside this range.[62] The results of this analysis are presented in Table 3.17. The coefficient of *PcFemale* remains positive and significant at the 1% level. Also, the coefficient of *AvgAge1* is negative and significant at the 1% level. These findings indicate that the results presented in the main analysis are not driven by data outliers.[63]

Fifth, I follow prior studies investigating the determinants of cash holding and re-estimate the main model using the Fama-MacBeth regression (Bates, Kahle, and Stulz 2009; Opler et al. 1999; Riddick and Whited 2009; Subramaniam et al. 2011). The two-step procedure of Fama and Macbeth (1973) estimates annual cross-sectional regressions for the 22 years in the sample before reporting the signs and averaging the coefficients and standard errors. This approach takes into consideration the possibility of cross-sectional dependence on the error term. Table 3.17 shows that the results continue to hold after accounting for this possibility. The average coefficient of *PcFemale* is positive and significant at the 10% level, consistent with *H1*. Similarly, the average coefficient of *AvgAge1* is negative and significant at the 1% level, further contrasting with *H2* and supporting the negative relationship found in the main model.

[62] Other studies remove such observations (i.e. trim the data), but this method results in the loss of many observations.
[63] Note that the coefficient of *CashFlow* changes signs in this test, which may indicate the *CashFlow* has some outliers. However, the variables of interest are not influenced by sever values as evident from the stability of their coefficients.

Lastly, I examine whether the results are driven by managerial compensation or wealth. If the compensation structure differs systematically across gender and age, it may significantly influence the results.[64] For instance, if the compensation packages of male managers encourage them to take more risks than female managers, then any systematic difference between male and female managers might be caused by their compensation. Similarly, it is possible that managerial compensation is not randomly distributed across young and mature managers. Further, Chapter 2 presents several studies which suggest that individuals' wealth impacts on their risk-taking behaviour (e.g. (Atkinson, Baird, and Frye 2003; Jianakoplos and Bernasek 1998)). Consequently, I include three control variables that capture the average wealth of the managers (*Log_Avg_Wealth*), the sensitivity of their compensation to their risk-taking (*Log_Avg_Vega*) and the sensitivity of their compensation to their firm performance (*Log_Avg_Delta*). *Log_Avg_Wealth* is the natural logarithm of the average dollar value of executives' wealth in the firm. *Log_Avg_Vega* is the natural logarithm of the average dollar change in the wealth of the TMT per 1 percent change in the standard deviation of the stock price of the firm. *Log_Avg_Delta* is the natural logarithm of the average dollar change in the wealth of the TMT per 1 percent change in the stock price of the firm. Delta and Vega better capture managers' incentives created by their compensation structures (Coles, Daniel, and Naveen 2006; Core and Guay 2002).[65]

Table 3.18 shows that the coefficient of *PcFemale* continues to be positive and significant at the 1% level. Similarly, the coefficient of *AvgAge1* continues to be negative and significant at the 1% level. These findings suggest that the findings of this chapter are not influenced by managerial wealth or incentives created by compensation.[66]

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[64] The participants at the BAFA 2018 conference made this point when I was presenting Chapter 4, but it also applies to this chapter. However, one may argue that managerial wealth and compensation might be partially captured by managerial tenure.

[65] I am thankful to Lalitha Naveen, who made the data on Delta, Vega, and Wealth available on her website. https://sites.temple.edu/lnaveen/data/

[66] I re-estimate this model with the sums for wealth, vega, and delta. The results are similar to the main analysis. In addition, when I exclude tenure from this model in an un-tabulated test, the results remain similar to those of the main analysis. Additionally, I included a dummy denoting the periods pre- and post-sox to control for governance, which improved after the passage of SOX, and the results are similar to those of the main analysis.

Overall, the results presented in the main analysis are robust to these different specifications. They continue to show a positive association between the proportion of female executives on the TMT and cash holding. Similarly, the negative relationship between TMT average age and cash holding remains under different specifications.

3.6.3. CEOs versus CFOs: Gender, Age and Cash Holdings

So far, the results of this chapter indicate that both TMT gender and age are systematically related to cash holding. In particular, the percentage of female managers on the TMT is positively associated with cash holding, while the average age of the TMT is negatively related to it. This section aims to provide further insights by investigating managerial gender and age at both the CEO and CFO levels.

These two executives are reported to influence the corporate outcomes based on their risk-taking motives. For example, Kim, Li, and Zhang (2011) report that the sensitivity of the CFO's wealth to the stock price is related to the risk of a crash in the stock price. Additionally, while the UET advocates investigation at the TMT level (Hambrick 2007; Hambrick and Mason 1984), it also acknowledges the significance of the CEO as the most important decision-maker in the firm. With the exception of Peltomäki, Swidler, and Vähämaa (2018), prior studies on executives' gender and age have tended to focus on the CEO (Elsaid and Ursel 2011; Faccio, Marchica, and Mura 2016; Serfling 2014; Yim 2013; Zeng and Wang 2015). Hence, I extend these studies by investigating the roles of the CEO and CFO genders and ages to dismantle the effects of CEOs, CFOs, and the TMT as a single unit.

Table 3.19 presents four different models. Model 1 includes CEO characteristics, Model 2 CFO characteristics, Model 3 both, and Model 4 is augmented by managerial compensation and wealth.[67] In all of the models, I control for industry and year fixed effects and include all available observations. In doing so, I account for time-invariant industry characteristics as well as year-specific factors. These models are estimated using a pooled ordinary least square estimator with the Huber-White standard errors corrected for heteroscedasticity.

[67] I estimate this model to account for the possibility that managerial incentives and wealth may drive the results, as discussed in the previous section (robustness checks).

Models 1, 3, and 4 show that the coefficients of *CEO_Female* are positive and significant (the significance level ranges between the 10% and 1% levels). This is consistent with the findings of the univariate analysis (Table 3.6), which show that firms with female CEOs hold more cash. The existing literature provides similar results (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015). Looking at the CFO, the univariate analysis (Table 3.6) provides similar results by showing that firms with female CFOs are associated with higher cash holdings. Similarly, Peltomäki, Swidler, and Vähämaa (2018) find a positive association between female CFOs and cash holdings. However, Models 2-4 show that the coefficients of *CFO_Female* are insignificant. That is; the gender of the CFO is not systematically related to cash holdings, once we control for the factors identified in the literature.

These findings provide valuable insights. First, they indicate that the positive association between *PcFemale* and *Cash1* is influenced by the gender of the CEO but unaffected by the gender of the CFO. Additionally, Chava and Purnanandam (2010) show that the incentives of the CEO are more influential than those of the CFO in determining the cash holdings, attributing their findings to a stronger CEO influence on the decision of holding cash. Likewise, the findings in this section may indicate that the CEOs have a greater influence over the cash holding decision than the CFOs. Also, the inconsistency between the findings of this chapter and those of Peltomäki, Swidler, and Vähämaa (2018) with respect to CFO gender point to the importance of controlling for the variables identified in the literature.[68]

Turning to age, Models 1, 3 and 4 show that the coefficients of *Log_CEO_Age* are negative and significant at the 1% level. Existing studies provide mixed evidence in this regard. While Bertrand and Schoar (2003) and Orens and Reheul (2013) find a positive relationship between the CEO age and cash holding, Peltomäki, Swidler, and Vähämaa (2018) report a negative one. Furthermore, Models 2-4 show that the coefficients of *Log_CFO_Age* are negative and significant at the 1% level. These findings

[68] *CFO_Female* remains insignificant when I use their sample's starting date (2006). The difference between the results in this chapter and their results might be related to the fact that their models do not control for managerial tenure. However, the details of their models are unavailable to explain this difference in more detail.

are similar to those of Peltomäki, Swidler, and Vähämaa (2018), who report a negative relationship between CFO age and cash holding.

These findings shed light on several issues. First, they enhance our understanding of the observed negative relationship between *AvgAge* and *Cash1* by showing that this relationship is influenced by both CEO age and CFO age. This is consistent with the view of Hambrick and Mason (1984) that executives other than the CEO are important in determining the corporate policies. Indeed, prior studies provide evidence to support the importance of the CFO in particular (Chava and Purnanandam 2010; Francis, Hasan, and Wu 2013; Kim, Li, and Zhang 2011). Second, prior studies provide mixed evidence regarding the relationship between CEO age and cash holdings (Bertrand and Schoar 2003; Orens and Reheul 2013; Peltomäki, Swidler, and Vähämaa 2018). Using a large dataset, these findings add to this debate by showing a negative relationship between CEO age and cash holdings, before and after controlling for the factors identified as influencing cash holdings.

Overall, this section suggests that the relationship between the proportion of female executives on the TMT and cash holdings is affected by the CEO but not the CFO. It also shows that the negative relationship between the average age of the TMT and cash holdings is influenced by both CEO age and CFO age.

The following section summarises and concludes the chapter.

3.7. Conclusion

Understanding the determinants of cash holdings is important, given the growing tendency to accumulate cash. The extant literature enhances our understanding of the cash holding phenomenon by identifying some of its drivers. Previous studies suggest that one of the main motives for accumulating cash is to withstand future distress and obtain future opportunities (i.e. a precautionary motive) (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999), yet holding the firm's resources in cash may provide a return that is lower than the minimum rate of return required by investors. Therefore, managers must weigh up the benefits and losses associated with holding cash.

In this context, managerial risk-taking behaviour may affect the decision regarding the cash holding level. In particular, the extant literature provides evidence that personal preferences regarding risk-taking manifest themselves in their firm's decisions (Bertrand and Schoar 2003; Huang, Tan, and Faff 2016; Malmendier and Tate 2016). Building on this literature, this chapter investigates whether managerial gender and age influence firms' cash holdings. This is because both gender and age can influence risk-tolerance (Charness and Gneezy 2012; Croson and Gneezy 2009; Faccio, Marchica, and Mura 2016; Mata et al. 2011; Serfling 2014), and cash is held for precautionary motives (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999). This proposition assumes that holding a large cash balance is a conservative policy since it can be used to withstand financial distress or crises when they arise (Cassell et al. 2012; Chava and Purnanandam 2010; Ferris, Javakhadze, and Rajkovic 2017).

To test these propositions, I use a large dataset of S&P 1500 firms from 1992 to 2013 and calculate the proportion of female managers on the TMT (*PcFemale*) together with their average age (*AvgAge*), in line with Hambrick and Mason (1984). The main findings can be summarised as follows. First, a positive relationship between *PcFemale* and cash holdings is documented. These results hold under several robustness checks and are consistent with those of Adhikari (2018), who attributes them to female risk-aversion. However, this chapter provides an alternative explanation. Given that males could more overconfident than females (Barber and Odean 2001; Huang and Kisgen 2013), it is possible that TMTs with fewer females are more overconfident. In that case, overconfident TMTs may underestimate the need to hold cash for times of future distress since overconfident managers overestimate their abilities and underestimate the probability of negative events.

Moreover, the analysis reveals a negative relationship between *AvgAge* and cash holding. This relationship holds under several tests, but contradicts recent studies reporting a negative relationship between managerial age and the riskiness of the firm and its policies (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Nonetheless, the relationship between age and risk-tolerance is not conclusive in the psychology literature. For instance, several studies suggest that this relationship depends on contextual or situational factors (Bonem, Ellsworth, and Gonzalez 2015; Dror, Katona, and Mungur 1998). These findings are in line with the view that older managers have longer success records that could protect them when they fail, leading them to take more risks (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Alternatively, it is possible that ageing is positively related to risk-taking (Huang et al. 2013), which could induce older executives to reduce their cash holdings.

Acknowledging the importance of CEOs and CFOs, I perform an additional analysis using hand-collected data and examine whether managerial gender and age at the CEO and CFO levels are related to cash holdings. The results indicate that female CEOs are positively related to cash holdings. Given that there exists a relationship between CEO gender and cash holdings while none between CFO gender and cash holdings, we may interpret these results as indicative of the influence of CEOs on cash holding-related decisions. For example, Chava and Purnanandam (2010) find that the compensation of the CEO influences the level of cash holdings while there is no influence for CFO compensation, concluding that CEOs dominate the cash holdings-related decisions. Moreover, both CEO age and CFO age are negatively related to cash holding. Collectively, these findings suggest that other TMT members matter in determining cash holdings, consistent with the UET of Hambrick and Mason (1984).

These findings have several implications. First, they may inform corporate boards when hiring and compensating managers. When calibrating the risk-taking behaviour of their TMTs, the board members could consider managerial gender and age as attributes that have implications regarding the riskiness of the firm. For instance, with all else being equal, female managers could help to curb excessive risk-taking. Second, by showing that managerial gender and age can affect the riskiness of the corporate policies, this chapter informs policy-makers on the potential implications of policies related to corporate female representation or changes in the retirement age.

Table 3.1

Data Sample 1992 – 2013

This table illustrates the selected sample. It begins by collecting all of the executives' data between 1992-2013, leading to 41,808 firm-years. Financial and utility companies are excluded, reducing the sample size to 32,831 observations.

Executives Available on ExecuComp	242,079
All Firm Years on ExecuComp	41,808
(-) Firm Year with SIC (6000-6999) & (4900-4999)	8,977
= Firm Year Available for the Analysis	32,831

Table 3.2

Sample Distribution over the Years

This table shows the distribution of the observations across the years.

YEAR	Total	Percentage
1992	1,220	4%
1993	1,318	4%
1994	1,379	4%
1995	1,470	4%
1996	1,581	5%
1997	1,654	5%
1998	1,669	5%
1999	1,584	5%
2000	1,490	5%
2001	1,475	4%
2002	1,499	5%
2003	1,528	5%
2004	1,492	5%
2005	1,396	4%
2006	1,493	5%
2007	1,654	5%
2008	1,593	5%
2009	1,551	5%
2010	1,513	5%
2011	1,473	4%
2012	1,427	4%
2013	1,372	4%

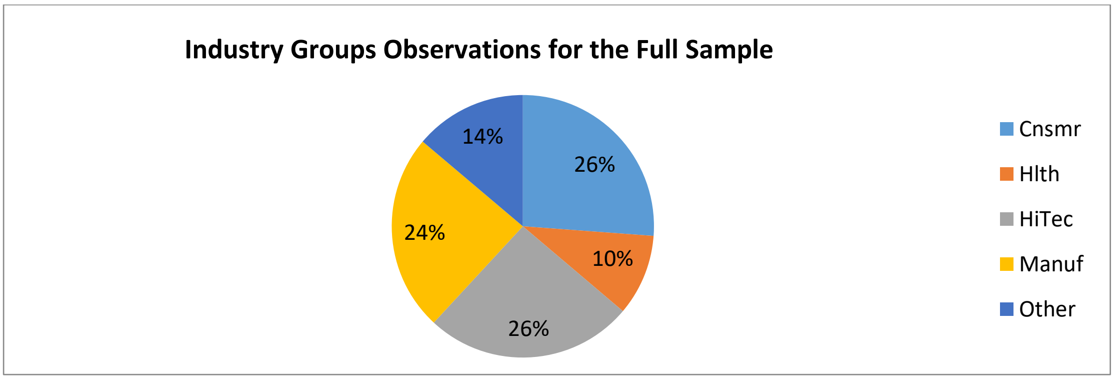

Figure 3.1 Industry Groups Observations for the Full Sample

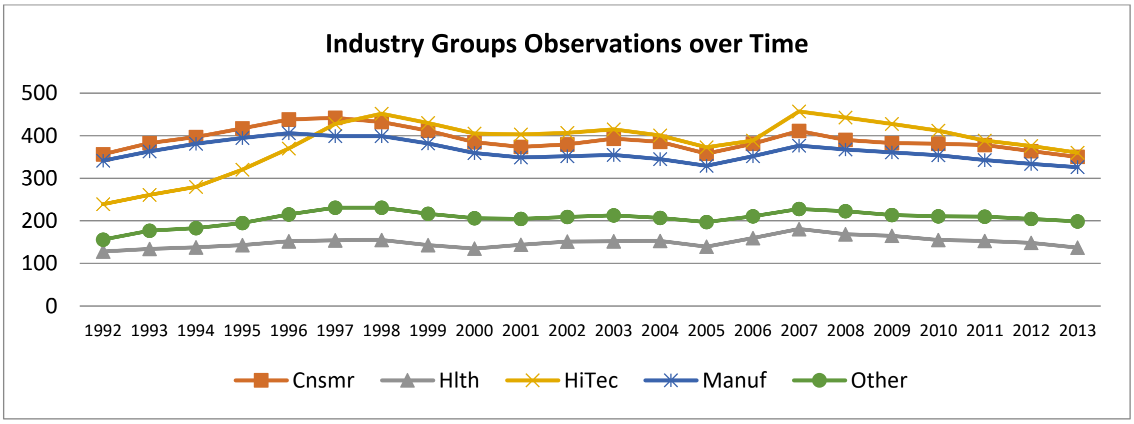

Figure 3.2 Industry Groups Observations over Time

Table 3.3

Cash Holdings across Industries and over Time

This table shows the means for CHE (Cash and Short Term Investments) and total assets in nominal dollar values. It also shows the cash holding proxy (*Cash1*) over time and across F&F 5 Industry groups. *Cash1* is cash and short-term investments divided by total assets.

YEAR	CHE	ASSETS	Cash1					
			Full Sample	Consumers	Health	HiTec	Manufacturing	Other
1992	163	2,944	13.41%	8.61%	29.39%	20.51%	7.62%	13.09%
1993	162	2,954	13.29%	8.09%	26.41%	21.97%	7.80%	13.01%
1994	158	2,969	11.67%	6.55%	22.99%	20.97%	6.87%	9.98%
1995	165	3,013	11.94%	6.70%	22.49%	22.45%	6.24%	9.97%
1996	181	3,117	13.46%	8.11%	23.79%	23.99%	6.60%	11.98%
1997	198	3,218	14.75%	7.96%	24.37%	26.76%	6.74%	13.06%
1998	215	3,509	14.38%	7.54%	22.64%	27.02%	6.05%	11.34%
1999	283	4,222	14.58%	7.23%	20.54%	28.76%	6.38%	10.87%
2000	316	4,975	14.04%	6.79%	23.39%	26.67%	6.22%	10.24%
2001	381	5,286	15.81%	8.51%	23.63%	28.58%	7.82%	12.17%
2002	451	5,251	16.65%	9.55%	23.49%	29.70%	8.69%	12.56%
2003	558	5,577	18.13%	10.77%	26.07%	31.16%	9.64%	14.84%
2004	657	6,027	18.16%	11.05%	25.81%	30.12%	9.81%	16.53%
2005	705	6,570	17.57%	10.16%	24.79%	29.00%	10.51%	16.04%
2006	667	6,587	17.08%	10.16%	24.30%	27.72%	9.44%	17.11%
2007	628	6,575	16.77%	8.71%	26.49%	26.69%	9.58%	15.63%
2008	631	6,566	16.10%	9.53%	24.62%	24.74%	8.90%	15.68%
2009	785	6,838	18.81%	13.50%	25.02%	28.28%	11.21%	17.29%
2010	920	7,553	18.53%	13.35%	25.40%	27.25%	12.13%	16.54%
2011	991	8,291	17.19%	12.39%	23.71%	25.72%	11.00%	15.54%
2012	1072	8,957	16.36%	11.67%	22.55%	24.48%	10.52%	15.07%
2013	1255	9,767	16.47%	11.85%	22.66%	24.76%	11.15%	14.12%
Average	523	5,489	15.72%	9.41%	24.31%	26.58%	8.59%	13.80%

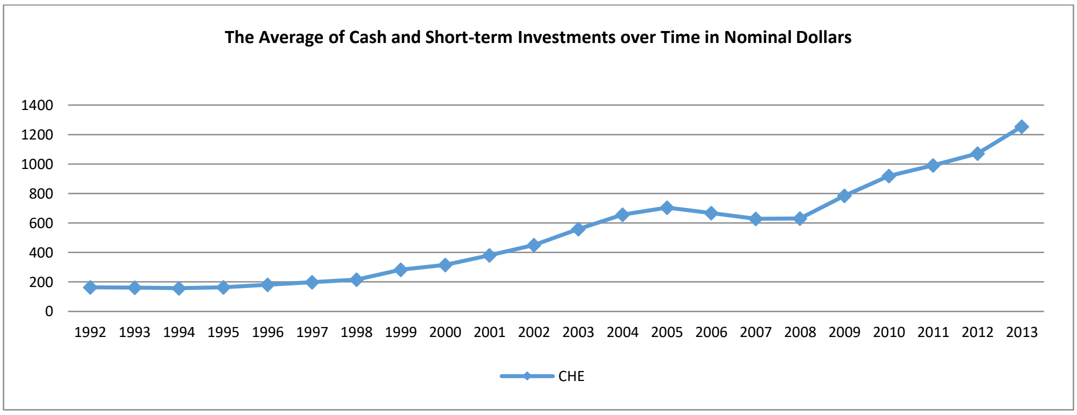

Figure 3.3 The Average of Cash and Short-term Investments over Time in Nominal Dollars

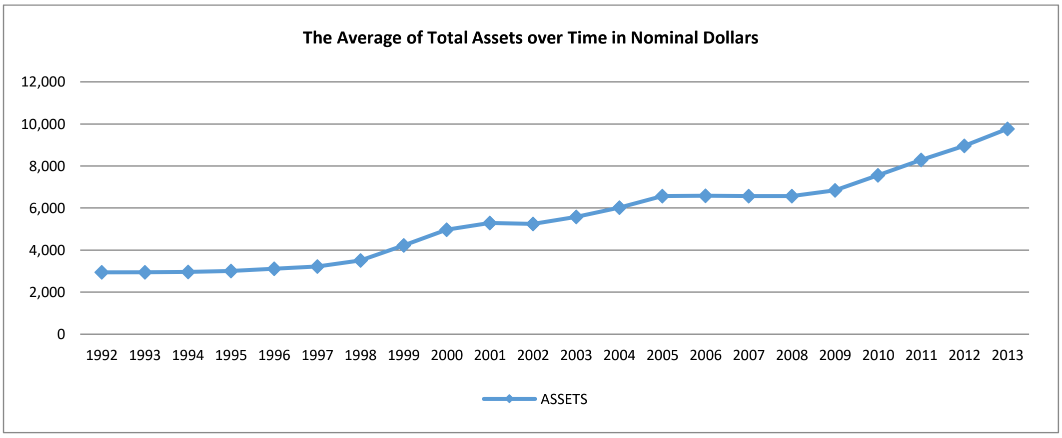

Figure 3.4 The Average of Total Assets over Time in Nominal Dollars

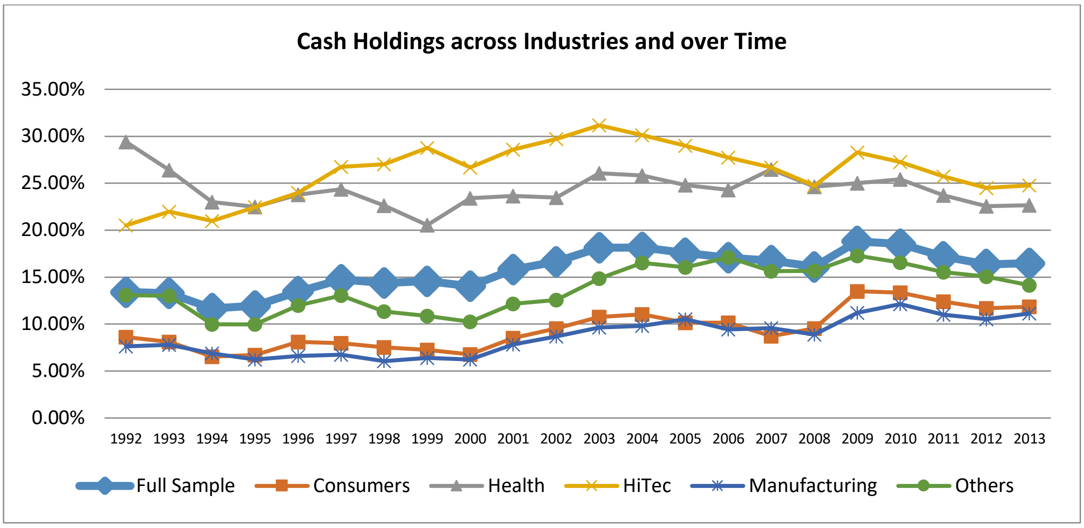

Figure 3.5 Cash Holdings across Industries and over Time

Table 3.4

Descriptive Statistics

The sample consists of 32,831 firm-year observations for all firms available on ExecuComp for 1992-2013, excluding financial and utility firms. Executive data are from ExecuComp, and financial data are from Compustat. *Cash1* is cash and short-term investments scaled by total assets. *PcFemale* is the percentage of female executives on the TMT. *CEO_Female* and *CFO_Female* are dummies that take the value of 1 if the executive is female. *AvgAge* is the average age of the executives on the TMT. *CEO_Age* and *CFO_Age* are stated in years. *Avg_Tenure* measures the tenure of the TMT, on average. *CEO_Tenure* and *CFO_Tenure* are stated in years. *MtB* is the market to book ratio. Assets are the total assets. *CashFlow* is the cash flow of the firm. *ROA* is the return on assets. *Div_Payer* is a dummy denoting dividend payers. *RD1* is R&D expenses divided by total assets. *NWC* is the working capital net of cash. *CAPEX* is the capital expenditure of the firm scaled by its total assets. *AQ* is acquisitions divided by total assets. *Lev* is total debt over total assets. *Intang* is the percentage of intangible assets to total assets. *CashFlowSD_10* is the standard deviation of the cash flow. For all variables, all available observations are included. All variables are defined in the appendix of this chapter.

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Cash1	32,646	0.16	0.09	0.18	0	1
PcFemale	32,831	0.06	0	0.11	0	1
CEO_Female	29,542	0.02	0	0.15	0	1
CFO_Female	25,064	0.07	0	0.26	0	1
AvgAge	29,119	53.32	53	5.6	31	88
CEO_Age	28,232	55.46	55	7.64	27	96
CFO_Age	15,524	50.41	50	6.97	26	87
Avg_Tenure	32,820	4.61	4.17	2.63	1	22
CEO_Tenure	29,542	7.06	5	7.35	0	61
CFO_Tenure	25,064	4.13	3	5.15	0	44
MtB	32,050	2.2	1.64	2.44	0.2	151.18
Assets	32,655	5,482.93	989.68	23,266.25	0	797,769.00
CashFlow	30,402	0.07	0.09	0.67	-100	0.73
ROA	32,633	0.03	0.05	0.7	-103	35.51
Div_Payer	32,831	0.46	0	0.5	0	1
RD1	32,830	0.04	0	0.12	0	14.86
NWC	31,774	0.07	0.07	0.93	-131.09	1
CAPEX	32,831	0.06	0.04	0.06	-0.03	1.21
AQ	32,831	0.03	0	0.07	-0.92	1
Lev	32,524	0.23	0.2	0.85	0	120.94
Intang	32,831	0.15	0.08	0.18	0	0.93
CashFlowSD_10	31,281	0.07	0.04	0.54	0	57.23

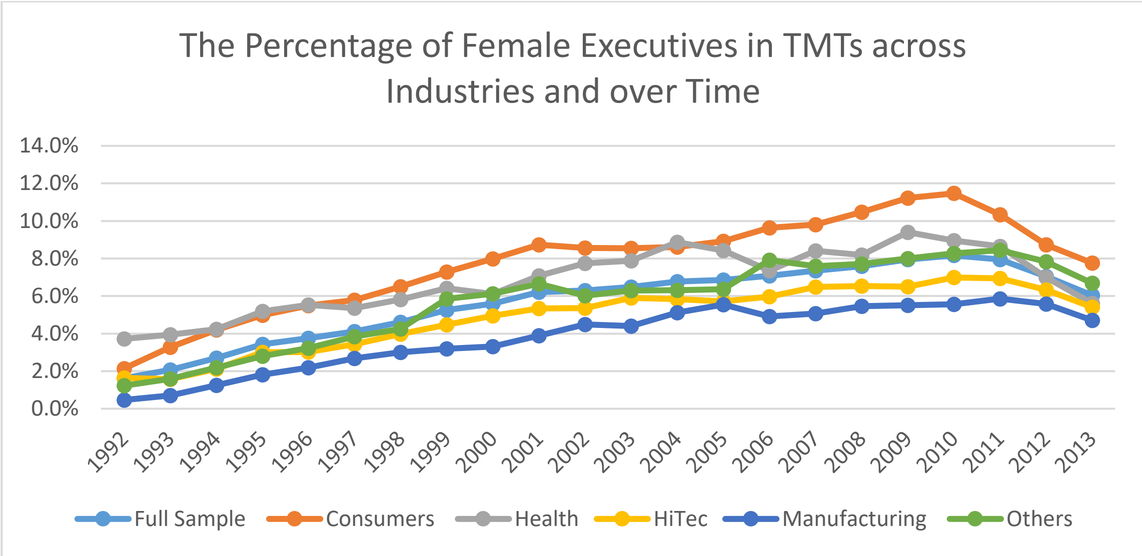

Figure 3.6 The Development of Female Representation in TMTs across Industries and over Time

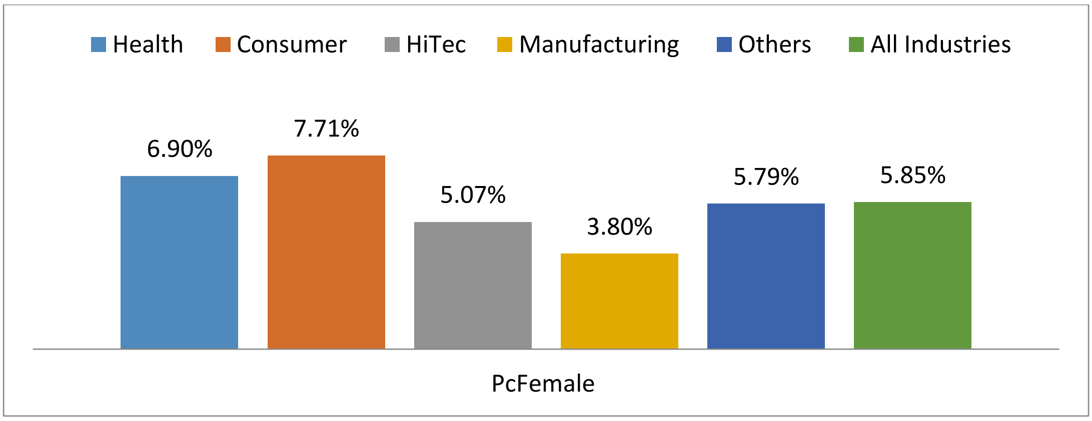

Figure 3.7 The Percentage of Females in TMTs in Different Industries

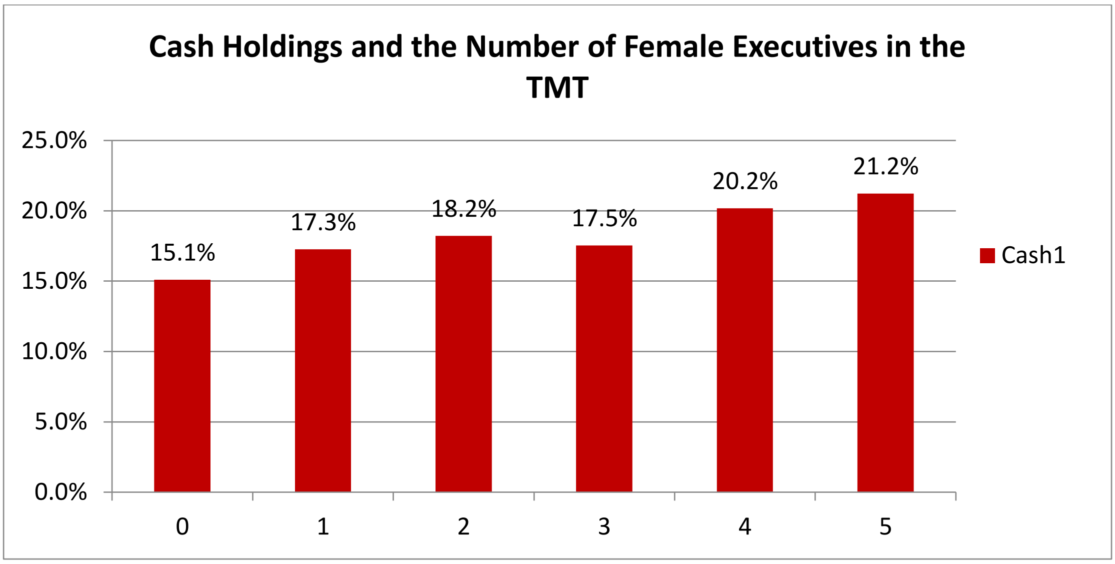

Figure 3.8 Cash Holdings and the Number of Female Executives in the TMT

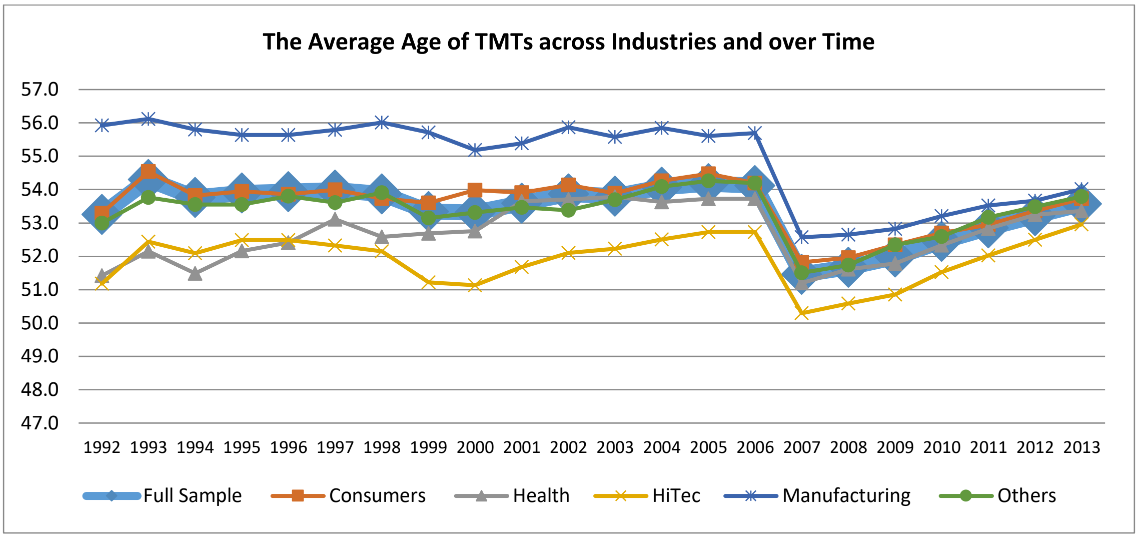

Figure 3.9 The Average Age of TMTs across Industries and over Time

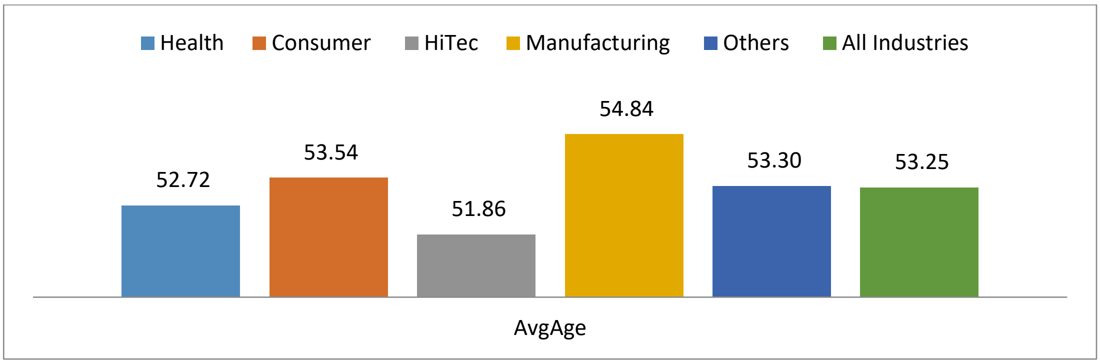

Figure 3.10 The Average Age of TMTs in Different Industry Groups

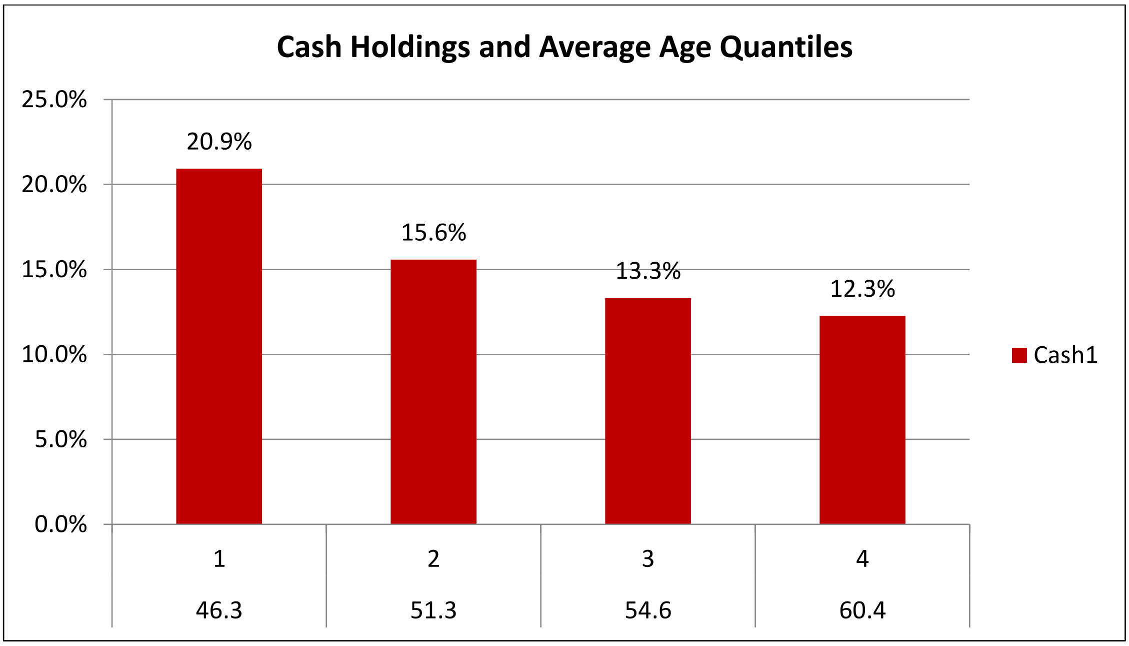

Figure 3.11 Cash Holdings and Average Age Quantiles

Table 3.5
Correlation Matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Cash1																					
2	PcFemale	0.03																				
3	CEO_Female	0.01	0.36																			
4	CFO_Female	0.02	0.45	0.04																		
5	AvgAge1	-0.15	-0.07	-0.02	-0.03																	
6	Log_CEO_Age	-0.10	0.01	-0.04	0.00	0.60																
7	Log_CFO_Age	-0.04	-0.05	-0.01	-0.09	0.56	0.18															
8	Log_Avg_Tenure	-0.06	-0.01	-0.01	0.01	0.36	0.24	0.21														
9	Log_CEO_Tenure	0.04	-0.02	-0.06	-0.02	0.18	0.37	0.07	0.29													
10	Log_CFO_Tenure	-0.04	-0.04	-0.05	-0.01	0.19	0.12	0.23	0.42	0.19												
11	Size	-0.29	-0.02	0.00	0.02	0.21	0.11	0.15	0.23	-0.05	0.06											
12	CashFlow	-0.06	0.01	0.00	0.02	-0.01	0.00	0.00	-0.01	0.00	0.00	0.13										
13	ROA	-0.04	0.01	0.00	0.03	0.04	0.02	0.03	0.03	0.02	0.02	0.16	0.84									
14	NWC	-0.04	0.00	0.00	0.00	-0.01	0.01	-0.01	-0.01	-0.01	0.01	0.05	0.74	0.60								
15	Div_Payer	-0.23	-0.02	-0.01	0.02	0.25	0.17	0.14	0.20	0.00	0.06	0.34	0.03	0.11	0.02							
16	RD1	0.46	-0.04	-0.03	-0.02	-0.10	-0.09	0.02	-0.06	0.00	-0.02	-0.23	-0.34	-0.36	-0.20	-0.20						
17	CAPEX	-0.20	-0.04	-0.02	-0.03	-0.06	-0.04	-0.08	-0.07	0.03	0.01	-0.01	0.04	0.00	-0.01	-0.02	-0.11					
18	AQ	-0.13	-0.01	0.00	0.01	-0.05	-0.03	-0.02	-0.05	-0.01	-0.01	0.01	0.02	0.02	0.01	-0.03	0.00	-0.12				
19	Lev	-0.04	-0.01	0.00	-0.01	0.02	0.01	0.01	0.02	0.01	-0.01	-0.03	-0.69	-0.56	-0.98	-0.01	0.15	0.00	0.01			
20	MtB	0.24	0.00	-0.02	0.01	-0.07	-0.07	-0.01	-0.03	0.02	0.00	-0.14	-0.50	-0.38	-0.70	-0.05	0.31	0.01	-0.02	0.67		
21	Intang	-0.25	0.04	0.02	0.03	-0.01	-0.02	0.02	0.04	-0.01	0.02	0.21	0.00	0.00	-0.01	0.02	-0.06	-0.35	0.33	0.02	-0.07	
22	CashFlowSD_10	0.03	-0.01	0.00	-0.01	-0.03	-0.04	-0.03	-0.04	-0.02	-0.03	-0.07	-0.09	-0.08	-0.08	-0.04	0.07	-0.01	0.02	0.08	0.07	0.01

Table 3.6
Difference in Means for Cash Holdings (TMT Subsamples)

This table shows the differences in cash holdings as measured by *Cash1*. The data are based on the full sample. *HighFemale* indicates a TMT that is more than 50% female. *MaleFemaleTeam* indicates a TMT with at least one female manager. *CEO_Female* and *CFO_Female* indicate female executives. *HighAge* indicates a TMT whose executives' average age is higher than that of the full sample.

TMT Characteristics	Yes	No	Difference	T-statistic
HighFemale	20.86%	15.68%	-5.20%	-4.7736
MaleFemaleTeam	17.46%	15.10%	-2.40%	-10.4197
CEO_Female	18.78%	15.31%	-3.47%	-4.9857
CFO_Female	18.60%	15.62%	-2.98%	-6.9108
HighAge	12.72%	18.09%	5.37%	26.2460

Table 3.7
Difference in Means for the Percentage of Females in the TMT (Industry Subsamples)

This table shows the difference of the percentages of females on the TMT (*PcFemale*) across F&F's five industry classifications.

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	7.71%	5.04%	-2.67%	-19.5616
Health	6.90%	5.61%	-1.30%	-6.4415
HiTec	5.07%	5.97%	0.90%	6.4789
Manufacturing	3.80%	6.36%	2.56%	18.2413
Other	5.79%	5.73%	5.74%	-0.3756

Table 3.8
Difference in Means for the Average Age of the TMT (Industry Subsamples)

This table shows the difference in the average age of TMTs across F&F's Five industry classification.

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	53.54	53.24	-0.30	-4.0309
Health	52.72	53.39	0.67	6.0878
HiTec	51.86	53.81	1.95	26.0906
Manufacturing	54.83	52.83	-2.00	-26.6435
Other	53.30	53.33	0.03	0.3005

Table 3.9
Difference in Means for Cash Holdings (Industry Subsamples)

This table shows the difference in the cash holdings, measured by *Cash1*, across F&F's five industry classification.

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	9.41%	17.96%	8.5%	38.5655
Health	24.31%	14.77%	-9.5%	-29.077
HiTec	26.58%	11.96%	-14.6%	-68.5807
Manufacturing	8.59%	18.01%	9.4%	41.578
Other	13.80%	16.03%	2.2%	7.7392

Table 3.10
Difference in Means for Cash Holdings (Industry-TMT Subsamples)

This table shows the differences in cash holdings as measured by *Cash1* across F&F's 5 industry groups and other team characteristics. *HighFemale* indicates a TMT that is more than 50% female. *MaleFemaleTeam* indicates a TMT with at least one female manager. *HighAge* indicates a TMT whose executives' average age is higher than that of the full sample.

F&F5	TMT Characteristics	Yes	No	Difference	T-statistic
Consumers	HighFemale	18.56%	9.23%	-9.3%	-10.4842
	MaleFemaleTeam	11.57%	8.37%	-3.2%	-12.127
	HighAge	8.63%	10.33%	1.7%	6.8118
Health	HighFemale	34.11%	24.25%	-9.9%	-1.9156
	MaleFemaleTeam	25.87%	23.57%	-2.3%	-2.6131
	HighAge	23.50%	25.12%	1.6%	1.9598
HiTec	HighFemale	26.41%	26.58%	0.2%	0.0537
	MaleFemaleTeam	27.55%	26.27%	-1.3%	-2.4447
	HighAge	23.78%	28.94%	5.2%	11.4708
Manufacturing	HighFemale	9.88%	8.59%	-1.3%	-0.3693
	MaleFemaleTeam	10.32%	8.19%	-2.1%	-6.7499
	HighAge	8.08%	9.51%	1.4%	5.5765
Other	HighFemale	20.44%	13.74%	-6.7%	-2.5465
	MaleFemaleTeam	15.37%	13.22%	-2.1%	-4.0611
	HighAge	13.20%	14.47%	1.3%	2.7029

Table 3.11
Difference in Means for Cash Holdings (Firms' Characteristics Subsamples)

This table shows the difference of cash holdings, measured by *Cash1*, for firms with different characteristics. Payers are firms that pay dividends in a given year. A company that reports RD expenses > 0 for the year is classified as an R&D investor. Acquirers are firms that report acquisition activities in the year.

Firm Characteristics	Yes	No	Difference	T-statistic
Payers	10.00%	20.70%	10.7%	56.0786
R&D Investors	20.68%	10.33%	-10.3%	-30.909
Acquirers	12.61%	18.34%	5.7%	29.0556

Table 3.12

OLS Regressions estimating the Determinants of Cash Holdings (Main Model)

$$Cash1_{it} = \propto_i + \beta_1 PcFemale + \beta_2 AvgAge1 + \beta_t Controls + \beta_t Industry\ \&\ Year\ Dummies + \varepsilon_{it}$$

The dependent variable for all models in this panel is *Cash1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0326*** **	**0.0256*** **
	(0.0080)	(0.0075)
AvgAge1	**-0.1240*** **	**-0.0924*** **
	(0.0088)	(0.0085)
Log_Avg_Tenure	**0.0140*** **	**-0.0094*** **
	(0.0018)	(0.0022)
MtB	**0.0172*** **	**0.0155*** **
	(0.0014)	(0.0012)
Size	**-0.0155*** **	**-0.0155*** **
	(0.0009)	(0.0007)
CashFlow	**0.1324*** **	**0.0942*** **
	(0.0244)	(0.0198)
ROA	**0.0290** **	**0.0233*** **
	(0.0123)	(0.0084)
CashFlowSD_10	**0.0063**	**0.0041**
	(0.0054)	(0.0046)
NWC_Orth	**-0.0567*** **	**-0.0477*** **
	(0.0025)	(0.0024)
Div_Payer	**-0.0584*** **	**-0.0428*** **
	(0.0022)	(0.0020)
RD1	**0.3135*** **	**0.2048*** **
	(0.0688)	(0.0572)
CAPEX	**-0.8450*** **	**-0.6959*** **
	(0.0249)	(0.0229)
AQ	**-0.1297*** **	**-0.0948*** **
	(0.0097)	(0.0094)
Lev_Orth	**-0.0079* **	**-0.0095*** **
	(0.0043)	(0.0036)
Intang	**-0.2165*** **	**-0.2847*** **
	(0.0048)	(0.0053)
Constant	**0.7884*** **	**0.6211*** **
	(0.0360)	(0.0374)
Observations	25,554	25,554
R-squared	0.4410	0.5161
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.13

OLS Regressions estimating the Determinants of Cash Holdings (Alternative Controls)

The dependent variable for all models in this panel is *Cash1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Both models use alternative controls. *Log_Sale* substitute for *Size*, and *CashFlowSD_5* replaces *CashFlowSD_10*. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed five after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0397*****	**0.0233*****
	(0.0076)	(0.0073)
AvgAge1	**-0.1128*****	**-0.0761*****
	(0.0084)	(0.0082)
Log_Avg_Tenure	**0.0190*****	**-0.0064*****
	(0.0017)	(0.0021)
MtB	**0.0164*****	**0.0150*****
	(0.0013)	(0.0012)
Log_Sale	**-0.0278*****	**-0.0263*****
	(0.0010)	(0.0008)
CashFlow	**0.1401*****	**0.1071*****
	(0.0206)	(0.0171)
ROA	**0.0314****	**0.0263*****
	(0.0124)	(0.0093)
CashFlowSD_5	**0.0022**	**0.0008**
	(0.0043)	(0.0038)
NWC_Orth	**-0.0562*****	**-0.0481*****
	(0.0024)	(0.0023)
Div_Payer	**-0.0431*****	**-0.0299*****
	(0.0019)	(0.0018)
RD1	**0.2982*****	**0.2083*****
	(0.0593)	(0.0498)
CAPEX	**-0.8686*****	**-0.6970*****
	(0.0225)	(0.0217)
AQ	**-0.1519*****	**-0.1114*****
	(0.0098)	(0.0093)
Lev_Orth	**-0.0056**	**-0.0068***
	(0.0041)	(0.0036)
Intang	**-0.2146*****	**-0.2793*****
	(0.0045)	(0.0051)
Constant	**0.8194*****	**0.6239*****
	(0.0346)	(0.0360)
Observations	25,545	25,545
R-squared	0.4803	0.5446
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.14

OLS Regressions estimating the Determinants of Cash Holdings (Alternative Measure for Cash Holdings)

The dependent variable for all models in this panel is *Log_CHE* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed five after the orthognolisations of *NWC* and *Lev*. The exception is for the fixed effect dummies. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

	(1)	(2)
VARIABLES	Model 1	Model 2
PcFemale	**0.4953*** **	**0.2616*** **
	(0.0623)	(0.0579)
AvgAge1	**-1.0045*** **	**-0.6035*** **
	(0.0734)	(0.0684)
Log_Avg_Tenure	**0.1680*** **	**-0.0751*** **
	(0.0151)	(0.0167)
MtB	**0.1284*** **	**0.1188*** **
	(0.0111)	(0.0091)
Size	**0.8944*** **	**0.9089*** **
	(0.0058)	(0.0050)
CashFlow	**1.0951*** **	**0.7145*** **
	(0.1558)	(0.1261)
ROA	**0.2144** **	**0.1613*** **
	(0.0883)	(0.0570)
CashFlowSD_10	**0.0370**	**0.0182**
	(0.0323)	(0.0265)
NWC_Orth	**-0.4989*** **	**-0.3907*** **
	(0.0209)	(0.0184)
Div_Payer	**-0.4584*** **	**-0.3007*** **
	(0.0182)	(0.0161)
RD1	**2.2627*** **	**1.3327*** **
	(0.4282)	(0.3259)
CAPEX	**-6.9523*** **	**-4.5887*** **
	(0.1955)	(0.1900)
AQ	**-1.2106*** **	**-0.8165*** **
	(0.1071)	(0.0983)
Lev_Orth	**-0.0388**	**-0.0546** **
	(0.0321)	(0.0274)
Intang	**-1.4219*** **	**-2.0326*** **
	(0.0455)	(0.0459)
Constant	**2.2771*** **	**0.7531** **
	(0.2947)	(0.3104)
Observations	25,554	25,554
R-squared	0.6337	0.7027
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.15

OLS Regressions estimating the Determinants of Cash Holdings (Alternative Measures for Gender and Age)

The dependent variable for all models in this panel is *Cash1* for each firm in year t. All models include the natural logarithm of the number of female executives in the TMT in a firm year (*Log_No_Female*), a dummy variable that takes the value of 1 if the average age of the top executives is above the average age for all TMTs (*HighAge*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed five after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1	(2) Model 2
Log_No_Female	**0.0098*** **	**0.0084*** **
	(0.0023)	(0.0022)
HighAge	**-0.0199*** **	**-0.0126*** **
	(0.0016)	(0.0016)
Log_Avg_Tenure	**0.0124*** **	**-0.0112*** **
	(0.0018)	(0.0022)
MtB	**0.0175*** **	**0.0158*** **
	(0.0014)	(0.0012)
Size	**-0.0156*** **	**-0.0156*** **
	(0.0009)	(0.0008)
CashFlow	**0.1325*** **	**0.0944*** **
	(0.0244)	(0.0199)
ROA	**0.0288** **	**0.0232*** **
	(0.0122)	(0.0084)
CashFlowSD_10	**0.0063**	**0.0041**
	(0.0055)	(0.0046)
NWC_Orth	**-0.0570*** **	**-0.0479*** **
	(0.0025)	(0.0024)
Div_Payer	**-0.0600*** **	**-0.0439*** **
	(0.0023)	(0.0020)
RD1	**0.3126*** **	**0.2046*** **
	(0.0689)	(0.0573)
CAPEX	**-0.8399*** **	**-0.6905*** **
	(0.0248)	(0.0228)
AQ	**-0.1288*** **	**-0.0937*** **
	(0.0097)	(0.0094)
Lev_Orth	**-0.0083* **	**-0.0098*** **
	(0.0044)	(0.0036)
Intang	**-0.2144*** **	**-0.2837*** **
	(0.0048)	(0.0053)
Constant	**0.3079*** **	**0.2601*** **
	(0.0092)	(0.0158)
Observations	25,554	25,554
R-squared	0.4391	0.5147
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.16

OLS Regressions estimating the Determinants of Cash Holdings (Winzorised Variables)

The dependent variable for all models in this panel is *Cash1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. All continues variables are winzorised at the 1st and 99th percentiles. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed five after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0488*** **	**0.0312*** **
	(0.0070)	(0.0070)
AvgAge1	**-0.0982*** **	**-0.0731*** **
	(0.0080)	(0.0079)
Log_Avg_Tenure	**0.0188*** **	**-0.0015**
	(0.0015)	(0.0019)
MtB	**0.0149*** **	**0.0154*** **
	(0.0009)	(0.0009)
Size	**-0.0124*** **	**-0.0139*** **
	(0.0006)	(0.0006)
CashFlow	**-0.2495*** **	**-0.2823*** **
	(0.0187)	(0.0182)
ROA	**0.2453*** **	**0.2603*** **
	(0.0146)	(0.0141)
CashFlowSD_10	**0.2563*** **	**0.1964*** **
	(0.0159)	(0.0156)
NWC_Orth	**-0.0798*** **	**-0.0829*** **
	(0.0019)	(0.0024)
Div_Payer	**-0.0436*** **	**-0.0340*** **
	(0.0016)	(0.0016)
RD1	**0.7766*** **	**0.6014*** **
	(0.0208)	(0.0244)
CAPEX	**-0.7735*** **	**-0.6651*** **
	(0.0164)	(0.0185)
AQ	**-0.1276*** **	**-0.0953*** **
	(0.0099)	(0.0097)
Lev_Orth	**0.0817*** **	**0.1196*** **
	(0.0077)	(0.0092)
Intang	**-0.2140*** **	**-0.2720*** **
	(0.0044)	(0.0050)
Constant	**0.6425*** **	**0.5287*** **
	(0.0318)	(0.0342)
Observations	25,554	25,554
R-squared	0.5550	0.5994
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.17

Fama-MacBeth Regression estimating the Determinants of Cash Holdings

The dependent variable in this model is *Cash1* for each firm in year t. The independent variables are the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The maximum observations available are included. The Fama-MacBeth standard errors are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1
PcFemale	**0.0515***
	(0.0268)
AvgAge1	**-0.0631*****
	(0.0086)
Log_Avg_Tenure	**-0.0018**
	(0.0046)
MtB	**0.0169*****
	(0.0012)
Size	**-0.0160*****
	(0.0013)
CashFlow	**-0.0999****
	(0.0363)
ROA	**0.1835*****
	(0.0295)
CashFlowSD_10	**0.1398*****
	(0.0301)
NWC_Orth	**-0.0682*****
	(0.0038)
Div_Payer	**-0.0433*****
	(0.0023)
RD1	**0.5750*****
	(0.0435)
CAPEX	**-0.7636*****
	(0.0535)
AQ	**-0.0998*****
	(0.0131)
Lev_Orth	**0.0655*****
	(0.0155)
Intang	**-0.2390*****
	(0.0124)
Constant	**0.5633*****
	(0.0347)
Observations	25,554
Average R-squared	0.5366

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.18

OLS Regressions estimating the Determinants of Cash Holdings (Controlling for Delta, Vega, and Wealth)

The dependent variable for all models in this panel is *Cash1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are augmented with the natural logarithms of average delta, average vega, and average wealth for the TMT. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed five for the variables of interest. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0423*** **	**0.0296*** **
	(0.0072)	(0.0069)
AvgAge1	**-0.1080*** **	**-0.0810*** **
	(0.0087)	(0.0085)
Log_Avg_Tenure	**0.0132*** **	**-0.0128*** **
	(0.0017)	(0.0021)
Log_Avg_Delta	**-0.0260*** **	**-0.0046**
	(0.0073)	(0.0071)
Log_Avg_Vega	**0.0040*** **	**0.0022** **
	(0.0010)	(0.0010)
Log_Avg_Wealth	**0.0320*** **	**0.0176*** **
	(0.0064)	(0.0063)
MtB	**0.0112*** **	**0.0093*** **
	(0.0013)	(0.0012)
Size	**-0.0201*** **	**-0.0244*** **
	(0.0009)	(0.0009)
CashFlow	**-0.1009*** **	**-0.1292*** **
	(0.0284)	(0.0257)
ROA	**0.1327*** **	**0.1298*** **
	(0.0264)	(0.0247)
CashFlowSD_10	**0.0715*** **	**0.0535*** **
	(0.0207)	(0.0164)
NWC_Orth	**-0.0916*** **	**-0.0982*** **
	(0.0023)	(0.0028)
Div_Payer	**-0.0463*** **	**-0.0343*** **
	(0.0019)	(0.0018)
RD1	**0.5964*** **	**0.3930*** **
	(0.0368)	(0.0358)
CAPEX	**-0.8323*** **	**-0.7047*** **
	(0.0236)	(0.0227)
AQ	**-0.1379*** **	**-0.1135*** **
	(0.0103)	(0.0099)
Lev_Orth	**0.1471*** **	**0.1990*** **
	(0.0099)	(0.0110)
Intang	**-0.2327*** **	**-0.3016*** **
	(0.0052)	(0.0057)
Constant	**0.5936*** **	**0.5124*** **
	(0.0456)	(0.0463)
Observations	23,786	23,786
R-squared	0.5258	0.5908
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.19

OLS Regressions estimating the Determinants of Cash Holdings (CEO/CFO)

The dependent variable for all models in this panel is *Cash1* for each firm in year t. Model 1 includes *CEO_Female*, a dummy taking the value of 1 if the CEO is female, *Log_CEO_Age*, the natural logarithm of *CEO_Age*, and a set of controls. Model 2 includes *CFO_Female*, a dummy taking the value of 1 if the CFO is female, *Log_CFO_Age*, the natural logarithm of *CFO_Age*, and a set of controls. Model 3 includes the CEO and CFO variables, and model 4 is expanded by the inclusion of executives' compensation and wealth variables as controls. All models include year and industry dummies, based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for the variables of interest does not exceed five. Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses. All variables are defined in the appendix of this chapter.

VARIABLES	(1) CEO	(2) CFO	(3) CEO/CFO	(4) CEO/CFO
CEO_Female	**0.0200*****		**0.0129***	**0.0243*****
	(0.0056)		(0.0069)	(0.0070)
CFO_Female		**0.0060**	**0.0053**	**0.0042**
		(0.0042)	(0.0042)	(0.0039)
Log_CEO_Age	**-0.0648*****		**-0.0389*****	**-0.0322*****
	(0.0071)		(0.0099)	(0.0104)
Log_CFO_Age		**-0.0440*****	**-0.0394*****	**-0.0344*****
		(0.0092)	(0.0093)	(0.0096)
Log_CEO_Tenure	**0.0075*****		**0.0071*****	**0.0056*****
	(0.0010)		(0.0014)	(0.0016)
Log_CFO_Tenure		**-0.0015**	**-0.0024***	**-0.0032****
		(0.0012)	(0.0013)	(0.0013)
Log_CEO_Delta				**0.0293*****
				(0.0061)
Log_CEO_Vega				**-0.0069*****
				(0.0013)
Log_CFO_Delta				**-0.0104***
				(0.0062)
Log_CFO_Vega				**0.0094*****
				(0.0019)
Log_CEO_Wealth				**-0.0190*****
				(0.0052)
Log_CFO_Wealth				**0.0100****
				(0.0050)
MtB	**0.0149*****	**0.0143*****	**0.0140*****	**0.0102*****
	(0.0013)	(0.0018)	(0.0019)	(0.0021)
Size	**-0.0157*****	**-0.0112*****	**-0.0104*****	**-0.0200*****
	(0.0008)	(0.0010)	(0.0010)	(0.0015)
CashFlow	**0.1061*****	**0.0485**	**0.0623**	**-0.1036****
	(0.0195)	(0.0532)	(0.0504)	(0.0478)
ROA	**0.0241*****	**0.0647****	**0.0578****	**0.1096****
	(0.0093)	(0.0282)	(0.0281)	(0.0482)
CashFlowSD_10	**0.0039**	**-0.0009**	**-0.0011**	**0.1032*****
	(0.0044)	(0.0030)	(0.0028)	(0.0332)
NWC_Orth	**-0.0501*****	**-0.0419*****	**-0.0433*****	**-0.1023*****
	(0.0025)	(0.0030)	(0.0028)	(0.0039)
Div_Payer	**-0.0446*****	**-0.0291*****	**-0.0285*****	**-0.0290*****
	(0.0020)	(0.0027)	(0.0028)	(0.0030)
RD1	**0.2137*****	**0.5984*****	**0.5947*****	**0.3961*****
	(0.0557)	(0.0552)	(0.0567)	(0.0619)
CAPEX	**-0.6989*****	**-0.6849*****	**-0.6953*****	**-0.7140*****
	(0.0244)	(0.0359)	(0.0368)	(0.0387)
AQ	**-0.0929*****	**-0.0929*****	**-0.0930*****	**-0.0978*****
	(0.0097)	(0.0149)	(0.0152)	(0.0148)
Lev_Orth	**-0.0080****	**-0.0134*****	**-0.0123*****	**0.2095*****
	(0.0036)	(0.0042)	(0.0040)	(0.0160)
Intang	**-0.2845*****	**-0.2893*****	**-0.2899*****	**-0.3127*****
	(0.0056)	(0.0075)	(0.0078)	(0.0086)
Constant	**0.4942*****	**0.4053*****	**0.4636*****	**0.4946*****
	(0.0336)	(0.0588)	(0.0549)	(0.0603)
Observations	22,837	11,412	10,581	9,246
R-squared	0.5207	0.5432	0.5495	0.6077
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix: Descriptions of the Variables

Managerial Variables			
Variable	**Definitions**	**Proxy For**	**Source**
PcFemale	Percentage of female executives to total number of executives available in the database	Managerial Gender	ExecuComp
HighFemale	A dummy variable that takes the value of 1 if PcFemale is larger than 50%; 0 otherwise.		
MaleFemaleTeam	A dummy variable that takes the value of 1 if the TMT has at least one female manager; 0 otherwise.		
Log_No_Female	The natural logarithm of the number of female executives on the TMT.		
CEO_Female	A dummy that equals 1 if the CEO is female; 0 otherwise.		
CFO_Female	A dummy that equals 1 if the CFO is female; 0 otherwise.		
AvgAge	Average age of all executives available. For the regressions, I use the log of this value.	Managerial Age	
HighAge	A dummy variable that takes the value of 1 if AvgAge of the team is higher than that of the sample; 0 otherwise.		
CEO_Age	The age of the CEO. For the regressions, I use the Log of this value.		
CFO_Age	The age of the CFO. For the regressions, I use the Log of this value.		
Avg_Tenure	The average tenure of all TMT members. The natural logarithm of this variable is used in the regressions.	Managerial Tenure	
CEO_Tenure	The tenure of the CEO. The natural logarithm is used in the regressions.		
CFO_Tenure	The tenure of the CFO. The regressions include the natural logarithm of this value.		
Log_Avg_Delta	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the stock price of the firm.	Performance-based compensation	Dr. Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CEO_Delta	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the stock price of the firm.		
Log_CFO_Delta	The natural logarithm of the dollar change in the wealth of the CFO per a 1 percent change in the stock price of the firm.		
Log_Avg_Vega	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the standard deviation of the stock price of the firm	Risk-based compensation	
Log_CEO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm		
Log_CFO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm		
Log_Avg_Wealth	The natural logarithm of the average dollar value of the TMT executives' wealth in the firm.	Executives' Wealth	
Log_CEO_Wealth	The natural logarithm of the dollar value of the CEO executives' wealth in the firm.		
Log_CFO_Wealth	The natural logarithm of the dollar value of the CFO executives' wealth in the firm.		

Financial Variables From Compustat			
Variable	**Definitions**	**Data Items**	**Proxy For**
Cash1	Cash and short-term assets scaled by total assets	Cash Holdings (CHE/AT)	Cash holdings
CHE	Cash and short-term investments. *Log_CHE* is the natural logarithm of this value.	CHE	
MtB	(Book value of assets - Book Value of Equity + Market value of equity)/total assets	(AT + CSHO*PRCC - CEQ)/AT	Growth opportunity
Size	Natural logarithm of total assets	Log(AT)	Firm size
Log_Sale	Natural logarithm of sales	Log(Sales)	
CashFlow	(Operating income before depreciation - Interests and related expenses - Income taxes - Dividends) scaled by total assets	(OIBDP-XINT-TXT-DVC)/AT	Cash flow
ROA	Return on assets	IB/AT	Performance
CashFlowSD_10	The rolling standard deviation for the companies' cash flows for the past 10 years (minimum 3 years).	SD(CashFlow)	Volatility of cash flow
CashFlowSD_5	The rolling standard deviation for the companies' cash flows for the past 5 years (minimum 3 years).		
NWC	(Working capital - cash and short-term assets) scaled by total assets. *NWC_Orth* is the orthogonal value of *NWC* with respect to leverage.	(WCAP-CHE)/ AT	Cash alternatives
Div_Payer	A dummy variable that takes the value of 1 if the firm pays dividends in the year; 0 otherwise.	DVC	Payout
Payers	A dummy variable that takes the value of 1 if the firm has a payout (dividends or stock repurchases); 0 otherwise	DVC & PRSTKC	
RD1	Research and development expenses scaled by total assets (any missing value = 0)	XRD/AT	Growth Opportunity/Liquidity demands/Information asymmetry
R&D Investor	A dummy variable that takes the value of 1 if the firm invests in R&D; 0 otherwise	XRD	
CAPEX	Capital expenditure scaled by total assets (any missing value = 0)	CAPX/AT	Cash outflows/Growth opportunity/Collateral availability
AQ	Acquisitions scaled by total assets, any missing value = 0	AQC/AT	Cash outflows/Growth opportunity/Collateral availability
Acquirer	A dummy variable that takes the value of 1 if the firm invests in acquisitions; 0 otherwise	AQC	
Lev	Total debt scaled by total assets. *Lev_Orth* is the orthogonal value of Lev with respect to *NWC*.	(DLTT + DLC)/AT	Risk (higher probability for financial distress)/Cost of holding cash
Intang	Intangible assets scaled by total assets	INTAN/AT	Collateral Availability/ Information asymmetry

Chapter 4 Executives' Characteristics and R&D Investments[69]

JEL Classification: G40, G32, J10

Keywords: Gender, Age, TMT, Upper Echelons Theory, Corporate Governance, R&D Investments, Risk-Aversion, Overconfidence, CEO, CFO.

[69] I presented this chapter at the BAFA conference 2018. I thank the participants for their valuable feedback.

4.1. Introduction

Technological advancements have been crucial drivers for economic growth. The industrial revolution represents an example from history of the importance of technological progress in the growth of economies, and perhaps even civilizations. These advancements are the result of innovative activities and knowledge creation, which are obtained by research and development (R&D). Investments in research and development can be public or private because they serve the goals of both governments and firms. A recent report using the UNESCO database suggests that R&D investments in G20 countries are mostly funded by private entities.[70] The gross expenditure on research and development (GERD) funded by governments amounts to 0.65% of GDP while the same figure for businesses is 1.25%. In the US, the government finances around third of GERD and the private sector provides funding for the remainder. Given the significance of corporate R&D investments, a considerable body of research has developed exploring the determinants of those investments. This chapter contributes to this literature.

Prior studies propose several drivers for corporate R&D investments. Several studies have examined firm characteristics, such as governance and internal finance availability (Bloch 2005); industry characteristics; and country-specific factors (see (Belloc 2012) and (Becker 2015) for an extensive review). Yet, Becker (2015) points out the need to further understand the different aspects of the motives determining R&D investments at the firm level. Most of the existing literature examines firms' characteristics to understand the determinants of R&D investments, but there is a growing body of literature that considers managerial characteristics to explain the variation in corporate R&D investments.

For example, Abdel-Khalik (2014) found that the CEO's level of risk-aversion, captured by an index developed from their socio-demographic variables, is negatively associated with their R&D expenditure. Also, Daellenbach and McCarthy (1999) find that the technical orientation of the TMT and CEO is positively associated with above average R&D investments. Similarly, CEO age is negatively associated with R&D investments, while their wealth invested in the firm and their R&D-related past experiences positively

[70] https://scienceogram.org/blog/2013/05/science-technology-business-government-g20

influence their R&D investments (Barker and Mueller 2002). Further, Hsiang-Lan Chen and Hsu (2009) find that there is a negative relationship between R&D investment and leverage, which is moderated by TMT characteristics such as tenure and age.

Such studies have enhanced our understanding of the managerial determinants of corporate R&D investments. However, whether some of the variations in corporate R&D investments can be explained by other attributes of the top management team (TMT) needs further examination. Thus, this chapter aims to investigate the possibility that the gender and age of the TMT play a role in determining the investments in R&D. The proposition that these two characteristics could be related to R&D investments is built upon the following three strands of literature.

First, the level of risk-taking for the TMT is determined by their characteristics, including socio-demographic factors such as age, and their level of risk-taking influences their financial policies. In their Upper Echelons Theory, Hambrick and Mason (1984) argue that studying the observable characteristics of the TMT might provide a better insight since the CEOs manage their firms in conjunction with their teams. Second, existing studies suggest that both gender and age are related to managerial risk-taking. For example, females and older executives are associated with more conservative policies (Huang and Kisgen 2013; Serfling 2014). Third, R&D investments are risky because they have uncertain outcomes and their adjustment costs are very high (Abdel-Khalik 2014; Brown, Fazzari, and Petersen 2009; Kim and Lu 2011). Hence, it is possible that the proportion of female executives on the TMT and the average age of the TMT are negatively related to R&D.

The analyses show that the proportion of female executives on the TMT and R&D investments are negatively related. These results are consistent with the view that TMT characteristics can affect the outcome of the firm (Hambrick and Mason 1984). It is possible that TMTs that contain more female executives may take less risks than other TMTs due to female risk-aversion or male overconfidence, leading to lower investments in risky R&D (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). Further, the additional analysis shows that female CEOs and female CFOs are associated with lower R&D investments, suggesting that the findings at the TMT level might be influenced partially by CEO gender and CFO gender. [71]

Moreover, the analysis shows that the average age of the TMT and R&D investments are not systematically related. While this is consistent with the theoretical argument that the experience gained offsets the risk-aversion developed with ageing (Worthy et al. 2011), the additional analysis suggests that it is driven by the cancelling out effect within the TMT. In particular, while the age of the CEO is negatively related to R&D investments, the age of the CFO is positively related to it.

The contributions of this chapter are as follows. First, it adds to the literature testing the Upper Echelons Theory (UET) proposed by Hambrick and Mason (1984), who suggest that TMT characteristics have an impact on corporate policies. This chapter provides some evidence that is consistent with their theory by documenting that the gender and age of the executives influence R&D investments. Moreover, this chapter adds to the literature investigating the determinants of R&D investments. Furthermore, the UET recommends examining theoretical predictions at the TMT level as a single unit (Hambrick and Mason 1984). I document that that CEO age and CFO age are related to R&D investments in different directions, emphasising the importance of considering the other TMT members when testing theoretical predictions.

Second, this chapter adds to the literature examining the relationship between managerial gender and R&D investments. Elsaid and Ursel (2011) show that female CEOs are associated with lower R&D investments, while Peltomäki, Swidler, and Vähämaa (2018) show that female CEOs (CFOs) are positively (negatively) associated with them. Using a larger dataset with hand-collection, this chapter shows that the proportion of female executives on the TMT, female CEOs, and female CFOs are all negatively related to R&D investments. Further, Baixauli-Soler, Belda-Ruiz, and

[71] It is important to note that these findings do not indicate that female executives reduce firms' innovation. First, R&D expenses are not the only channel for R&D investments. Studies increasingly show that firms use other channels to substitute for the in-house R&D, such as acquisitions or venture capital (Cassiman and Veugelers 2006; Dushnitsky and Lenox 2005). Thus, in-house R&D investments may not capture all of the R&D activities of the firm. Second, since research outputs are not considered in this chapter, a reduction in R&D investments does not necessarily lead to reduced R&D outputs, such as patents or citations. For example, men trade more than females, but women deliver better returns (Barber and Odean 2001). Hence, it is possible that female managers invest less in R&D while delivering better results (i.e. the overconfidence explanation).

Sanchez-Marin (2014) and Perryman, Fernando, and Tripathy (2016) find that the proportion of female executives on the TMT is negatively related to firms’ total risks. The negative association between female representation on the TMT and R&D investments point to R&D investments as a channel through which female executives reduce the riskiness of the frim. Thus, this chapter provides new evidence that is consistent with the view that female managers are associated with more conservative corporate policies (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013).

Third, this chapter complements existing studies by documenting that CEO age is negatively related to R&D investments, even after controlling for important factors, consistent with the view that older managers adopt more conservative policies (Barker and Mueller 2002; Chowdhury and Fink 2017; Peltomäki, Swidler, and Vähämaa 2018; Serfling 2014). Nevertheless, by documenting that CFO age is positively related to R&D investments, this chapter opens up a new opportunity for future research to understand the reasons for this discrepancy.

The reminder of this chapter is organised as follows. Section 4.2 surveys the literature. Section 4.3 presents the hypotheses development. Section 4.4 covers the data sources and their measurement. Section 4.5 reports the descriptive statistics. Section 4.6 presents the analyses and results, and section 4.7 summarises the chapter and concludes the study.

4.2. Literature Review

Given the importance of investments in corporate R&D, a large body of literature has developed. The previous studies aim to understand the drivers of R&D investments in firms. One of the motives behind this strand of literature may relate to the fact that corporate R&D is the largest source of the overall R&D investments in G20 countries.[72] This section reviews the theories and existing evidence related to R&D drivers. It begins by reviewing the theoretical drivers and empirical evidence on firm and industry characteristics that determine R&D investments. The second subsection surveys the literature investigating managerial characteristics as determinants of R&D investments.

4.2.1. Theories and Empirical Evidence on R&D Investments

Surveying the literature, Becker (2015) suggests that there are five broad categories of determinants of R&D investments. These categories are: 1) Firm and Industry Characteristics, 2) Product Market Competition, 3) Government R&D Policies, 4) Location and Resources Factors, and 5) Foreign R&D Spill-over. However, given that this study is limited to a single country, which thus reduces the influence of any contextual factors, this section is limited to the literature on firm- and industry-related characteristics as determinants of corporate R&D investments.

4.2.1.1. Firm Size and R&D Investments

Theoretically, Joseph Schumpeter was perhaps the first to formalise R&D as a key driver of economic growth, thereby highlighting the importance of R&D. While Adam Smith suggests that profit is generated through capital and Carl Marx links it to labour, Schumpeter argues that entrepreneurial innovations are the main driver of profit (Oakey 2015). Accordingly, studies on R&D are influenced by his seminal contributions.

Schumpeter had two somewhat opposing views, which are Schumpeter Mark I and Schumpeter Mark II, both of which have influenced the study of R&D investments (Oakey 2015). First, Schumpeter Mark I suggests that entrepreneurs create economic

[72] https://scienceogram.org/blog/2013/05/science-technology-business-government-g20/

growth through new innovations that creatively destroy large firms, which are incapable of matching the new, superior products introduced to customers by younger firms (Schumpeter 1939). Under this vision, it is expected that entrepreneurs and younger firms will maintain a higher level of R&D investments to deliver what is called "creative destruction", a main driver of economic growth. As small firms enter the market, they provide new products that consumers may favour. By doing so, they destroy the old firms that used to control the market, and this destruction is assumed to generate economic growth.

Second, Schumpeter Mark II is a revision of his first proposition that smaller firms invest more in R&D. In his new proposition, Schumpeter (1947) argues that it is the innovations delivered by larger corporations through their large-scale R&D activities that drive economic growth. His revised proposition leads to different predictions. Firm age and size are expected to influence R&D positively. As firms grow larger and become more prominent, they will further invest in R&D to advance their products, growing the overall economy through what is called "creative accumulation". Under this vision, R&D activities are assumed to require considerable investments that smaller firms and newer entrepreneurs cannot provide, given their limited financial abilities compared to larger firms.

Moreover, size can affect R&D investments in several ways, such as economies of scale in R&D activities, implementation efficiency, and the ability to finance risky R&D investments in imperfect capital markets (Becker and Pain 2008). Larger firms have more resources, which enable them to conduct several R&D projects that allow them to realise the benefit of scale. When these R&D projects result in successful products, larger firms are in a better position to produce them. In addition, larger firms have better access to external finance, allowing them to obtain the necessary funding for R&D investments.

Several empirical studies have examined Schumpeter’s two opposing arguments. In terms of size, especially within high-tech firms, Lunn and Martin (1986) find that larger firms spend more on R&D for every dollar of sales they make. Similarly, firm size positively increases R&D investments (Baysinger and Hoskisson 1989). Cohen and Klepper (1996) find that R&D investments are positively linked to firm size and increase at a faster rate.

However, there is some evidence that firm age and size negatively affect R&D activities, as measured by the outputs of manufacturing firms (i.e. new products) (Hansen 1992). Also, Barker and Mueller (2002) report evidence to support the negative relationship argument. Similarly, Hirshleifer, Low, and Teoh (2012) and Di Vito, Laurin, and Bozec (2010) find a negative effect of size on R&D investments. A possible explanation for the negative relationship is that larger firms enjoy significant market power as a result of their size, which in turn reduces the managers' incentive to invest in R&D for new products which might upset the *status quo* (Barker and Mueller 2002). Abdel-Khalik (2014) reports mixed evidence on the relationship between firm age and R&D investments.

Also, the previous studies do not distinguish between firm size and firm age (Barge-Gil and López 2014). This might be due to a presumed correlation between age and size, which in turn may have been affected by young yet large high tech firms. Overall, the empirical evidence is mixed on the relationship between firms' size/age and their R&D investments.

4.2.1.2. Firm Industry and R&D Investments

In a recent review of Schumpeter's contributions, Oakey (2015) suggests that it is possible to reconcile the two opposing views of Schumpeter and their empirical evidence by focusing on the industry. On one hand, there are some sectors that require high levels of R&D investments (e.g. aerospace and pharmaceuticals). Such investments cannot be done by small firms or new firms, which fits Schumpeter Mark II. In such industries, the relationship between size and R&D investments is expected to be positive. On the other hand, small firms or new entrepreneurs can make efficient and effective R&D investments that disturb larger firms in some industries, whose R&D activities do not require high levels of investments, such as software and the internet. In such industries, the relationship between R&D and size is expected to be negative and therefore may be better explained by Schumpeter Mark I. This reconciliation of Schumpeter's views highlights the importance of industry characteristics in the study of corporate R&D investments. In other words, Schumpeter's suggestions, and the empirical predictions stemming from them, can be seen as industry-specific. This understanding of Schumpeter's propositions seems to be in line with that of Cohen and Klepper (1996), who suggest that the relationship between the size of the firm and its R&D activities is industry-specific.

It is reasonable to argue that R&D investments are industry-specific. Certain characteristics, such as product type, induce firms to invest more in R&D. For example, the need for research and development activities in the pharmaceutical industry is higher than in the retail industry. Therefore, utilising the industry fixed effect in the models explaining the variations of R&D is common in the literature (Abdel-Khalik 2014; Hirshleifer, Low, and Teoh 2012). In fact, Hirschey, Skiba, and Wintoki (2012) find that the fixed effects explain most of the variations in R&D. Other papers recognise the importance of industry by limiting their analysis to a single industry (e.g. (Chen, Hsu, and Huang 2010)). Overall, theoretical reasoning and the existing evidence suggest that R&D investments are heavily influenced by the industry.

4.2.1.3. Financial Flexibility and R&D Investments

Modigliani and Miller (1958) put forward the idea that the source of capital is irrelevant, given that attractive projects with positive net present values can be financed internally or externally with no difference in cost. This view, however, is built on two main assumptions: market perfection and information symmetry. These assumptions do not hold in the real world. For example, Myers and Majluf (1984) suggest that companies' finance choices follow a pecking order, whereby they exhaust their internal resources before approaching external resources. In doing so, firms follow a cost-based hierarchical order where internal funds are at the top of the pyramid. External finance is more expensive because it is more difficult for external financers than for managers to project the future cash flows likely to arise from such opportunities. Given the higher level of uncertainty faced by external financers, they demand higher compensation in the form of higher interest or required return. As a result, and given that the information asymmetry problem is augmented in R&D investments due to its complex nature, it is predicted that the availability of capital is essential in determining the level of R&D investments. As firms become more financially constrained, they will refrain from/reduce their R&D investments.

Two important R&D characteristic can play a significant role in this context by augmenting the relationship between financial flexibility and R&D investment. First, the adjustment of the R&D investments level is costly. This is because research and development projects take time and involve set-up costs (Arrow 1962). Such sunk costs drive the adjustments costs upwards since they are irreversible. In addition, based on its nature, a large proportion of R&D investments goes towards the payroll of the researchers. Reducing R&D investments may therefore require firing researchers, which increases the adjustment costs in two ways: increasing the hiring and firing costs, and increasing the cost caused by the loss of the know-how that these researchers have developed during the time with the firm. The second characteristic originates from the fact that R&D investments largely create intangible assets which cannot be pledged as collateral to lenders (Berger and Udell 1995). Without collateral, the risk that lenders face increases, inducing them to request more compensation in the form of higher interest rates. Given these two characteristics, it is possible that the level of R&D investment is influenced by firms' financial ability to acquire funds. That is; financially constrained firms invest less in R&D.

Previous empirical studies examined capital availability as a determinant of R&D. In a survey of the literature, Hall (2002) reports that the cost of capital is high for small and young innovative companies, but the findings are less conclusive for large firms, despite their preference for internal capital. This is due to capital market imperfection, which restrains firms from obtaining the necessary funding to finance their R&D activities, leading companies to prefer internal capital. Bloch (2005) finds evidence that capital market imperfection influences R&D, as he found that the availability of internal funds is a significant determinant of R&D investment. Bloch (2005) also reports that R&D is more sensitive to cash flows in small firms and in those with low levels of debt. Similarly, internal funds are an important determinant of R&D activities in Italian firms, and smaller firms face more financial constrains than larger ones (Ughetto 2008). Also, cash flow and equity issues are used to finance R&D in the US (Brown, Fazzari, and Petersen 2009), indicating that R&D investments are hard to finance. For HiTec firms, the cash flow and external capital effect on R&D is found in young rather than old firms, adding to the argument that R&D is industry-specific. Overall, the availability of capital may influence R&D investments due to market imperfection. The availability of capital can therefore be positively associated with R&D investments.

4.2.1.4. Other Theories

Other theories that have influenced corporate R&D research include the agency theory. Given the separation between ownership and management, the interests of shareholders and those of managers may be misaligned. While managers aim to keep their jobs and increase their compensation, shareholders aim to maximise their wealth by increasing the value of their investments (Jensen and Meckling 1976). Using this framework, two opposing predictions can be formulated (Honoré and Munari 2010).[73] The first prediction is that strong corporate governance leads to high levels of R&D investments. Managers are risk-averse because they cannot diversify their job by managing different firms, while shareholders are risk-neutral, given their ability to diversify away from firm-specific risks by investing in other companies. This may lead managers to refrain from investing in R&D, given its high level of risks. This could, in turn, incentivise shareholders to design governance mechanisms that induce managers to make such investments, given their high potential. In addition, managers are assumed to favour short- over long-terms goals. This might also lead shareholders to impose governance mechanisms that induce managers to make long-term risky investments, such as R&D.

However, it is also possible that strong corporate governance will result in low R&D investments, and this prediction is more likely to happen with the existence of short-term institutional investors or minorities. Because R&D has a high level of uncertainty and requires a high level of understanding to gauge its future potential, which tend be in the long-term, it is hard for managers to communicate such potential, leading shareholders to exert pressure to reduce R&D investments.

The relationship between corporate governance and R&D investment has been investigated thoroughly, and the results indicate that corporate governance influences R&D. For example, studies report that a high percentage of insider directors and

[73] They offer a comprehensive theoretical discussion on the relationship between corporate governance and R&D investments

concentrated ownership by institutional investors positively affect R&D spending (Baysinger, Kosnik, and Turk 1991). However, David, Hitt, and Gimeno (2001) draw a different conclusion. They suggest that it is the activism of the institutional shareholders, rather than the ownership itself, that influences R&D spending positively in both the short- and long-terms.

4.2.1.5. Summary

In sum, theories on R&D detriments at the firm level point to three firm characteristics. First, size can affect R&D in two directions. On one hand, smaller firms can be more prone to invest more in R&D so that they can enter the market. On the other hand, larger firms might have the capacity required to undertake large-scale projects, which small firms cannot afford. Yet, these predictions might be industry-specific. Second, capital availability is important in determining R&D investments due to market imperfection, which is more pronounced in R&D investments, given their high adjustment costs and the fact that they cannot be pledged as collateral. Therefore, the availability of capital may increase the R&D investments. Third, the agency problem may influence R&D in two ways. If we assume that managers are risk-averse since they cannot diversify away from the firm and consequently underinvest in R&D, then stronger corporate governance will induce them to invest more in R&D. Nevertheless, if we accept that investors cannot fully understand R&D activities and are interested in the short-term results, stronger governance will reduce R&D investments.

The next section surveys the literature on the relationship between R&D investments and managerial characteristics.

4.2.2. Executives' Characteristics and R&D Investments

Researchers have examined the effects of several executives' characteristics on the level of R&D investments. Within the field of finance, a central argument underpinning this strand of literature is that R&D investments are inherently risky because they are associated with higher levels of uncertainty and entail higher adjustment costs. For example, Hirshleifer, Low, and Teoh (2012) find that overconfident CEOs invest more in R&D because they overestimate either their ability or the probability of a positive outcome, leading them to allocate more finance to risky investments. Malmendier and Tate (2005) suggest that overconfident managers may overinvest since they overestimate the returns on their investments. Cassell et al. (2012) report that CEOs with inside debt reduce the riskiness of the firm through several channels, including reducing R&D investments. Similarly, Hutton, Jiang, and Kumar (2015) find that republican CEOs (deemed more conservatives in their risk-taking) reduce the riskiness of the firm by adopting more conservative policies, such as reducing R&D investments. Benmelech and Frydman (2015) report that CEOs with military experience adopt more conservative policies, such as a low R&D investment policy. These findings support the idea that managerial risk-taking preferences determine the corporate R&D investments,[74] and further attest to the argument that managerial characteristics could play a role in determining the outcome of the firm (Hambrick 2007; Hambrick and Mason 1984).

Studies investigating the effect of executives' gender and age on the riskiness of the firm have considered R&D investments. Given that these investments are risky, they could be a channel through which managers affect the riskiness of the firm. Elsaid and Ursel (2011) investigate how the riskiness of the firm is altered following the appointment of female CEOs. They report a reduction in R&D investments.

Moreover, Dechow and Sloan (1991) finds that CEOs reduce their discretionary spending on R&D during the last year prior to retirement to provide better short-term

[74] However, Bernile, Bhagwat, and Yonker (2018) report that board diversity (measured by an index that captures six characteristics) is associated with conservative policies, such as a higher payout ratio and lower leverage. Interestingly, their index is positively associated with R&D investments. While they acknowledge the argument that R&D is inherently risky, they draw on the literature and advance an alternative explanation. They argue that, since diverse backgrounds could enhance decision-making when creative solutions are required, R&D investments become more efficient and therefore less risky.

earnings since R&D is accounted for as an expense, reducing the net income of the firm. Serfling (2014) report that older CEOs adopt more conservative policies, such as low R&D investments. Li, Low, and Makhija (2017) find a negative association between CEO age and R&D investments. Chowdhury and Fink (2017) find that firms with older CEOs reduce the riskiness of the firm by investing less in R&D. However, one drawback of these studies is that they fail to control for gender, which could bias their results, given that women are systematically younger than men (Peltomäki, Swidler, and Vähämaa 2018; Withisuphakorn and Jiraporn 2017).

Barker and Mueller (2002) use a sample of 172 US firms between 1989 and 1990 to examine whether CEO characteristics explain part of their R&D investments. CEOs who are young, have greater wealth invested in their companies, and have experience in marketing and/or engineering/R&D functions affect R&D investments positively and significantly. Once a CEO has obtained a college degree, additional education does not lead to higher R&D investments. CEOs with an advanced science education invest more in R&D. While their study provides valuable insights, its shortcomings include the small sample size and not controlling for CEO gender.

Using data from ExecuComp for the period 1993-2009, Abdel-Khalik (2014) develops an index to measure the risk tolerance of CEOs. The index captures CEOs' sociodemographic factors (age, tenure, income, and wealth) that have been shown to affect individuals' risk-tolerance. The study confirms the validity of the index by demonstrating its connection to pay-at-risk, a common measure of risk-aversion. The results show that CEOs risk-tolerance is positively and significantly associated with R&D investments. His work supports the argument that the sociodemographic factors of managers impact on R&D investment decisions via managerial risk-tolerance. It also demonstrates that R&D investments are thought to be risker by managers.

Chowdhury and Fink (2017) investigate whether CEO age is related to R&D investments. Their results indicate that CEO age is negatively associated with R&D investments, and that these investments are sub-optimal when made by older CEOs. They further report that this reduction in R&D investments is one channel through which older CEOs reduce the riskiness of the firm. They suggest that these results are consistent with the argument that older executives become myopic or seek to limit the risk of their retirement benefits as they approach the end of their career.

Interestingly, most of the corporate finance literature limits the study of executives' gender and age to the CEO level, rather than incorporating other executives. Hambrick and Mason (1984) suggest that the unit of analysis should be the entire top management team rather than the CEO alone. They justify their recommendation by suggesting that CEOs share responsibilities and authority with the rest of the TMT. While they acknowledge that the CEO is the most influential executive in the firm, they suggest that setting the TMT as the unit of analysis for managerial characteristics is at least equally important.

However, in a working paper, Peltomäki, Swidler, and Vähämaa (2018) extended the analysis to include CFOs. Their data cover S&P 1500 companies from 2006 to 2014. They investigate the influence of CEO and CFO gender and age on the riskiness of the firm. They report that firms with older CEOs and CFOs reduce the riskiness of the firm. While not the focus of their study, they find that older CEOs and CFOs are associated with higher R&D investments. Surprisingly, they find that female CEOs are positively related to R&D while female CFOs are negatively related to R&D. However, one of the drawbacks of their study is not controlling for tenure, which has been found to affect the inference regarding the relationship between age and R&D investments (Cazier 2011), as well as that between executives age and risk-taking in general (Serfling 2014; Yim 2013).

Further, within the management literature, the influence of TMT characteristics on R&D investments has been investigated. For example, Daellenbach and McCarthy (1999) examine how R&D investments can be affected by TMTs' firm- and industry-related experiences, technical background, diversity in functional background, and educational background. They also consider the impact of CEO openness to innovations, measured by their backgrounds. The proportion of technical managers in the TMT is positively related to R&D investments, as is the technical background of CEOs. No effect is found for educational background or for firm or industry experience. Notably, their sample is limited to 52 firms.

Another example is the study of Kor (2006), which uses a sample of 77 firms to test for the direct and indirect effects of TMT/board composition on R&D investments. Among other things, she examines the effects of managerial tenure, team-specific experience, and functional background on R&D investments. The results show that tenure is negatively related to R&D investments. While relatively new managers push for R&D investments to be associated with developments and new products, tenured managers prefer moderate R&D levels to avoid assuming high risks for investments with a long-term payoff. Also, shared TMT-specific experience is found to be positively related to R&D. The study argues that, given the risky nature of R&D investments, which require trust and understanding to exist among the managers, those who share common TMT-specific experience may be better placed to deal with the uncertainty associated with R&D investments.

Another study focuses on SMEs in Taiwan between 2000-2002 (Chen, Hsu, and Huang 2010), using a sample of 95 companies. Given the financial constrains that small companies experience, the authors test for a negative relationship between R&D investments and financial leverage, and propose that this relationship is moderated by TMT characteristics (tenure, age, education, stock ownership). Their results confirm a negative relationship, indicating a preference for equity over debt to avoid an increase in the cost of debt resulting from underinvestment and information asymmetry, among other problems. The results show that the negative R&D-leverage relationship is heavily moderated by TMT characteristics, pointing to a strong influence of managers on R&D investments. Older and more tenured managers strengthen the relationship, while more educated managers and those with greater ownership weaken it. They suggest that older and more tenured managers are more conservative in order to protect their reputation and job security, educated managers have more confidence in their decision-making skills, and managers with high ownership have a stronger incentive to take more return-maximising risks.

This chapter aims to extend this literature and addresses some of its gaps. In contrast to Dechow and Sloan (1991), Serfling (2014), Chowdhury and Fink (2017), and Peltomäki, Swidler, and Vähämaa (2018), it incorporates the idea of the UET perspective and investigates the relationship between R&D investments and the gender and age of the

TMT. Second, in an additional analysis, I investigate this relationship at both the CEO and CFO levels, while controlling for factors such as tenure. Third, the study utilises a large dataset using hand-collection to investigate the relationship between executives' gender and age and R&D investments at the CEO, CFO, and TMT levels.[75]

The following section builds on this literature and on that presented in Chapter 2, and puts forward the main hypotheses for this chapter.

[75] It is worth noting that another strand of literature examines the influence of board characteristics and the riskiness of the firm and corporate policies, including R&D (e.g. (Adams and Ferreira 2009; Chen, Leung, and Evans 2018; Sila, Gonzalez, and Hagendorff 2016). However, this thesis focuses on executives rather than directors. Directors differ from executives in the sense that the former are more engaged with monitoring executives and less engaged with the operation of the firm compared to the latter.

4.3. Hypotheses Development

The existing literature suggests that R&D investments are risky (Abdel-Khalik 2014; Barker and Mueller 2002; Kim and Lu 2011; Serfling 2014). There are several factors that support this argument. First, R&D investments involve certain costs with highly uncertain results, which may only appear in the long-term. For example, the Congressional Budget Office reports that merely 8-10% of the R&D projects in the pharmaceutical industry achieve the commercial stage (CBO, cited in Abdel-Khalik 2014). Second, R&D investments have high adjustment costs, reducing the financial flexibility of the firm, and also involve high setup costs (sunk costs) which are irreversible (Arrow 1962). Because a substantial part of R&D investments is in the form of researchers' salaries, a reduction in R&D investments may mean firing some researchers, leading to an increase in the firing costs and a loss of know-how. Third, when investments in R&D succeed, they produce intangible assets that cannot be pledged as collateral, thereby reducing the ability of the firm to raise debt when needed (Berger and Udell 1995). Coles, Daniel, and Naveen (2006) show that R&D investments are positively associated with total risks.

Studies examining the relationship between executives' characteristics and the outcome of the firm have adopted the notion that R&D is risky. Hirshleifer, Low, and Teoh (2012) report that overconfident CEOs are associated with higher stock return volatility and invest more in riskier investments, such as R&D. They argue that overconfident managers overestimate the net present value of risker projects and/or overestimate their ability to succeed in such projects, leading them to increase their R&D investments. Similarly, Cassell et al. (2012) postulates that one of the channels through which CEOs reduce the riskiness of the firm is R&D investments, which entail highly uncertain payoffs relative to other investments. Hutton, Jiang, and Kumar (2015) argue that the riskiness of R&D investments not only arises from their high uncertainty, but also from the longer period that tends to be required for these investments to generate payoffs (if any). These studies adopt the view that R&D investments are risky and partially determined by executives' risk preferences.

Furthermore, the notion that executives' risk preferences play a role in determining the outcome of the firm is supported by theoretical reasoning and empirical evidence. In their Upper Echelons Theory (UET), Hambrick and Mason (1984) postulate that managerial risk preference could alter the outcome of the firm, given the bounded rationality assumption. In particular, they argue that managers' observable characteristics may alter their perception of – and also their response to – reality. The implication of this is that, if executives perceive a decision to be risker than it actually is, they are then less likely to take it compared to executives who perceive the decision to be less risky. Moreover, risk-averse managers might prefer more conservative projects with lower returns to riskier investments (Easterbrook 1984). The existing literature provides evidence for the notion that managerial risk preferences can affect corporate decisions (Bertrand and Schoar 2003; Cronqvist, Makhija, and Yonker 2012; Hutton, Jiang, and Kumar 2015).

Because R&D investments are risky and executives' risk preferences partially determine corporate policies, including R&D investments, it is possible that executives with characteristics reported to increase their levels of risk-aversion (overconfidence) invest less (more) in R&D. This study focuses on two executives' characteristics that have been found to influence individuals' risk-tolerance levels: gender and age.

First, the psychology literature has examined the relationship between gender and risk-taking (see Chapter 2). The majority of studies suggest that females take less risks than males, attributing this to female risk-aversion or male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). This line of inquiry has been extended to include executives, since gender differences may not hold for executives, who may differ from the rest of the population (Faccio, Marchica, and Mura 2016). Empirical studies suggest that female executives are associated with lower risks, attributing this difference to female risk-aversion or male overconfidence (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013). Thus, two empirical predictions can be proposed. If female executives are no different from male ones in terms of their risk-tolerance, R&D investments and female executives may be unrelated. Otherwise, if female executives are more risk-averse or less overconfident than their male counterparts, we might observe a negative association between female executives and R&D investments, given the riskiness of R&D.

Second, many scholars within the psychology field have investigated the relationship between age and risk-taking, but their findings are mixed, as shown in the literature review in Chapter 2 and also asserted by Bonem, Ellsworth, and Gonzalez (2015). This strand of literature has been extended to examine whether executives' age affects the riskiness of the firm. Studies investigating the riskiness of the firm draw on several strands of literature and advance several arguments with respect to the relationship between executives' age and corporate risks (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). On one hand, older executives may adopt more conservative policies since their career horizon is shorter, leading them to prefer projects with benefits that appear in the near future. Also, older executives may prefer more conservative policies because they do not feel it necessary to signal their superior performance since they already have a well-established reputation. Moreover, Hambrick and Mason (1984) argue that the reduction in risk-taking associated with age could also be due to a reduction in mental and physical energy, a greater commitment to the *status quo* of the company, and an additional emphasis on their personal financial security, given their social commitments (e.g. a larger family). Therefore, it is possible to observe a negative relationship between managerial age and R&D investments.

Yet, it is possible that this relationship cannot be observed since managerial ageing is associated with more experience, which may induce risk-taking (Worthy et al. 2011). Consequently, the reduction in risk-taking might be offset by the experience gained. This argument suggests that R&D investments and managerial age are unrelated statistically.

On the other hand, since older executives have well-established reputations, which might protect them when they fail, they may adopt risker policies. Jian and Lee (2011) report that the negative market reaction to investments announcements is reduced when the CEO has a better reputation.[76] These findings lend support to the idea that older CEOs could invest more, given that their reputation is valued by the market. Hence, it is possible to observe a positive relationship between R&D investments and managerial age.

[76] CEO reputation is defined as the market assessment of their abilities.

The existing evidence supports the notion that older executives adopt more conservative policies (Bertrand and Schoar 2003; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Others find that CEO age is negatively associated with more conservative choices (Iqbal 2013). Given that the majority of studies document that older executives are more conservative, one may predict a negative association between executives' age and R&D investments, since these investments are considered risker than the alternatives (e.g. CAPEX investments, cash holdings, payouts).

Moreover, Hambrick and Mason (1984) and Hambrick (2007) argue for the investigation of executives' characteristics at the TMT level as a single unit, rather than limiting the inquiry to CEOs. They postulate that, even when CEOs are the most important decision-makers within the firm, they tend to share their tasks and responsibilities with other executives. As a result, the risk tolerance of the other members of the TMT may better explain the outcome of the firm. This idea finds support within both the psychology and corporate policies literature. For example, groups' decisions are influenced by the risk tolerance levels of their members (Wallach, Kogan, and Bem 1962). Given that CEOs take the R&D investment decision in consultation with other members of the TMT, one may predict that the level of risk-tolerance of the other members of the TMT could play a role in determining the R&D investments. Also, studies examining the influence of executives' characteristics on financial policies have shown the importance of executives other than the CEO (Aggarwal and Samwick 2003; Bertrand and Schoar 2003; Chava and Purnanandam 2010).[77] Moreover, Perryman, Fernando, and Tripathy (2016) show that the percentage of female executives on the TMT is negatively related to companies' total risks. These findings point to the importance of examining executives' characteristics at the TMT level.

Based on the aforementioned arguments, this chapter advances two hypotheses. The first relates to the relationship between the proportion of female executives on the TMT and R&D investments:

[77] For example, many of the executives reported by ExecuComp hold titles such as "VP Research and Development". Such executives' risk preferences could play an important role in the level of R&D investments. Adopting the argument of the UET (i.e. TMT level analysis) makes it possible to incorporate such executives when studying the effect of managerial characteristics on R&D investments.

H1: *The proportion of female executives in the top management team and R&D investments of the company are negatively related.*

The second hypothesis proposes a relationship between the average age of the executives in the TMT and R&D investments:

H2: *The average age of the top management team and R&D investments of the company are negatively related.*

The following section discusses the data and variables used to test these hypotheses.

4.4. Data and Variables

I collect executive data from ExecuComp for the period 1992-2013, which is the most recent available data at the collection period. The data on ExecuComp is limited to S&P 1500 companies. The executive data are then complemented by financial data from Compustat. I exclude companies from the financial and utility sectors due to their regulatory environment (Hirshleifer, Low, and Teoh 2012; Perryman, Fernando, and Tripathy 2016). Firms in these two industries are heavily regulated, and therefore previous studies considering financial policies exclude them from their analysis. This procedure resulted in a sample of 32,831 firm-years.[78]

4.4.1. Dependent Variables: R&D Investments

Two groups of R&D measures are available in the literature: input and output measures (Becker 2015). R&D investments are an example of input measures, while the number of patents or innovations falls into the output measures category. Given that the focus of this chapter is the decision to invest in R&D rather than the value created by that investment, I use R&D intensity as a proxy for R&D investments. The extant literature calculates R&D intensity as R&D divided by a scaler, such as total assets (Brown, Fazzari, and Petersen 2009; Hirshleifer, Low, and Teoh 2012; Lewis and Tan 2016; DiVito, Laurin, and Bozec 2010), the market value of equity (Gu 2016), sales (Chen and Hsu 2009; Cheng 2004), or the number of employees (Baysinger, Kosnik, and Turk 1991).

In line with the literature, *RD1* is research and development expenses (*XRD*) scaled by total assets (*AT*) (Coles, Daniel, and Naveen 2006; Serfling 2014). This measure is preferred since all of the normalised financial variables are scaled by assets. Kennedy (2003) asserts that all variables should be normalised using the same scaler.

More importantly, Bromiley, Rau, and Zhang (2016) do not find R&D intensity (R&D expense scaled by sales) to be positively correlated with R&D spending (absolute dollar value). They caution that these two variables might proxy for different constructs. As a result, while R&D is commonly scaled by sales in the literature, I scale R&D by

[78] See the data section in Chapter 3 for more details.

total assets.[79] To check the sensitivity of my results to the measurement of R&D investments, I use the natural logarithm of R&D investments and denote it as *Log_XRD*.

In both measures, I assume R&D expenses to be zero when they are missing for a firm year (Hirshleifer, Low, and Teoh 2012; Kim and Lu 2011; Serfling 2014). This treatment assumes that values are missing due to the absence of R&D expenses on firms' financial statements, for which there is a missing value. Hirschey, Skiba, and Wintoki (2012) argue that this procedure is justifiable since the SEC has required all firms to report all material R&D since 1974.

Moreover, it is important to note that the measurement of R&D may differ from one database to another, given the classification freedom with respect to R&D expenses (Becker 2015). Because the analysis of this chapter is limited to US companies included on the Compustat database, the estimates will not be biased by using an intensity measure. However, it could lead to incomparable results to those obtained using alternative databases.

4.4.2. Explanatory Variables: Determinants of R&D Investments[80]

The explanatory variables include the variables of interest in addition to a set of control variables that have been shown to influence R&D investments. Managerial variables are measured at the TMT level, in line with the UET (Hambrick 2007; Hambrick and Mason 1984). Further, managerial variables are measured at the CEO and CFO levels to perform an additional analysis.

4.4.2.1. Variables of Interest

Managerial Gender

Managerial gender is the first variable of interest. The first hypothesis developed in this chapter predicts a negative association between the proportion of female executives and R&D investments. *PcFemale* is the percentage of female executives to the total number of executives in a firm year (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin

[79] In addition, since the three empirical chapters in this study are closely related, I maintain consistency by scaling all of the dependent variables by total assets.

[80] All of the managerial variables are discussed in further detail in the data section in Chapter 3.

2014; Jurkus, Park, and Woodard 2011; Perryman, Fernando, and Tripathy 2016). Moreover, *HighFemale* is an indicator variable taking the value of 1 if *PcFemale* exceeds 50%, and zero otherwise. Further, *MaleFemaleTeam* is a dummy variable that takes the value of 1 if the TMT includes at least one female executive, and zero otherwise. For the additional analysis, *CEO_Female* is a dummy variable that takes the value of 1 if the CEO is female, and zero otherwise. Similarly, *CFO_Female* is a dummy variable taking the value of 1 if the CFO is female, and zero otherwise.

Managerial Age

Managerial age is the second variable of interest in this chapter. *H2* predicts a negative relationship between executives' average age and R&D investments. *AvgAge* is the average age of all executives in a firm year. In all regressions, I use *AvgAge1*, which is the natural logarithm of *AvgAge* (Serfling 2014). Moreover, *HighAge* is a dummy variable that takes the value of 1 if *AvgAge* for the TMT exceeds that of the average TMT across the years, and zero otherwise. When *AvgAge* is missing, *HighAge* is set to missing. For the additional analysis, *CEO_Age* is the age of the CEO in years. For the regressions, I use the natural logarithm of *CEO_Age*, denoted as *Log_CEO_Age*. Also, *CFO_Age* is the age of the CFO in years. The multivariate models include *Log_CFO_Age*, which is the natural logarithm of *CFO_Age*.

4.4.2.2. Control Variables

In the multivariate analysis, I augment my models with several control variables that have been identified in the literature as influencing R&D investments. In particular, I control for managerial tenure, firm growth opportunities, liquidity, performance, firm age, firm size, financial constraints, and changes in capital.

Managerial Tenure

Managerial tenure could influence R&D investments in two directions. To the extent that managerial tenure proxies for managerial entrenchment and abilities (Yim 2013), it could be positively associated with R&D investments. Equally, tenured managers might be less concerned about their careers (Li, Low, and Makhija 2017), which could lead them to invest less since they do not need to signal their superior performance. *Avg_Tenure* is the average tenure of all executives serving on the TMT in the observed year. For the regressions, I use *Log_Avg_Tenure*, which is the natural logarithm of managerial tenure (Serfling 2014). When I investigate the influence of CEO and CFO characteristics on R&D investments, I use *CEO_Tenure,* which is CEO tenure in years. *Log_CEO_Tenure* is the natural logarithm of *CEO_Tenure*. Likewise, *CFO_Tenure* proxies for the number of years for which the CFO has been in position. *Log_CFO_Tenure* is the natural logarithm of *CFO_Tenure*.

Growth Opportunity

Companies with high growth opportunities may invest more in R&D to achieve their growth potential (Wu and Tu 2007). R&D investments represent a channel through which firms realize their growth potential. It is also possible that a company is perceived as a growth firm (high *MtB*) because it invests heavily in R&D. That is; the market values investors in R&D. *MtB* is the market to book ratio, a proxy for growth opportunity (Serfling 2014). *MtB* is expected to be positively associated with R&D investments.

Liquidity

Given that information asymmetry is augmented in the case of R&D because it requires a deep knowledge of the project to estimate its future cash flows, external investors may demand higher compensation for this risk, thereby increasing the cost of external funds (Hall 2002). Therefore, companies with available internal funds are better positioned to invest in R&D projects. The available cash can be used to finance R&D. The models include two proxies for liquidity; namely, cash holdings and net working capital, since it substitutes for cash (Bates, Kahle, and Stulz 2009; Opler et al. 1999). *Cash1* is cash and short term investments scaled by total assets, a proxy for internal fund availability (Hirshleifer, Low, and Teoh 2012; Serfling 2014). *NWC* is the working capital net of cash and short-term investments scaled by total assets. Given that working capital is a cash substitute (Bates, Kahle, and Stulz 2009), *NWC* proxies for internal fund availability too.[81] I expect companies' liquidity and liquidity substitutes to positively influence R&D investments (Bloch 2005).

Performance

[81] Adding *NWC* makes it possible to test the substitution argument presented in the previous chapter. If *NWC* is cash substitute, it should have a similar coefficient sign to that of cash holdings.

Firms that perform well are expected to invest more in R&D for two reasons. First, their previous success induces them to invest more in risky investments. Second, they are in a better financial position to take risky investments (i.e. not financially constrained). Alternatively, firms with weak performance might be inclined to "experiment with innovative activities" (Barker and Mueller, 2002)(p.791). Performance is measured by *ROA*, which is return on total assets (Hirshleifer, Low, and Teoh 2012; Serfling 2014).

Firm Size

The size of the firm has been theorised and reported to influence R&D investments. The previous studies theorise and support both negative and positive relationships (Abdel-Khalik 2014; Barker and Mueller 2002; Cohen and Klepper 1996; Oakey 2015). It is possible that larger firms have better resources with which to initiate and sustain their R&D investments, leading to a positive relationship between size and R&D investments. On the other hand, larger firms may resist change and feel secure, given their market position, leading to a negative relationship between size and R&D investments (Barker and Mueller 2002). Nonetheless, it is also possible that these predictions are industry-specific (Oakey 2015). For this study, *Size* is measured as the natural logarithm of total assets and proxies for the size of the firm (Abdel-Khalik 2014). For robustness, I measure size as the natural logarithm of total sales, denoted as *Log_Sale* (Hirshleifer, Low, and Teoh 2012; Serfling 2014).

Firm Age

The arguments of Schumpeter (discussed in section 4.2) suggest a relationship between firm age and its R&D activities. In other words, the age of the firm might proxy for its ability to deliver Schumpeter's creative destruction. Alternatively, Chen (2013) suggests that firm age proxies for firms' experience and finds a negative relationship with R&D investments. For this study, *FirmAge1* is the natural logarithm of firm age, the time between the observation and the first year when the firm was first listed on Compustat (Serfling 2014).

Financial Constrains

Given that markets are imperfect and that R&D is risky, financially constrained firms may invest less in R&D. In line with Barker and Mueller (2002) and Serfling (2014), *Lev* is measured as total debt scaled by total assets, a proxy for financial constraints.

Leverage may negatively influence R&D investments (Hirshleifer, Low, and Teoh 2012). Also, I control for the volatility of firm cash flows, *CashFlowSD_10*, as another measure of financial constraint. This variable measures the volatility of firm cash flow for the last ten years. For the robustness checks, I use *CashFlowSD_5*, which is the standard deviation of firm cash flow in the previous five years.

Changes in Capital

The availability of capital allows companies to invest in R&D (Barker and Mueller 2002). *DeltaCap* is changes in capital (i.e. stock and debt) in a given year. The changes in capital include debt and equity issuances minus debt and equity retirements. I take the natural logarithm of *DeltaCap*, and denote it as *DeltaCap1*. The argument is that, as firms increase their capital, they can use this increase to finance their R&D activities, possibly by issuing more debt or equity.

Industry

R&D investments are influenced by industry since some industries require more R&D than others (e.g. HiTec). For this reason, I consider industry in describing and analysing my date. For the descriptive statistics, I use Fama and French's five industry classifications. This scheme classifies industries into Consumers, Manufacturing, High-Technology (HiTec), Health, and Other. Further, when I control for the influence of industry in the multivariate analysis, I use the SIC two digits scheme (Hirshleifer, Low, and Teoh 2012), dividing companies into 58 unique industries.

A summary of all of the variables and their measurements is available in the appendix. The subsequent section describes the data.

4.5. Descriptive Statistics

This section provides descriptive statistics for the variables used in this chapter. It begins by discussing the dependent variable, R&D investments. It then provides descriptive statistics for managerial gender and age and how these are related to R&D investments. These variables are presented for the full sample and across Fama and French's five industry grouping. [82] Lastly, the control variables are briefly discussed.

4.5.1. R&D Investments for the period 1992-2013

Table 4.1 shows the trends in R&D investments as measured by *RD1*, as well as the components of this measure (*XRD* and *Assets*). Moreover, figure 4.1 depicts the trends in *RD1* over time for the full sample and across Fama and French's five industries. Over the sample period, *RD1* has an average of 3.69%. This figure is comparable to prior studies. Serfling (2014) uses a sample of S&P1500 firms for the period 1992-2010 and reports an average *RD1* of 3.47%. The slight difference may be related to the sample period or to the winzorisation performed by Serfling (2014).[83]

At the beginning of the sample period, the *RD1* is 3.30%. However, R&D investments started to increase, from 3.25% in 1993 up to 4.71% in 1998. This increase is in line with the findings of Brown, Fazzari, and Petersen (2009), who attribute the increase to the HiTec sector. The data described in this section extends their findings by showing that this increase can also be attributed to the Health industry. In particular, R&D investments are the highest in the Health industry for the period 1993-1998.

Following this period, the *RD1* for the full sample started to decline at a slow rate, reaching 3% in 2013. An exception to this is 2008, when *RD1* reached its peak of 4.9%, which can be attributed to an increase in *XRD* coupled with a decline in *Assets* following the financial crises, which might have resulted in asset impairment. In dollar terms, *XRD* seems to increase in nominal terms over time, starting at $106 million in 1992 and

[82] The classification is available for download from French's official website via the following link. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[83] When I winzorise *RD1*, the average becomes 3.44%, slightly lower than that of Serfling (2014). Also, Lewis and Tan (2016) report an average *RD1* of 3.4% for a sample spanning the period 1972-2009.

reaching an all-time high in 2013 of $300 million, as displayed in Figure 4.2. A similar trend is observable in Figure 4.3, which shows the total assets over time.

Table 4.1 also reports the *RD1* across Fama and French's five industries classification and over time. Fama and French's five industries are: Consumers, Health, HiTec Manufacturing, and Other. Companies in the Consumers, Manufacturing, and Other industries report persistently low *RD1*. In contrast, firms in the HiTec and Health industries are more R&D intense, with some volatility. This can be attributed to the nature of their businesses. HiTec and Health industries require more R&D in order to deliver their innovative products.

Table 4.2 shows the number of observations for R&D expense *(XRD*) as well as *RD1*. There are 20,748 firm-year observations for *XRD* compared to 32,831 firm-years for *RD1*. The difference between the number of observations for these two variables is due to the missing *XRD* values, which are set to zero in the calculation of *RD1* (Hirshleifer, Low, and Teoh 2012; Kim and Lu 2011; Serfling 2014). Moreover, Table 4.2 shows that the median of *RD1* is 0.16%, compared to the mean of 3.7%. This is understandable, given that 12,083 firm-years report a missing value for *XRD*, setting *RD1* to zero. Lastly, the standard deviation for *RD1* is 12%.

4.5.2. Executives' Gender and R&D Investments

Figure 4.4 shows the trend in female representation on companies' TMTs (*PcFemale*) for the period 1992-2013. The percentage of females on the TMT increased dramatically between 1992 and 2011. At the beginning of the sample, in 1992, only 1.9% of TMT members were female compared to 8.2% in 2011. Nevertheless, *PcFemale* started to decline to 6% in 2013. This figure is close to the average for the full sample across all years at 5.85%, as reported in Table 4.2. The median for *PcFemale* is zero, suggesting that at least 50% of the firm-years do not have any female executives, as shown in Table 4.2. Specifically, only 8,621 firm-years have at least one female executive out of the full sample of 32,831 firm-years. In other words, only 26.2% of all annual TMTs include at least one female executive. These figures are comparable to the findings of prior studies (Perryman, Fernando, and Tripathy 2016).

The trends are similar across all industries, in which *PcFemale* increases during the 1990s and early 2000s, before a steady decline sets in during the second decade of the century. The Consumers industry has the highest percentage of female executives, with an average of 7.7% during the sample period. It is possible that women represent the largest customer base for the Consumers industry, which in turn hires more female executives. The Manufacturing sector, meanwhile, depends on a lower percentage of female executives, at 3.8% during the sample period.

Considering the development of both *PcFemale* and *RD1*, both are increasing over time. This reduces the risk of an omitted variable driving any observed negative relationship between *RD1* and *PcFemale*. That is; if *PcFemale* and *RD1* move in opposite directions over time, it could also be the case that a third variable (such as time) is driving the relationship.

Importantly, Figure 4.5 shows the levels of R&D investments for companies with different numbers of female executives. For example, while TMTs with no female members report an average *RD1* of 3.8%, those with three female members report an average *RD1* of 1.2%. The general trend is that TMTs with more females invest less in R&D. Furthermore, Table 4.3 reports the correlation between *RD1* and *PcFemale*, which is -0.05. This negative correlation and the trends portrayed in Figure 4.5 are in line with *H1*, which predicts that firms with more females on the TMT invest less in R&D.

Furthermore, Table 4.2 reports the descriptive statistics for CEO gender and CFO gender. Female CEOs represent 2.2% of all CEO-years, while female CFOs account for 7.2%. Also, Table 4.3 shows a negative correlation between *RD1* and both *CEO_Female* and *CFO_Female*. This is consistent with the negative correlation between *RD1* and *PcFemale*.

The overall trend indicates an increase in female participation over time. Moreover, the descriptive statistics show a negative relationship between managerial gender and R&D investments, which is consistent with the relationship predicted in this chapter. However, whether this correlation is systematic remains to be examined.

4.5.3. Executives' Age and R&D Investments

Figure 4.6 depicts the trends in the average age of the TMT for 1992-2013. The age of the TMT had been stable, at around 54 years, until the financial crises of 2007, when a significant drop occurred in all industries. The *AvgAge* was 52 years in 2007, and started to increase until it regained its previous level by 2013. The decline in 2007 may have been due to executives' replacements following the 2007 crisis. For the full sample, Table 4.2 shows that *AvgAge* is 53.32 for the average TMT. Further, the *AvgAge* of the TMT is close for all industries. However, Manufacturing companies tend to have the oldest executives, while HiTec companies have the youngest one. This is the case both pre and post the financial crises, even though the age differences across industries seem to diminish over time. In addition, Table 4.3 reports a correlation of -0.10 between *AvgAge1* and *RD1*, which is consistent with *H2*, which predicts that older TMTs are associated with lower R&D.

Notably, figure 4.7 divides the sample into four quintiles based on the *AvgAge* of the TMT. TMTs in the first quintile report an *AvgAge* of 46.3 years compared to 60.4 years for TMTs in the fourth quintile. The general trend is that TMTs with younger managers invest more in R&D, which is consistent with *H2*, which suggests that older TMTs are negatively related to R&D investments. However, it is possible that this relationship disappears after accounting for the industry effect. This is because *AvgAge* is consistently lower in industries with high R&D investments, such as HiTec, as shown in Figure 4.6.

Moreover, Table 4.2 shows that *CEO_Age* has an average of 55.46 years and a median of 55 years. Consistent with the correlation between *AvgAge* and *RD1*, *CEO_Age* and *RD1* are negatively correlated. Further, the average of *CFO_Age* is 50.41 years. Surprisingly, the correlation between *CFO_Age* and *RD1* is positive.

4.5.4. Control Variables

Table 4.2 reports the descriptive statistics for the variables used in this study, while Table 4.3 displays the correlations between the variables.

Avg_Tenure is the average number of years for which the TMT members serve the firm. The average TMT tenure is 4.61 years. *CEO_Tenure*, which is the number of years for which the CEO has been in position, is 7.06 years on average. *CFO_Tenure*, which proxies for the number of years for which the CFO has been in position, is 4.13 years. Moreover, *Avg_Tenure* and *CFO_Tenure* are negatively correlated with *RD1*. This is consistent with the argument that tenured managers may have lower career concerns, reducing their need to signal their superior performance through undertaking risky projects. *CEO_Tenure* has a minimal positive correlation with *RD1*.

The *MtB* average is 2.22 times while the median is 1.64, indicating that the mean is influenced by firms with high *MtB*. A high *MtB* indicates that the firm is a growth firm. Growth firms are expected to maintain a high level of R&D investments to realise their growth potential. This argument is consistent with the positive correlation between *MtB* and *RD1*.

Cash1, which is the sum of cash and short-term investments scaled by total assets, has an average of 16% (median=8.6%), with an 18% standard deviation, suggesting that companies with large cash reserves are influencing the average. Firms with high levels of liquidity are better positioned to invest in R&D, given the market imperfection and the difficulty of raising external funds (Bloch 2005; Hall 2002). This is consistent with the positive correlation between *Cash1* and *RD1*.

NWC is 7%, on average, with a median of 7%. If *NWC* serves as a substitute for liquidity (Bates, Kahle, and Stulz 2009), it should be positively related to R&D investments since the availability of funds can facilitate such investments in imperfect markets (Bloch 2005; Hall 2002). In other words, it should relate to R&D investments in a way that is similar to cash holding. Yet, its correlation with *RD1* is negative. It is possible that *NWC* captures other constructs in addition to liquidity, or it may not substitute for cash holdings in the decision to invest in R&D.[84]

The return on assets, *ROA*, has an average of 3%, while the median is 5.2%. Firms with low returns are driving the average. Companies with good performance are expected to continue investing in R&D. Interestingly, *ROA* and *RD1* are negatively correlated. This

[84] Note that the correlation matrix in Table 4.3 substitutes *NWC* and *Lev* with *NWC_Orth* and *Lev_Orth*, respectively. These are the orthognlised values of each variable, given the high correlation between them, as discussed in the previous chapter.

is consistent with the view of Barker and Mueller (2002) that firms with weak performance may step up their R&D activities in order to improve their performance.

Additionally, *FirmAge*, based on the inclusion date in Compustat, varies from 1 to 64 years, with an average of 23 years. Also, the sampled firms are large, with average total assets of $5.4 billion dollars and a mean of $990 million. Both *FirmAge* and *Size* are negatively correlated with *RD1*. This indicates that mature firms invest less in R&D. It is possible that managers in large firms have a low motivation regarding the disruption produced by innovation (Barker and Mueller 2002).

Lev, the total debt scaled by the book value of capital, has an average of 23% and a median of 20%, with a high standard deviation of 85%. Moreover, *CashFlowSD_10* measures the volatility of the cash flow of the firm. Its average is 7% while its median is 4%. Interestingly, both *Lev* and *CashFlowSD_10* are positively correlated with *RD1*. This is inconsistent with the findings of Barker and Mueller (2002), because financially constrained firms are expected to invest less in R&D.

Lastly, *DeltaCap* is changes in capital, which includes debt and stock issuance net of debt retirement and stock repurchases. *DeltaCap* averaged $-12 million, with a substantial standard deviation of $1.12 billion. The correlation between *DeltaCap* and *RD1* is positive, in line with the argument that raising funds induces R&D investments.

The correlation between the independent variables is moderate, thereby reducing the risk of multicollinearity.

The following section analyses the date described in this section.

4.6. Analyses and Results

Using the data described above, this section answers the research questions of this chapter: 1) Does female representation on the TMT relate to R&D investments? Also, 2) Is TMT average age associated with R&D investments?

4.6.1. Univariate Analysis

Table 4.4 shows the results of the t-statistic of *RD1* over different groups based on executives' characteristics. T-statistics are used to show whether the means of *RD1* are systematically different among two different groups.

Companies with *HighFemale* = 1 (i.e. the percentage of females on the TMT is 50% or more) are significantly different from other companies in terms of their R&D investments (t-statistic statistic = 3.4). Those companies have an average *RD1* of 1.2% compared to 3.7% for companies with fewer females on the TMT. Also, TMTs that include at least one female manager (*MaleFemaleTeam* = 1) invest slightly less in R&D. Their firms report 3.5% of *RD1* compared to 3.8% (t-statistic = 1.96). These findings are in line with *H1*, which predicts that the percentage of females on the TMT and R&D investments are negatively related.

More, firms with female CEOs report an average *RD1* of 2.46% compared to 3.63% for firms with male ones. This difference is statistically significant, with a t-statistic of 2.4. Firms whose CFO is female have an average *RD1* of 3.04% compared to 3.52% for firms with male CFOs. This difference is systematic, as indicated by the t-statistic of 2.6. These findings are in line with those for the TMT.

Turning to managerial age, TMTs whose *AvgAge* is larger than the sample average invest less in R&D. The *RD1* for such teams has an average of 3.3% compared to 4.1% for younger teams. The difference in the means is significant (t-statistic = 6). This is in line with the prediction of *H2* that TMT average age and R&D investments are negatively related.

Next, I turn to firm characteristics. Table 4.5 shows that companies with large cash reserves (i.e. larger than those of the average firm in the sample) invest 7.7% in R&D compared to 1.6% invested by companies with smaller cash balances (t-statistic = 42). This is in line with the argument discussed previously, that internal resources determine R&D investments due to market imprecation, which makes external finance costly (Bloch 2005; Hall 2002). Firms that undertake acquisition invest less in R&D. This might be due to the demand on funds caused by the acquisition, which reduces the available funds for investing in R&D. Alternatively, acquisitions and R&D investments might be substitutes (Guo, David, and Toldr 2018). Larger firms, whose size is greater than that of the average firm in the sample, invest less in R&D. The difference is 2.9%, with t-statistic = 21. This is in line with the view of Barker and Mueller (2002) that managers of larger firms are reluctant to handle the disruption caused by innovations.

Finally, I test whether the means of *RD1* differ significantly across industries to investigate whether R&D investments are industry-specific. Using Fama and French's five industry classifications, I find results that are in line with this argument. Table 4.6 shows that firms classified as HiTec or Health invest significantly more in R&D. Health companies invest 9.4% compared to 3% by non-health companies (t-statistic = -28), while HiTec companies report a *RD1* mean of 8% compared to 2.2% for non-HiTec firms (t-statistic = -39). Companies classified as Consumers, Manufacturing, or Other report significantly lower R&D investments. These findings suggest that R&D is indeed industry-specific. The business nature differs from one industry to another, and this difference induces them to adopt different R&D policies. This is observable from the systematic difference between the R&D investments of HiTec and Health firms compared to other firms. Both industries require large R&D investments to deliver their sophisticated products, and therefore may invest significantly more in R&D.

Overall, the findings of the univariate analysis can be summarised as follows. First, consistent with *H1*, female managers and R&D investments are negatively related. It is possible that the proportion of female managers on the TMT reduces its risk-taking behaviour due to female risk-aversion or male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012). Given that R&D is risky (Abdel-Khalik 2014; Barker and Mueller 2002; Hirshleifer, Low, and Teoh 2012), a negative association is theoretically possible. Second, consistent with *H2*, a negative association between TMT age and R&D investments is observed. A possible explanation is that managerial age is positively related to risk-aversion (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), and thus older TMTs invest less in risky R&D (Abdel-Khalik 2014; Barker and Mueller 2002; Hirshleifer, Low, and Teoh 2012; Serfling 2014). Third, R&D investments are influenced by firm and industry characteristics.[85]

These findings are taken into consideration when performing the multivariate analysis in the following subsection.

4.6.2. Multivariate Analysis

Prior studies, discussed above, suggest that R&D investments are determined by several factors. Hence, the influence of managerial gender and age is examined while controlling for such factors.

4.6.2.1. Main Results

The next set of analyses are based on multivariate regression. This is because the dependent variable, *RD1*, is influenced by more than one variable, as we saw in the previous section. Therefore, this section further examines the aforementioned hypotheses by considering that R&D investments are determined by many variables simultaneously. *H1* predicts that the proportion of females in the TMT is negatively related to RD1, while *H2* proposes that the average age of the TMT is negatively related to R&D investments.

Table 4.7 reports the estimates of the determinants of *RD1* using the pooled Ordinary Least Square method. This estimation technique has been used in various studies examining the determinants of RD investments (Barker and Mueller 2002; Baysinger, Kosnik, and Turk 1991; Bloch 2005; David, Hitt, and Gimeno 2001; Hirshleifer, Low, and Teoh 2012), as well as in studies examining female representation on the TMT (Perryman, Fernando, and Tripathy 2016) and boards (Chen, Leung, and Evans 2018). In all models, the dependent variable is *RD1*. The variables of interest are *PcFemale* and *AvgAge1*, testing for *H1* and *H2*, respectively. The rest of the variables are

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[85] Note that the previous chapter also shows that managerial gender and age differ systematically across industries, which is consistent with the view of Hambrick and Mason (1984). See section 3.6.1. for details.

drawn from the literature and included for control purposes. The Huber-White standard errors are calculated to correct for heteroscedasticity, in line with similar studies (Alessandri and Pattit 2014; Huang and Kisgen 2013).

The difference between Models 1 and 2 relates to the inclusion of year industry fixed effect. Hirschey, Skiba, and Wintoki (2012) find that most of the variation in R&D investments is explained by the firm, industry, and time fixed effects.[86] As a result, accounting for the influence of industry and year is necessary when examining the determinants of R&D investments. First, R&D is industry-specific, as indicated in Table 4.6 in the univariate analysis, as are managerial characteristics, as argued by Hambrick and Mason (1984) and shown in the previous chapter.[87] Thus, I control for the industry effect based on the SIC two digits classifications, consistent with the R&D literature (Hirshleifer, Low, and Teoh 2012). Second, the inclusion of year fixed effects accounts for year-specific factors that might influence either R&D or managerial characteristics. For instance, Section 4.5.3 shows a substantial drop in *AvgAge* in 2007.

Consistent with *H1*, the coefficient of *PcFemale* is negative and significant at the 5% level, indicating that the percentage of female managers is negatively related to R&D investments. The negative and significant coefficient is present in the cross-section (Model 1) and after accounting for industry and year fixed effects (Model 2). Elsaid and Ursel (2011) report a reduction in R&D investments following the appointment of a female CEO, explaining the findings with the tendency of females to take less risks.[88] Further, Peltomäki, Swidler, and Vähämaa (2018) find that, while female CFOs are negatively associated with R&D investments, female CEOs are positively related to them.

These results could be explained by the reasoning discussed when constructing *H1*. Existing studies suggest that R&D is a risky investment for several reasons. For

[86] As discussed in the previous chapter, Zhou (2001) suggests that, since firm fixed effect estimators depend on within-firm changes and managerial ownership does not vary substantially over time, the use of a firm-fixed effect estimator may not detect a relationship between managerial ownership and performance, even where one exists. Given that managerial characteristics do not vary over time, the use of a firm fixed estimator may be inappropriate. However, a within-industry and year estimators are commonly used in similar studies (Hirshleifer, Low, and Teoh 2012), since managerial characteristics' variability can be detected within the industry but not within the firm (Chen, Leung, and Evans 2018).
[87] See Tables 3.7 and 3.8 in the univariate analysis in the preceding chapter.
[88] In their paper, they adopt the view that lower risks do not equate to sub-optimal decisions.

example, relative to other choices, R&D investments entail certain costs with highly uncertain payoffs (Abdel-Khalik 2014; Barker and Mueller 2002; Kim and Lu 2011; Serfling 2014). At the same time, managerial characteristics and their risk-tolerance have been shown to influence R&D investments. For instance, R&D investments are positively related to managerial overconfidence (Hirshleifer, Low, and Teoh 2012) and risk-tolerance (Abdel-Khalik 2014).

Moreover, earlier studies document that females are associated with lower risks compared to males, which could be attributed to female managers being more risk-averse or less overconfident (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013). Also, Harris, Jenkins, and Glaser (2006) report that women tend to prefer activities with high potential payoffs and certain minimal costs. In contrast, R&D investments entail certain costs with uncertain payoffs. Therefore, it is possible that TMTs that contain more female executives are less overconfident or more risk-averse, and therefore more careful when investing in risky R&D.

It is worth noting that, while both risk-averse TMTs and less overconfident TMTs could theoretically invest less in R&D, these two explanations differ. Intuitively, we assume that an unbiased TMT optimally invests in R&D. In this case, the overconfident TMT will overinvest since overconfidence leads to an overestimation of one's abilities and skills (Malmendier and Tate 2005a; Malmendier, Tate, and Yan 2011), and could push managers to undertake difficult tasks such as R&D investments (Hirshleifer, Low, and Teoh 2012). On the other hand, risk-aversion leads to an overestimation of the probability of failure or an exaggeration of the variance of the outcome, inducing managers to invest less in risky R&D. For example, studies suggest that women are more risk-averse because they have higher expectations of unfavourable outcomes (Fehr-Duda, De-Gennaro, and Schubert 2006; Harris, Jenkins, and Glaser 2006). Hence, it is possible that TMTs that contain more females will be more risk-averse or less overconfident (Faccio, Marchica, and Mura 2016; Hambrick and Mason 1984; Huang and Kisgen 2013), potentially explaining the negative relationship between *PcFemale* and *RD1*.

An alternative explanation could be drawn from the agency theory, which proposes that entrenched managers may overinvest due to "empire building" behaviour (Jensen 1986; Jensen and Meckling 1976). If TMTs that contain more females are less entrenched, the negative association may indicate that they curb R&D overinvestment.[89] While a potential explanation, I do not advance this for three reasons. First, I control for managerial entrenchment and the results continue to hold. In other words, the results continue to hold even after holding managerial entrenchment constant.[90] Second, while the agency theory predicts that the less entrenched manager should be associated with lower cash holdings to reduce the free cash flow problem outlined in (Jensen 1986), the preceding chapter shows a positive association between the percentage of female executives on the TMT and cash holdings. Thus, it is less likely that agency costs on the part of TMTs that contain more male managers are behind this observation. Third, the existing evidence documenting that females improve governance is mainly focused on female directors, who are shown to improve monitoring (Adams and Ferreira 2009). In turn, managers are less engaged with monitoring and more engaged with operations. Therefore, it is difficult to extend these findings to female executives. Nevertheless, it remains a potential explanation.

Considering managerial age, Table 4.7 shows that the coefficient of *AvgAge1* is positive but insignificant. This is surprising since several existing studies provide evidence for a negative relationship between CEO age and R&D investments (Barker and Mueller 2002; Chowdhury and Fink 2017; Peltomäki, Swidler, and Vähämaa 2018; Serfling 2014). However, the insignificance of this coefficient is possible, theoretically and econometrically. First, Chapter 2 shows that the evidence for the relationship between ageing and risk-taking is mixed. It is possible that the decline in risk-tolerance associated with ageing is offset by increased experience, which is reported to increase risk-tolerance (Worthy et al. 2011). Additionally, Rolison, Hanoch, and Wood (2012) find that older people tend to take less risky choices based on first impressions, but this systematic difference diminishes when older people gain experience within the context. In the corporate context, it is plausible to suggest that older TMTs have

[89] Note that TMTs who are less overconfident also curb overinvestments. The difference between the "less overconfidence" and "less entrenched" explanations may relate to the motives. The agency framework may attribute this to the ill intention of the managers who want to maximize their wealth; while the overconfidence explanation suggests that they might be well-intentioned but biased.
[90] The main model controls for managerial tenure. I also control for managerial wealth and compensations in the robustness checks.

experience of investments, and therefore may not systematically differ from younger TMTs in terms of their risk-tolerance.

Second, Hambrick and Mason (1984) assert that the UET approach (i.e. examining managerial characteristics at the TMT level) captures the central tendency of the team. Note that the correlation matrix in Table 4.3 shows that, while CEO age is negatively related to R&D investments, CFO age is positively related to them. If managerial age for different executives is related to R&D investments in different directions, it is possible to observe no relationship at the TMT level. That is; the influence of managerial age at different levels is cancelled out. I revisit this issue in greater detail later in this chapter in the additional analysis, in which I examine the influence of CEO and CFO age on R&D investments.

Overall, the multivariate analysis further supports the findings of the univariate analysis that are in line with *H1*: *The proportion of female executives in the top management team and R&D investments of the company are negatively related.* It is possible that TMTs with more female executives exhibit greater risk-aversion or less overconfidence, leading to lower R&D investments, since they are risky. Additionally, while the univariate analysis shows a negative relationship between the average age of the TMT and R&D investments, the multivariate analysis reveals that this relationship disappears once we control for the other R&D drivers that are identified in the literature. Hence, this analysis rejects *H2*: *The average age of the top management team and R&D investments of the company are negatively related.*

I check the robustness of these findings after discussing the control variables in the main analysis.

4.6.2.2. Control Variables

This section presents the results for the control variables. The results presented are available in Table 4.7 Model 2, which accounts for the industry and year effects. The coefficient of *Log_Avg_Tenure* is positive and insignificant. Serfling (2014) did not find a significant relationship between CEO tenure and R&D investments. Further, the coefficient of *MtB* is positive and significant at the 1% level. This is consistent with the view that growth firms invest more in R&D in order to fulfil their growth potential.[91]

The univariate analysis shows that firms with large cash reserves are associated with higher R&D investments. The coefficient of *Cash1* is positive and significant at the 1% level, but this significance disappears after accounting for the influence of year and industry.[92] The positive relationship is consistent with the view that firms with robust cash holdings are in a better position to invest in R&D since external finance might be costly (Hall 2002).

The coefficient of *ROA* is negative but insignificant.[93] The negative relationship is consistent with the notion that firms with weak performance step up their R&D activities (Barker and Mueller 2002). Otherwise, this could attributed to the fact that R&D is expensed and hence reduces ROA (Abdel-Khalik 2014). Moreover, the coefficient of *Log_FirmAge* is positive and significant at the 1% level, but it is no longer significant once we account for the industry and year effects.[94]

The univariate analysis shows that larger firms are associated with lower R&D investments. Consistent with this, the coefficient of *Size* is negative and significant at the 1% level. It is possible that larger firms resist change, leading to a negative relationship between firm size and R&D investments (Barker and Mueller 2002). Moreover, the coefficient of *CashFlowSD_10* is positive but insignificant.[95]

If net working capital is a cash substitute, as Bates, Kahle, and Stulz (2009) argue, it may proxy for internal funds' availability and be related to R&D in a similar direction. However, the coefficient of *NWC_Orth* is negative and significant at the 10% levels.[96] This may indicate that NWC is not a cash substitute, at least in the context of R&D

[91] Given that the coefficient of *PcFemale* is negative and significant while the coefficient of *MtB* is positive and significant, one may argue that this result suggests that female participation on the TMT deteriorates the value of the firm. However, it is important to note that firms with growth potential invest more in R&D to achieve their growth. The results in this table suggest that, holding growth opportunity constant; females are associated with lower R&D investments. It may not be appropriate to test the impact of executives' characteristics on R&D investments without controlling for growth opportunity.
[92] However, the coefficients of *Cash1* are positive and significant in most robustness checks.
[93] This finding becomes significant in several robustness checks.
[94] Looking at the robustness tests, it is generally positive and significant.
[95] In several robustness tests, it is positive and significant.
[96] This finding persists across several robustness checks.

investments. Further, the coefficient of *Lev_Orth* is negative but insignificant, and the coefficient of *DeltaCap1* is positive and insignificant.

The lack of significance of several control variables may add to the findings of Hirschey, Skiba, and Wintoki (2012), who suggest that R&D investments are mainly explained by the fixed effects in their models. For instance, Oakey (2015) suggests that size may influence R&D investments in opposing directions, depending on the industry. This argument may hold for other firm characteristics.[97]

4.6.2.3. Robustness Checks

This section presents several robustness analyses to check the reliability of the results presented in the main analysis. First, I examine whether these results are driven by my choice of controls variables. For instance, it is possible that the results are influenced by the inclusion of total assets as a control variable while simultaneously scaling the dependent variable by total assets. Hence, I replace *Size* with *Log_Sales*, which is the natural logarithm of total sales as an alternative proxy for firm size. I also replace *CashFlowSD_10* with *CashFlowSD_5* since the rolling windows for which the standard deviations are calculated are set arbitrarily. These results are presented in Table 4.8. They continue to support the findings of the main analysis and are in line with *H1*. Specifically, the coefficients of *PcFemale* are negative and significant at the 1% and 5% levels, after accounting for year and industry fixed effects. Further, the coefficient of *AvgAge1* remains positive but insignificant. This is consistent with the findings of the main analysis and continues to reject *H2*.

Second, I investigate the sensitivity of the results to the measurement of R&D investments. As discussed in section 4.4.1, there are several measures for R&D inputs. In this test, I replace *RD1* with *Log_XRD*, which is the natural logarithm of R&D expenses (the expense is set to zero when it is missing).[98] The results of this analysis are presented

[97] When I re-estimate the model without correcting for heteroscedasticity based on the Huber-White standard errors, the majority of the controls become significant, while the variables of interest are consistent with the main model. However, correcting for heteroscedasticity is important for panels with long time-dimensions.

[98] When I scale R&D investments by sales, a widely-used measure for R&D inputs, *PcFemale* is no longer significant. However, I do not present this analysis since this measure may be inappropriate for two reasons. First, Bromiley, Rau, and Zhang (2016) find different results when using R&D over sales. When they investigate the reasons for this, they find a weak correlation between the amount of R&D investments and

in Table 4.9. The coefficients of *PcFemale* are negative and significant at the 1% and 5% levels when controlling for year and industry time-invariant characteristics. These results further support *H1*. Interestingly, while the coefficient of *AvgAge1* remains positive and insignificant in Model 1, in line with the main analysis, the coefficient of *AvgAge1* becomes negative and significant at the 1% level after controlling for industry and year fixed effects. These results contradict the main analysis, provide support for *H2*, and are consistent with the univariate analysis (see Table 4.4).

Importantly, they add to prior studies suggesting that different R&D investments' measures may capture different constructs, calling for the better theorisation of the R&D investments' measures (Bromiley, Rau, and Zhang 2016). However, the measure used in this study, *RD1*, is widely used in similar studies (Brown, Fazzari, and Petersen 2009; Coles, Daniel, and Naveen 2006; Hirshleifer, Low, and Teoh 2012; Lewis and Tan 2016; Serfling 2014; DiVito, Laurin, and Bozec 2010). It also follows the recommendation of Kennedy (2003), who emphasises the importance of maintaining consistency when normalising variables. In this thesis, all of the scaled variables are scaled by total assets.

Third, since this is a panel dataset with a long time-dimension (22 years), it is possible that the model suffers from cross-sectional dependence on the error terms. Therefore, I re-estimate the model using the Fama-MacBeth two steps producer. Fama and Macbeth (1973) estimate cross-sectional regression for every period in the panel before averaging the coefficients, standard errors, and R-squared(s). This estimator is used in prior studies investigating the determinants of R&D investments (e.g. (Chen, Leung, and Evans 2018)). This analysis is presented in Table 4.10. The average coefficient of *PcFemale* is negative and significant at the 1% level, in line with the main analysis and further supports *H1*. The coefficient of *AvgAge1* is also consistent with the main analysis and remains positive but insignificant. Thus, this analysis continues to reject *H2*.

Fourth, the model is estimated using a pooled ordinary least square (OLS) estimator, consistent with prior studies examining the determinants of R&D investments

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R&D over sales, cautioning researchers against using R&D over sales. Second, it is important to use the same scaler for all variables (Kennedy 2003). Given that all normalized controls are scaled by total assets, it may be inappropriate to use R&D over sales as a dependent variable.

(Barker and Mueller 2002; Cassell et al. 2012; Ferris, Javakhadze, and Rajkovic 2017; Hirshleifer, Low, and Teoh 2012; Serfling 2014). This is consistent with Brooks (2007)'s proposition that using OLS is preferred to estimators that do not require normality distribution, since violating this assumption for large samples does not bias OLS. Still, other scholars have used Tobit regression since the dependent variable is censored to the left (truncated) (Chen, Leung, and Evans 2018; Coles, Daniel, and Naveen 2006). Following these studies, I verify my results using pooled Tobit regressions.

The results of this analysis are presented in Table 4.11, where Model 2 includes the industry and year fixed-effects. The coefficients of *PcFemale* in both models are negative and significant at the 1% level, which is in line with *H1* and the main analysis. Interestingly, the coefficient of *AvgAge1* is positive and significant at the 5% level in Model 1. Once I control for the industry and year effects, the coefficient of *AvgAge1* becomes positive but insignificant, which is in line with the main analysis and further rejects *H2*.

The fifth robustness test uses the lead value of *RD1* to account for the possibility of a time lag between changes in managerial characteristics and R&D investments, respectively. For instance, if TMT composition changes towards the end of the year, it is unlikely that its effect on R&D will appear in the same year since these investments might be speared throughout the year. Thus, I regress the lead value of *RD1* (t= t+1) on the independent variables. The results of this analysis are available in Table 4.12. The coefficients of *PcFemale* in both models are negative and significant at the 1% level, while the coefficients of *AvgAge1* are positive and continue to be insignificant. Thus, this analysis supports *H1*, and rejects *H2*.

The final test considers the potential influence of managerial compensation and wealth. For instance, it might be the case that TMTs that contain more females are compensated less with risk-inducing compensation or have less wealth, both of which may reduce the degree of risk-taking. If this is the case, then any observed negative relationship between *PcFemale* and *RD1* may reflect the effects of the compensation structures or wealth rather than the gender effect. Consequently, I augment the main model with three control variables that capture the influence of wealth and the incentives arising from compensation. These three additional controls are *Log_Avg_Wealth*, *Log_Avg_Vega*, and *Log_Avg_Delta*.[99]

The results of this analysis are shown in Table 3.14. Both models show that the coefficient of *PcFemale* is negative and significant at the 1% level, in line with the main analysis. Moreover, while the coefficient of *AvgAge1* is positive and significant in Model 1, it is no longer significant when accounting for observable and non-observable time and industry effects. Therefore, this analysis shows that the negative association between *PcFemale* and *RD1* holds even after controlling for managerial wealth and compensation, further supporting *H1*. It also continues to reject *H2* since it shows a positive relationship between *AvgAge1* and *RD1* that disappears with the inclusion of industry and year fixed effects.

In sum, with respect to the proportion of female executives on the TMT, the results of the main analysis persist across these different specifications. Mainly, the percentage of female executives is negatively associated with R&D investments, consistent with *H1*. Moreover, while the findings generally indicate that the average age of the TMT is not systematically related to R&D investments, the robustness checks provide mixed evidence in this regard. For instance, the coefficient of *AvgAge1* is negative when using an alternative measure of R&D (see Table 4.9) and positive in other models (see Tables 4.11 and 4.13). Hence, I reject *H2*, but further explore this issue in the following section.

4.6.3. CEOs versus CFOs: Gender, Age and R&D Investments

The results outlined in the previous section suggest that female representation on the TMT is negatively related to R&D investments. The results also show that the average age of the TMT and R&D investments are generally not systematically related. In this section, the roles of CEO and CFO gender and age on R&D investments are explored.

Following prior studies investigating the characteristics of both CEOs and CFOs (Chava and Purnanandam 2010; Jiang, Petroni, and Wang 2010; Kim, Li, and Zhang 2011), I estimate models for the CEO alone (Model 1), for the CFO alone (Model 2), and for both (Model 3). Moreover, Model 4 controls for managerial compensation and wealth,

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[99] See Section 3.6.2.3 in the preceding chapter for details on these variables.

for the reasons discussed in the preceding section. All of the models account for the industry and year fixed effects, are estimated using pooled OLS, and provide Huber-White standard errors that are corrected for heteroscedasticity. However, the models do not account for the firm fixed effect, as Zhou (2001) correctly argues that its inclusion is inappropriate when the variable of interest does not substantially vary within firms over time, as is also supported by Kim, Li, and Zhang (2011). All available observations are included, but the number of observations varies across the models due to data availability.

The results of this analysis are presented in Table 4.14. The coefficients of *CEO_Female* are negative and significant in Models 1,3, and 4. The significance levels vary from 1% to 10%, depending on the specifications. Similarly, the coefficients of *CFO_Female* are negative and significant, with the significance levels ranging from the 5% to 10% levels. The decline in the significance levels when two executives are included in one model is consistent with prior studies (e.g. (Kim, Li, and Zhang 2011)). The negative coefficients of *CEO_Female* are consistent with the findings of Elsaid and Ursel (2011) and Peltomäki, Swidler, and Vähämaa (2018) who also document a negative relationship between R&D investments and female CEOs. However, the negative association between female CFOs and R&D investments contradicts the findings of Peltomäki, Swidler, and Vähämaa (2018), who report a positive relationship between the two.

These findings enhance our understanding in several ways. First, they suggest that the observed negative relationship between *PcFemale* and *RD1* is partially determined by both CEO gender and CFO gender. Second, the divergence between the findings in this chapter and those of Peltomäki, Swidler, and Vähämaa (2018) could be attributed to the difference in the choice of controls or sample period. While their CFO data begin in 2006, this chapter uses a more comprehensive dataset covering the period 1992-2013.

One of the findings reported in the previous section is that *AvgAge* is not systematically related to R&D investments and, in some cases, related in different directions, although earlier studies document a negative relationship between CEO age and R&D investments (Barker and Mueller 2002; Chowdhury and Fink 2017; Li, Low, and Makhija 2017; Peltomäki, Swidler, and Vähämaa 2018; Serfling 2014).

The lack of a significant relationship between age and risky choices, such as R&D investments, is theoretically plausible since the experience gained from ageing could offset the risk-aversion associated with ageing (Worthy et al. 2011). Nevertheless, it might also be attributed to conflicting signs for different executives. This is possible because Table 4.3, which provides a correlation matrix, shows that CEO age and CFO age correlate with R&D in different directions. This additional analysis makes it possible to test for this possibility formally.

Table 4.14 shows that the coefficient of *Log_CEO_Age* is negative but insignificant in Model 1. Yet, once the CFO variables are included in Model 3, the coefficient of *Log_CEO_Age* becomes negative and significant at the 1% level. Similarly, the negative and significant coefficient of *Log_CEO_Age* persists after controlling for managerial compensation and wealth. These findings are consistent with those reported in the literature, and also with the view that older managers are associated with more conservative choices (Barker and Mueller 2002; Chowdhury and Fink 2017; Peltomäki, Swidler, and Vähämaa 2018; Serfling 2014). Interestingly, *Log_CFO_Age* is positive and significant at the 1% level in Models 2-4.[100] [101]

These findings enhance our understanding of the main analysis. First, they suggest that the lack of a statistically significant relationship between the average age of the TMT and R&D is due to the cancelling out effect. That is; because the coefficients of the CEO and CFO are significant at different directions; it is difficult to observe a meaningful relationship for the TMT as a single unit, which may explain why the UET promotes the examination of the TMT as one unit (Hambrick 2007; Hambrick and Mason 1984).[102]

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[100] In their working paper, Peltomäki, Swidler, and Vähämaa (2018) do not present the results on CFO age, and thus these cannot be compared to these findings. In addition, this finding opens up the possibility that CEOs and CFOs perceive the riskiness of R&D differently, but this may not be the case, given that the signs of *CEO_Female* and *CFO_Female* are in the same direction.

[101] I replaced *Log_CEO_Age* with a dummy marking CEOs whose age is above the average CEO age (55 years), and *Log_CFO_Age* with a dummy taking the value of 1 for CFOs whose age is above the average CFO (50 years). The results persist.

[102] It is worth noting that the data on the CFO on ExecuComp might be biased. Since ExecuComp mainly reports data on the five highest paid executives, it is possible that CFOs only appear when they are powerful (i.e. among the five top executives). That is; CFOs for whom data are available might be more powerful than other CFOs (Kim, Li, and Zhang 2011). This possibility may lend further support to the UET, which advocates investigating the TMT as a single unit.

In sum, the additional analysis suggests that the findings on the relationship between the percentage of female managers on the TMT and R&D investments are influenced by the gender of both the CEOs and CFOs. Further, while the average age of the TMT as a single unit is not systematically related to R&D investments, CEO (CFO) age is negatively (positively) related to R&D investments.[103]

The subsequent section concludes the chapter.

[103] This divergence calls for the testing of the linearity of the relationship between *AvgAge* and *RD1*, since CFOs are younger than CEOs, on average. Thus, I return to the main model and replace *AvgAge1* with three age dummies representing three age groups (Old TMT, Mid TMT, and Young TMT), omitting the Mid TMT indicator. However, the results do not show a non-linear relationship, which suggest that the lack of significance is not driven by misspecification.

4.7. Conclusion

R&D investments drive economic growth, and corporate R&D investments represent a significant share of the total R&D investments. For this reason, several studies aim to understand what determines the levels of R&D investments at the firm level. Most of the existing research tests for the determinants of R&D from the classical finance and economic point of view, assuming that individuals are rational decision-makers. However, recent studies have begun to relax this assumption and test for behavioural determinants of R&D (Abdel-Khalik 2014; Barker and Mueller 2002; Chen, Hsu, and Huang 2010; Daellenbach, McCarthy, and Schoenecker 1999). While such studies improve our understanding of R&D's behavioural determinants, several questions remain unanswered.

This chapter serves this purpose by examining the effect of TMT characteristics on R&D investments. The characteristics considered are the gender and age, while the unit of analysis is the TMT. Using S&P 1500 data for the period 1992-2013, I calculate the percentage of females (*PcFemale*) and the average age of the team (*AvgAge*), then examine whether or not they are related to R&D investments. This examination is built on three arguments; the Upper Echelons Theory, which suggests that the collective characteristics of the entire team influence their decisions (Hambrick and Mason 1984), the literature indicating that R&D investments are risky (Abdel-Khalik 2014), and the literature suggesting that gender and age influence managers' level of risk-aversion, which in turn influences their decisions as managers of the firm (Bertrand and Schoar 2003).

Two main findings have emerged. First, I document that the percentage of female managers on the TMT is negatively related to R&D investments. This finding persists under several robustness checks. This is consistent with the view that TMTs that contain more female executives may adopt more conservative policies, due to female risk-aversion or male overconfidence (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). Second, the analyses generally indicate that the average age of the TMT is unrelated to R&D investments. This is consistent with the view of Worthy et al. (2011) who argue that, although our risk-taking appetite may decline as we age, our additional experience may mitigate this decline.

To understand these findings more clearly, I conduct an additional analysis in which the relationship between managerial gender and age is examined at the CEO and CFO levels. I find that female CEOs and CFOs are negatively related to R&D investments, indicating that the relationship at the TMT level is, in part, driven by the CEOs and CFOs. Additionally, the results suggest that CEO age (CFO age) is negatively (positively) associated with R&D investments. Hence, the lack of a significant relationship between the average age of the TMT and R&D investments is due to cancelling out within the TMT, and so inconsistent with the view of Worthy et al. (2011).

The findings of this chapter could inform the decisions of corporate boards. For example, boards tasked with constructing TMTs could account for the role of managerial gender and age on R&D investments. Similarly, remuneration committees may consider these findings when designing managerial compensation packages.

Table 4.1

R&D Investments across Industries and over Time

This table shows the means of XRD (R&D expense) and total assets in nominal dollar values. It also shows R&D investment' proxy (*RD1*) over time and across the F&F 5 Industry groups. *RD1* is total R&D expense divided by total assets.

YEAR	XRD	ASSETS	RD1					
			Full Sample	Consumers	Health	HiTec	Manufacturing	Other
1992	106.10	2,944	3.30%	0.67%	8.24%	8.72%	1.75%	0.32%
1993	104.30	2,954	3.25%	0.70%	9.09%	8.18%	1.69%	0.24%
1994	103.14	2,969	3.64%	0.85%	11.32%	8.40%	1.68%	0.67%
1995	113.05	3,013	3.54%	0.79%	10.23%	8.16%	1.82%	0.45%
1996	109.08	3,117	3.90%	0.96%	10.64%	8.93%	1.84%	0.39%
1997	121.08	3,218	4.43%	0.68%	12.60%	9.57%	2.00%	0.83%
1998	131.43	3,509	4.71%	0.66%	12.27%	10.59%	1.96%	0.47%
1999	138.97	4,222	4.05%	0.60%	11.87%	8.43%	1.97%	0.46%
2000	163.14	4,975	3.63%	0.55%	8.51%	8.10%	1.88%	0.43%
2001	169.25	5,286	3.99%	0.63%	9.44%	8.66%	2.01%	0.47%
2002	162.48	5,251	3.90%	0.65%	8.84%	8.55%	1.87%	0.60%
2003	165.53	5,577	4.01%	0.61%	12.84%	7.63%	1.87%	0.44%
2004	175.97	6,027	3.51%	0.76%	8.31%	7.32%	1.81%	0.52%
2005	196.05	6,570	3.51%	0.83%	9.18%	7.06%	1.86%	0.45%
2006	220.45	6,587	3.40%	0.63%	8.51%	7.04%	1.73%	0.60%
2007	212.60	6,575	3.54%	0.62%	9.23%	6.97%	1.72%	0.44%
2008	229.33	6,566	4.89%	0.72%	10.84%	11.09%	1.82%	0.48%
2009	202.01	6,838	3.39%	0.59%	7.94%	6.97%	1.71%	0.54%
2010	228.61	7,553	3.16%	0.63%	7.28%	6.62%	1.65%	0.48%
2011	255.80	8,291	3.16%	0.70%	6.53%	6.96%	1.67%	0.53%
2012	278.19	8,957	3.17%	0.71%	6.29%	7.00%	1.69%	0.64%
2013	300.13	9,767	3.05%	0.71%	6.15%	7.07%	1.61%	0.13%
Average	**176.67**	**5,489**	**3.69%**	**0.69%**	**9.37%**	**8.09%**	**1.80%**	**0.48%**

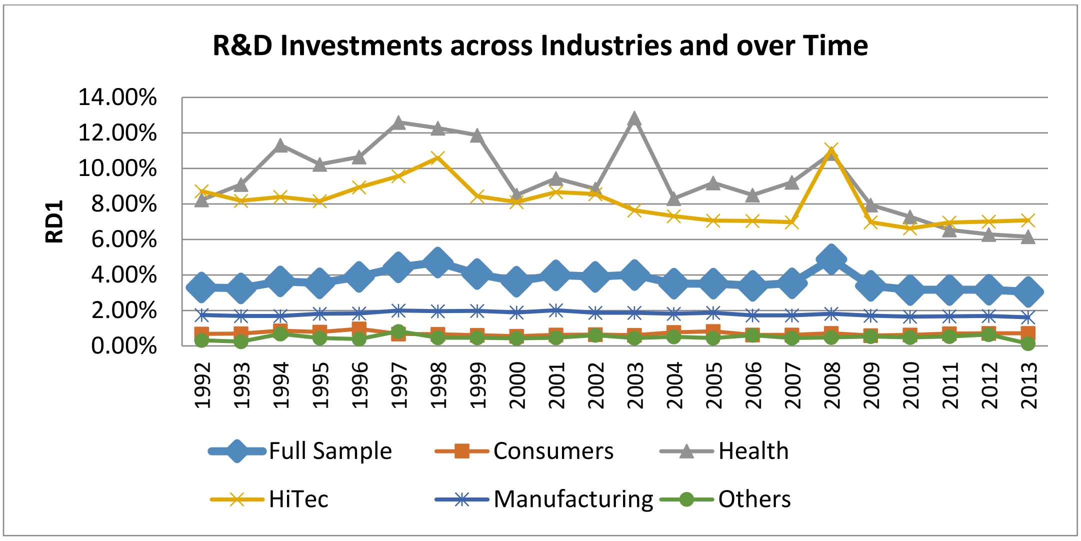

Figure 4.1 R&D Investments across Industries and over Time

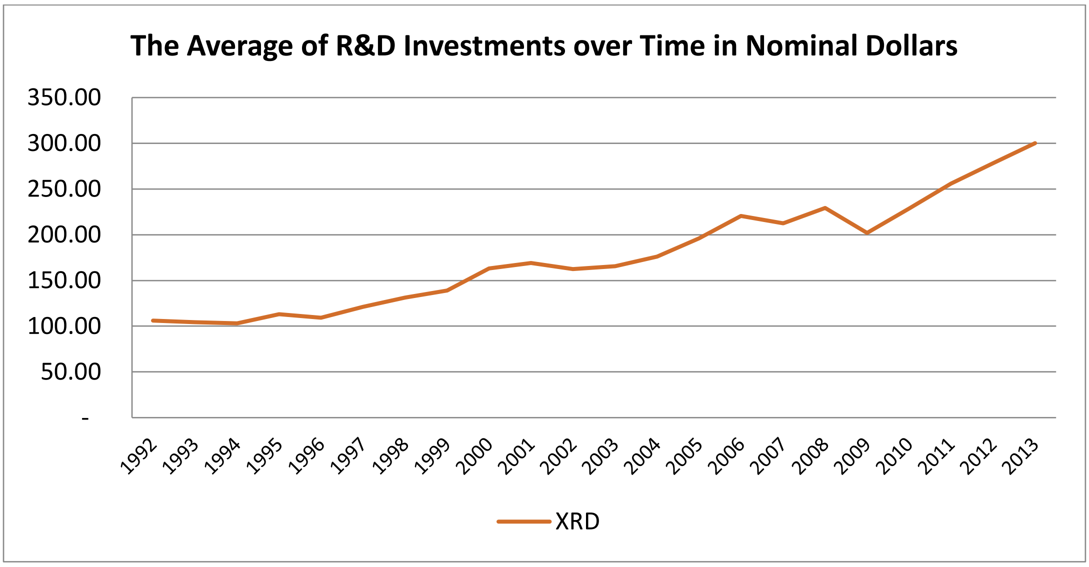

Figure 4.2 The Average of R&D Investments over Time in Nominal Dollars

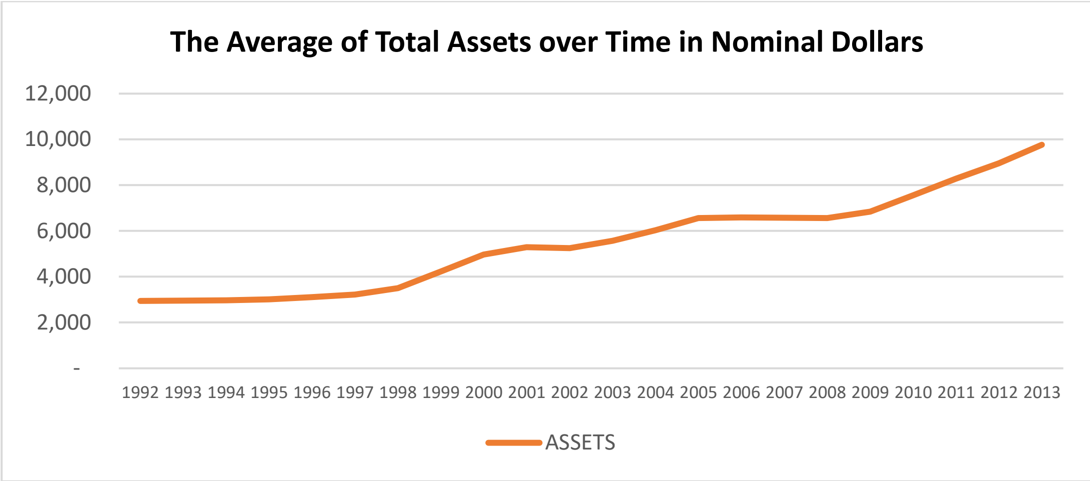

Figure 4.3 The Average of Total Assets over Time in Nominal Dollars

Table 4.2: Descriptive Statistics

The sample consists of 32,831 firm year observations for all firms available on ExecuComp for 1992-2013, excluding financial and utility firms. Executive data are from ExecuComp, and financial data are from Compustat. *XRD* is the dollar amount of R&D expenses. *RD1* is R&D expense scaled by total assets. *PcFemale* is the percentage of female executives on the TMT. *CEO_Female* and *CFO_Female* are dummies that take the value of 1 if the executive is female. *AvgAge* is the average age of the executives on the TMT in years. *CEO_Age* and *CFO_Age* are in years. *Avg_Tenure* measures the tenure of the TMT on average. *CEO_Tenure* and *CFO_Tenure* are in years. *MtB* is the market to book ratio. *Cash1* is cash and short term assets scaled by total assets. *ROA* is return on assets. *FirmAge* is the number of years since the firm was first listed on Compustat. *Assets* are the dollar value of total assets. *NWC* is working capital net of cash and short-term securities scaled by total assets. *Lev* is total debt scaled by total assets. *DeltaCap* is changes in capital, defined as debt and equity issuance net of debt and equity retirements. For all variables, all available observations are included.

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
XRD	20,748	$178	$21	$681	$0.00	$12,183
RD1	32,831	0.04	0.00	0.12	0.00	14.86
PcFemale	32,831	0.06	0.00	0.11	0.00	1.00
CEO_Female	29,542	0.02	0.00	0.15	0.00	1.00
CFO_Female	25,064	0.07	0.00	0.26	0.00	1.00
AvgAge	29,119	53.32	53.00	5.60	31.00	88.00
CEO_Age	28,232	55.46	55.00	7.64	27.00	96.00
CFO_Age	15,524	50.41	50.00	6.97	26.00	87.00
Avg_Tenure	32,820	4.61	4.17	2.63	1.00	22.00
CEO_Tenure	29,542	7.06	5.00	7.35	0.00	61.00
CFO_Tenure	25,064	4.13	3.00	5.15	0.00	44.00
MtB	32,050	2.20	1.64	2.44	0.20	151.18
Cash1	32,646	0.16	0.09	0.18	0.00	1.00
NWC	31,774	0.07	0.07	0.93	-131.09	1.00
Assets	32,655	$5,483	$990	$23,266	$0.00	$797,769
ROA	32,633	0.03	0.05	0.70	-103.00	35.51
FirmAge	32,831	23.49	19.00	16.35	0.00	64.00
Lev	32,524	0.23	0.20	0.85	0.00	120.94
CashFlowSD_10	31,281	0.07	0.04	0.54	0.00	57.23
DeltaCap	32,831	$-12	0.00	$1,127	$-38,695	$67,631

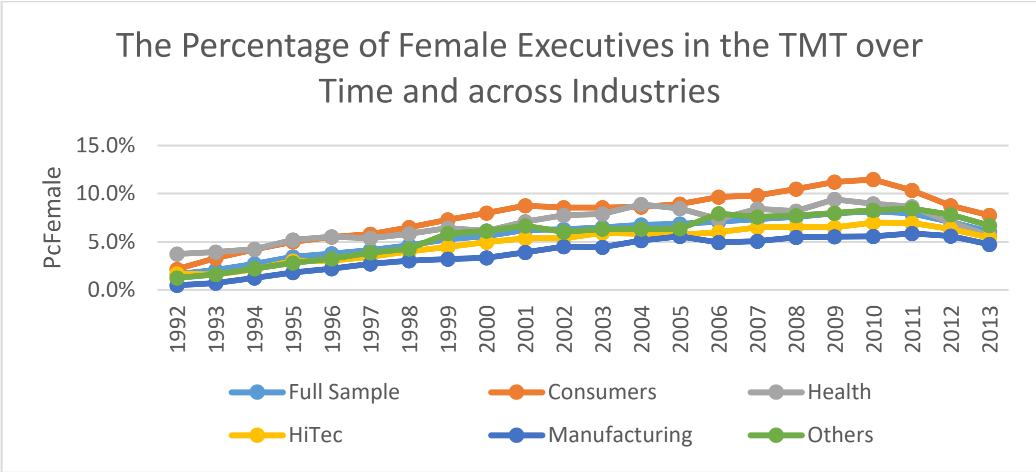

Figure 4.4 The Development of Female Representation in TMTs across Industries and over Time

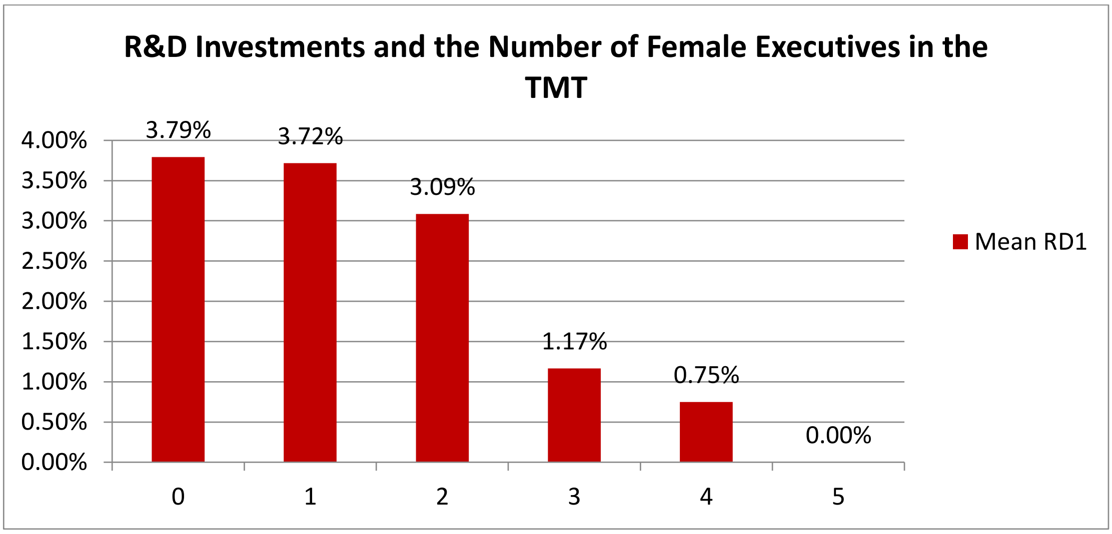

Figure 4.5 R&D Investments and the Number of Female Executives in the TMT

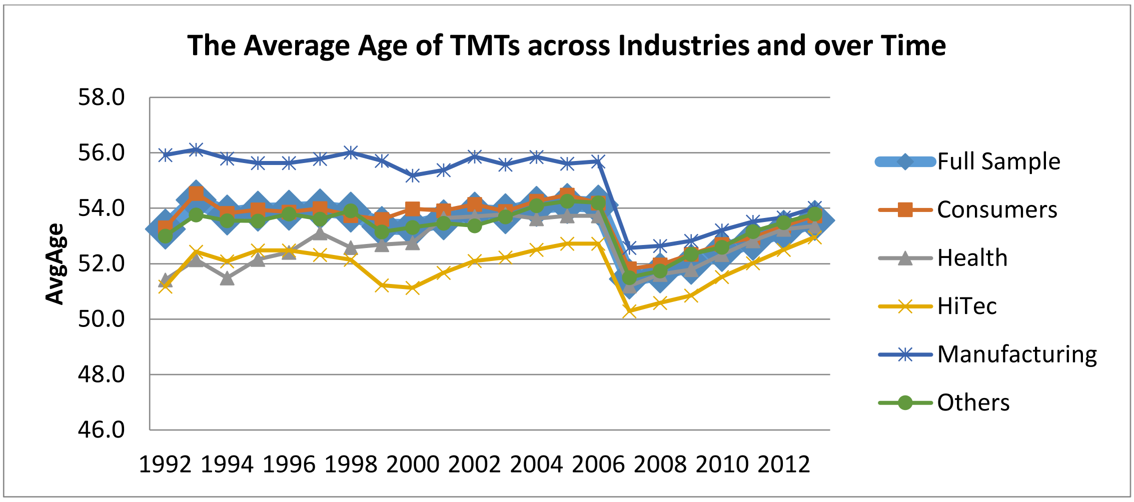

Figure 4.6 The Average Age of TMTs across Industries and over Time

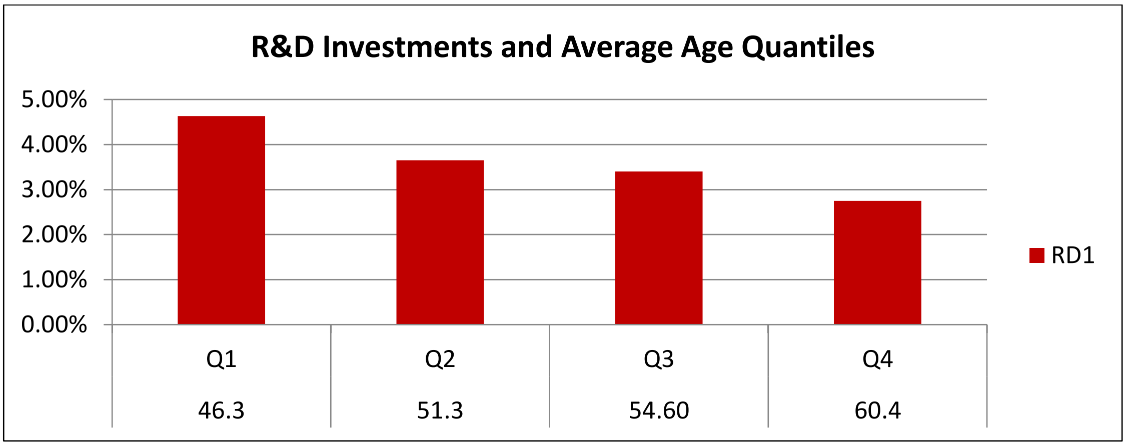

Figure 4.7 R&D Investments and Average Age Quantiles

Table 4.3

Correlation Matrix

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
11	RD1																		
22	PcFemale	-0.05																	
33	CEO_Female	-0.03	0.36																
44	CFO_Female	-0.03	0.46	0.05															
55	AvgAge1	-0.10	-0.07	-0.03	-0.04														
66	Log_CEO_Age	-0.10	0.00	-0.04	0.00	0.60													
77	Log_CFO_Age	0.02	-0.06	-0.01	-0.08	0.56	0.18												
88	Log_Avg_Tenure	-0.07	-0.02	0.00	0.01	0.36	0.25	0.21											
99	Log_CEO_Tenure	0.00	-0.02	-0.06	-0.02	0.18	0.37	0.07	0.30										
110	Log_CFO_Tenure	-0.02	-0.03	-0.05	-0.02	0.19	0.12	0.23	0.42	0.20									
111	MtB	0.30	0.00	-0.02	0.01	-0.08	-0.08	-0.02	-0.04	0.02	0.00								
112	Cash1	0.45	0.04	0.00	0.02	-0.16	-0.11	-0.05	-0.08	0.03	-0.04	0.25							
113	NWC_Orth	-0.28	-0.05	0.00	-0.03	0.10	0.08	0.02	0.01	-0.01	-0.01	-0.31	-0.39						
114	Size	-0.24	-0.02	0.00	0.02	0.21	0.12	0.15	0.23	-0.05	0.06	-0.15	-0.32	0.12					
115	ROA	-0.35	0.01	0.00	0.03	0.04	0.02	0.03	0.03	0.02	0.02	-0.35	-0.03	0.29	0.15				
116	Log_FirmAge	-0.10	-0.03	0.01	-0.01	0.38	0.23	0.25	0.39	-0.01	0.13	-0.13	-0.20	0.08	0.39	0.02			
117	Lev_Orth	0.14	-0.01	0.00	-0.01	0.03	0.01	0.01	0.02	0.01	-0.01	0.65	-0.05	-0.15	-0.02	-0.55	0.01		
118	CashFlowSD_10	0.07	-0.01	0.00	-0.01	-0.03	-0.04	-0.03	-0.04	-0.02	-0.03	0.07	0.04	-0.05	-0.08	-0.08	-0.06	0.08	
119	DeltaCap1	0.08	-0.06	-0.01	-0.02	-0.04	-0.02	-0.03	-0.09	0.00	-0.02	0.05	0.00	0.03	-0.04	-0.26	-0.07	0.06	0.04

Table 4.4
Difference in Means for R&D Investments (TMT Subsamples)

This table shows the differences in R&D investments as measured by *RD1*. The data are based on the full sample. *HighFemale* is for teams on which females represent 50% or more of the members. *MaleFemaleTeam* is for TMTs with at least one female executive. *CEO_Female* and *CFO_Female* are dummy variables that take the value of 1 if the executive is female. *HighAge* indicates teams whose executives' average age is higher than the average of the full sample.

TMT Characteristics	Yes	No	Difference	T-statistic
HighFemale	1.22%	3.73%	2.52%	3.466
MaleFemaleTeam	3.49%	3.79%	0.30%	1.960
CEO_Female	2.46%	3.63%	1.18%	2.389
CFO_Female	3.04%	3.52%	0.48%	2.636
HighAge	3.00%	4.17%	1.17%	7.977

Table 4.5
Difference in Means for R&D Investments (Firms' Characteristics Subsamples)

This table shows the difference of R&D investments as measured by *RD1*, for firms with different characteristics. Payers are firms that pay dividends and/or buyback their stocks in a given year. High Cash Holders are companies that report a cash balance as measured by *Cash1* that exceeds the average of *Cash1* for the sample. Acquirers are firms that report acquisitions activities in the year. Large firms are companies that are larger than the average, as measured by total assets

Firm Characteristics	Yes	No	Difference	T-statistic
High Cash Holders	7.27%	1.56%	-5.72%	-42.2409
Acquirers	3.04%	4.27%	1.23%	9.1208
Large Firms	2.20%	5.08%	2.88%	21.5048

Table 4.6

Difference in Means for R&D Investments (Industry Subsamples)

This table shows the difference in R&D investments, measured by *RD1*, across F&F's 5 industry groupings.

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	0.69%	4.78%	4.09%	26.9722
Health	9.39%	3.08%	-6.31%	-28.4676
HiTec	8.11%	2.19%	-5.92%	-39.2986
Manufacturing	1.80%	4.32%	2.52%	16.0969
Other	0.49%	4.23%	3.74%	19.2966

Table 4.7

OLS Regressions estimating the Determinants of R&D Investments (Main Model)

$$RD1_{it} = \propto_i + \beta_1 PcFemale + \beta_2 AvgAge1 + \beta_t Controls + \beta_t Industry \,\&\, Year\ Dummies +$$

The dependent variable for all models in this panel is *RD1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-0.0406*** **	**-0.0134** **
	(0.0076)	(0.0061)
AvgAge1	**0.0182**	**0.0062**
	(0.0131)	(0.0126)
Log_Avg_Tenure	**-0.0006**	**0.0035**
	(0.0024)	(0.0025)
MtB	**0.0058*** **	**0.0046*** **
	(0.0011)	(0.0010)
Cash1	**0.1050*** **	**0.0576**
	(0.0356)	(0.0368)
ROA	**-0.1084**	**-0.1049**
	(0.0720)	(0.0707)
Log_FirmAge	**0.0061*** **	**0.0015**
	(0.0019)	(0.0016)
Size	**-0.0073*** **	**-0.0072*** **
	(0.0020)	(0.0021)
CashFlowSD_10	**0.0026**	**0.0018**
	(0.0026)	(0.0024)
NWC_Orth	**-0.0246* **	**-0.0294* **
	(0.0144)	(0.0160)
Lev_Orth	**-0.0053**	**-0.0042**
	(0.0115)	(0.0116)
DeltaCap1	**0.1425**	**0.1396**
	(0.0969)	(0.0972)
Constant	**-0.0243**	**0.0596**
	(0.0418)	(0.0377)
Observations	27,291	27,291
R-squared	0.2651	0.3056
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.8

OLS Regressions estimating the Determinants of R&D Investments (Alternative Controls)

The dependent variable for all of the models in this panel is *RD1* for each firm in year t. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Both models use alternative controls. *Log_Sale* substitutes for *Size*, and *CashFlowSD_5* replaces *CashFlowSD_10*. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 after the orthognolisations of *NWC* and *Lev*. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-0.0375*** **	**-0.0131** **
	(0.0073)	(0.0060)
AvgAge1	**0.0180**	**0.0067**
	(0.0130)	(0.0123)
Log_Avg_Tenure	**-0.0008**	**0.0033**
	(0.0023)	(0.0025)
MtB	**0.0061*** **	**0.0048*** **
	(0.0011)	(0.0010)
Cash1	**0.0950*** **	**0.0510**
	(0.0342)	(0.0360)
ROA	**-0.1077**	**-0.1044**
	(0.0722)	(0.0710)
Log_FirmAge	**0.0070*** **	**0.0018**
	(0.0016)	(0.0014)
Log_Sale	**-0.0081*** **	**-0.0073*** **
	(0.0018)	(0.0019)
CashFlowSD_5	**0.0020**	**0.0014**
	(0.0025)	(0.0025)
NWC_Orth	**-0.0247***	**-0.0295***
	(0.0143)	(0.0160)
Lev_Orth	**-0.0055**	**-0.0043**
	(0.0115)	(0.0116)
DeltaCap1	**0.1351**	**0.1348**
	(0.0974)	(0.0976)
Constant	**-0.0198**	**0.0583**
	(0.0450)	(0.0396)
Observations	27,282	27,282
R-squared	0.2663	0.3055
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.9

OLS Regressions estimating the Determinants of R&D Investments (Alternative Measure for R&D)

The dependent variable for all of the models in this panel is *Log_XRD* for each firm in year t. It is defined as the natural logarithm of R&D investments (1+XRD), where missing XRD are set to zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 after the orthognolisation of *NWC* and *Lev*. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-1.8268*** **	**-0.1794** **
	(0.1101)	(0.0832)
AvgAge1	**0.0821**	**-0.8052*** **
	(0.1194)	(0.0891)
Log_Avg_Tenure	**-0.2445*** **	**-0.1203*** **
	(0.0266)	(0.0231)
MtB	**0.1266*** **	**0.0600*** **
	(0.0122)	(0.0069)
Cash1	**4.6252*** **	**2.2877*** **
	(0.0857)	(0.0782)
ROA	**-0.2452*** **	**-0.1539** **
	(0.0942)	(0.0754)
Log_FirmAge	**0.3890*** **	**0.0767*** **
	(0.0211)	(0.0156)
Log_Sale	**0.4178*** **	**0.5746*** **
	(0.0108)	(0.0087)
CashFlowSD_10	**0.0514*** **	**0.0119**
	(0.0101)	(0.0080)
NWC_Orth	**-0.0652*** **	**-0.1527*** **
	(0.0161)	(0.0192)
Lev_Orth	**-0.1965*** **	**-0.1088*** **
	(0.0202)	(0.0152)
DeltaCap1	**0.1598**	**0.1258**
	(0.1080)	(0.0919)
Constant	**-2.0325*** **	**1.9241*** **
	(0.4631)	(0.4831)
Observations	27,292	27,292
R-squared	0.1856	0.5925
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.10

Fama-MacBeth Regression estimating the Determinants of R&D Investments

The dependent variable for all of the models in this panel is *RD1* for each firm in year t. *RD1* is defined as R&D expenses and scaled by total assets. Model 1 includes the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The model is estimated using Fama-MacBeth's two-step procedure. The maximum observations available are included. The Fama-MacBeth standard errors are shown in parentheses.

VARIABLES	(1) Model 1
PcFemale	**-0.0367*** **
	(0.0051)
AvgAge1	**0.0097**
	(0.0080)
Log_Avg_Tenure	**-0.0029**
	(0.0020)
MtB	**0.0114*** **
	(0.0023)
Cash1	**0.1294*** **
	(0.0098)
ROA	**-0.2106*** **
	(0.0350)
Log_FirmAge	**0.0020* **
	(0.0010)
Size	**-0.0003**
	(0.0012)
CashFlowSD_10	**0.0417*** **
	(0.0124)
NWC_Orth	**-0.0041**
	(0.0057)
Lev_Orth	**-0.0249**
	(0.0220)
DeltaCap1	**0.0176**
	(0.0191)
Constant	**-0.0392**
	(0.0349)
Observations	27,291
Average R-squared	0.4819
Industry FE	NO
Year FE	NO

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.11

Tobit Regressions estimating the Determinants of R&D Investments

The dependent variable for all of the models in this panel is *RD1* for each firm in year t. *RD1* is defined as R&D expenses and scaled by total assets. Model 1 includes the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-0.1405*** **	**-0.0342*** **
	(0.0276)	(0.0122)
AvgAge1	**0.0653** **	**0.0113**
	(0.0277)	(0.0203)
Log_Avg_Tenure	**-0.0118*** **	**0.0001**
	(0.0037)	(0.0039)
MtB	**0.0112*** **	**0.0075*** **
	(0.0022)	(0.0017)
Cash1	**0.2552*** **	**0.1051*** **
	(0.0175)	(0.0365)
ROA	**-0.1972**	**-0.1863**
	(0.1220)	(0.1198)
Log_FirmAge	**0.0240*** **	**0.0045** **
	(0.0055)	(0.0021)
Size	**-0.0048**	**-0.0030**
	(0.0030)	(0.0032)
CashFlowSD_10	**0.0040**	**0.0008**
	(0.0025)	(0.0022)
NWC_Orth	**-0.0265**	**-0.0419* **
	(0.0166)	(0.0224)
Lev_Orth	**-0.0234**	**-0.0199**
	(0.0175)	(0.0171)
DeltaCap1	**0.1191**	**0.1271**
	(0.1140)	(0.1221)
Constant	**-0.3664*** **	**-0.0642**
	(0.1352)	(0.0956)
Observations	27,291	27,291
Pseudo R2	0.8335	1.8209
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.12

OLS Regressions estimating the Determinants of R&D Investments (Lead R&D Investments)

The dependent variable for all of the models in this panel is *RD1* for each firm in year t+1. All of the models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 after the orthognoliation of *NWC* and *Lev*. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-0.0402*** **	**-0.0139*** **
	(0.0046)	(0.0044)
AvgAge1	**0.0098**	**0.0006**
	(0.0079)	(0.0099)
Log_Avg_Tenure	**-0.0002**	**0.0039***
	(0.0020)	(0.0023)
MtB	**0.0041*** **	**0.0030*** **
	(0.0010)	(0.0011)
Cash1	**0.1623*** **	**0.1197*** **
	(0.0087)	(0.0113)
ROA	**-0.0467** **	**-0.0447** **
	(0.0221)	(0.0214)
Log_FirmAge	**0.0011**	**-0.0024*** **
	(0.0008)	(0.0007)
Size	**-0.0051*** **	**-0.0053*** **
	(0.0015)	(0.0017)
CashFlowSD_10	**0.0051**	**0.0043**
	(0.0033)	(0.0031)
NWC_Orth	**0.0007**	**-0.0012**
	(0.0019)	(0.0021)
Lev_Orth	**-0.0058**	**-0.0046**
	(0.0049)	(0.0049)
DeltaCap1	**0.0251**	**0.0197**
	(0.0194)	(0.0191)
Constant	**0.0013**	**0.0580***
	(0.0279)	(0.0349)
Observations	27,291	27,291
R-squared	0.0947	0.1263
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.13

OLS Regressions estimating the Determinants of R&D Investments (Controlling for Delta, Vega, and Wealth)

The dependent variable for all of the models in this panel is *RD1* for each firm in year t. All of the models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are augmented with the natural logarithms of average delta, average vega, and average wealth for the TMT. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5 for the variables of interest. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**-0.0422*** **	**-0.0119*** **
	(0.0030)	(0.0030)
AvgAge1	**0.0187*** **	**0.0038**
	(0.0042)	(0.0042)
Log_Avg_Tenure	**-0.0028*** **	**0.0044*** **
	(0.0009)	(0.0011)
Log_Avg_Delta	**-0.0081*** **	**-0.0141*** **
	(0.0026)	(0.0024)
Log_Avg_Vega	**0.0087*** **	**0.0072*** **
	(0.0004)	(0.0004)
Log_Avg_Wealth	**0.0043** **	**0.0108*** **
	(0.0021)	(0.0020)
MtB	**0.0071*** **	**0.0059*** **
	(0.0010)	(0.0009)
Cash1	**0.1387*** **	**0.0949*** **
	(0.0045)	(0.0045)
ROA	**-0.1651*** **	**-0.1568*** **
	(0.0165)	(0.0163)
Log_FirmAge	**0.0035*** **	**-0.0001**
	(0.0006)	(0.0006)
Size	**-0.0054*** **	**-0.0054*** **
	(0.0005)	(0.0005)
CashFlowSD_10	**0.0342*** **	**0.0307*** **
	(0.0094)	(0.0086)
NWC_Orth	**-0.0013**	**-0.0116*** **
	(0.0012)	(0.0015)
Lev_Orth	**-0.0166*** **	**0.0172*** **
	(0.0047)	(0.0057)
DeltaCap1	**0.0121**	**0.0060**
	(0.0083)	(0.0080)
Constant	**-0.0647*** **	**0.0059**
	(0.0194)	(0.0208)
Observations	25,465	25,465
R-squared	0.4156	0.5073
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.14

OLS Regressions estimating the Determinants of R&D Investments (CEO/CFO)

The dependent variable for all of the models in this panel is *RD1* for each firm in year t. Model 1 includes *CEO_Female*, a dummy taking the value of 1 if the CEO is female, *Log_CEO_Age*, the natural logarithm of *CEO_Age*, and a set of controls. Model 2 includes *CFO_Female*, a dummy taking the value of 1 if the CFO is female, *Log_CFO_Age*, the natural logarithm of *CFO_Age*, and a set of controls. Model 3 includes the CEO and CFO variables, while Model 4 is expanded by the inclusion of executives' compensation and wealth variables as controls. All models include year and industry dummies, based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for the variables of interest does not exceed 5. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) CEO	(2) CFO	(3) CEO/CFO	(4) CEO/CFO
CEO_Female	**-0.0071*** **		**-0.0051** **	**-0.0050***
	(0.0024)		(0.0025)	(0.0026)
CFO_Female		**-0.0033** **	**-0.0024***	**-0.0025***
		(0.0013)	(0.0014)	(0.0014)
Log_CEO_Age	**-0.0033**		**-0.0267*** **	**-0.0208*** **
	(0.0096)		(0.0042)	(0.0046)
Log_CFO_Age		**0.0192*** **	**0.0196*** **	**0.0257*** **
		(0.0045)	(0.0047)	(0.0051)
Log_CEO_Tenure	**-0.0012**		**0.0013** **	**0.0015** **
	(0.0009)		(0.0006)	(0.0007)
Log_CFO_Tenure		**-0.0003**	**-0.0002**	**0.0002**
		(0.0006)	(0.0006)	(0.0006)
Log_CEO_Delta				**-0.0015**
				(0.0025)
Log_CFO_Delta				**-0.0070*** **
				(0.0025)
Log_CEO_Vega				**0.0022*** **
				(0.0006)
Log_CFO_Vega				**0.0028*** **
				(0.0008)
Log_CEO_Wealth				**0.0014**
				(0.0020)
Log_CFO_Wealth				**0.0054*** **
				(0.0020)
MtB	**0.0042*** **	**0.0056*** **	**0.0051*** **	**0.0057*** **
	(0.0010)	(0.0008)	(0.0009)	(0.0008)
Cash1	**0.0540**	**0.1051*** **	**0.1079*** **	**0.0848*** **
	(0.0411)	(0.0062)	(0.0066)	(0.0072)
ROA	**-0.1040**	**-0.0832*** **	**-0.0848*** **	**-0.1408*** **
	(0.0735)	(0.0194)	(0.0212)	(0.0320)
Log_FirmAge	**0.0026**	**-0.0026*** **	**-0.0020** **	**0.0002**
	(0.0020)	(0.0008)	(0.0008)	(0.0011)
Size	**-0.0076*** **	**-0.0021*** **	**-0.0022*** **	**-0.0046*** **
	(0.0023)	(0.0005)	(0.0006)	(0.0007)
CashFlowSD_10	**0.0014**	**0.0013**	**0.0011**	**0.0574** **
	(0.0023)	(0.0013)	(0.0013)	(0.0240)
NWC_Orth	**-0.0328***	**-0.0013**	**-0.0012**	**-0.0111*** **
	(0.0182)	(0.0011)	(0.0013)	(0.0023)
Lev_Orth	**-0.0044**	**-0.0073*** **	**-0.0070*** **	**0.0175** **
	(0.0118)	(0.0025)	(0.0027)	(0.0086)
DeltaCap1	**0.1509**	**-0.0050**	**-0.0119**	**-0.0182**
	(0.1098)	(0.0101)	(0.0114)	(0.0115)
Constant	**0.1057*** **	**-0.0440** **	**0.0620** **	**-0.0026**
	(0.0246)	(0.0218)	(0.0259)	(0.0279)
Observations	24,407	12,220	11,325	9,897
R-squared	0.3045	0.4477	0.4480	0.4900
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix: Descriptions of the Variables

Managerial Variables			
Variable	**Definitions**	**Proxy For**	**Source**
PcFemale	Percentage of female executives to total number of executives available in the database	Managerial Gender	ExecuComp
HighFemale	A dummy variable that takes the value of 1 if *PcFemale* is larger than 50%; 0 otherwise.		
MaleFemaleTeam	A dummy variable that takes the value of 1 if the TMT has at least one female manager; 0 otherwise.		
CEO_Female	A dummy that equals 1 if the CEO is female; 0 otherwise.		
CFO_Female	A dummy that equals 1 if the CFO is female; 0 otherwise.		
AvgAge	Average age of all executives available. For the regressions, I use the log of this value.	Managerial Age	
HighAge	A dummy variable that takes the value of 1 if *AvgAge* of the team is higher than that of the sample; 0 otherwise.		
CEO_Age	The age of the CEO. For the regressions, I use the log of this value.		
CFO_Age	The age of the CFO. For the regressions, I use the log of this value.		
Avg_Tenure	The average tenure of all TMT members. The natural logarithm of this variable is used in the regressions.	Managerial Tenure	
CEO_Tenure	The tenure of the CEO. The natural logarithm is used in the regressions.		
CFO_Tenure	The tenure of the CFO. Regressions include the natural logarithm of this value.		
Log_Avg_Delta	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the stock price of the firm.	Performance-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CEO_Delta	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the stock price of the firm.		
Log_CFO_Delta	The natural logarithm of the dollar change in the wealth of the CFO per a 1 percent change in the stock price of the firm.		
Log_Avg_Vega	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the standard deviation of the stock price of the firm	Risk-based compensations	
Log_CEO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm		
Log_CFO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm		
Log_Avg_Wealth	The natural logarithm of the average dollar value of the TMT executives' wealth in the firm.	Executives Wealth	
Log_CEO_Wealth	The natural logarithm of the dollar value of the CEO executives' wealth in the firm.		
Log_CFO_Wealth	The natural logarithm of the dollar value of the CFO executives' wealth in the firm.		

Financial Variables from Compustat			
Variable	**Definitions**	**Data Items**	**Proxy For**
RD1	Research and development expenses scaled by total assets (any missing value = 0)	*XRD/AT*	R&D Investments
Log_XRD	The natural logarithm of R&D expense	*XRD*	
MtB	(Book value of assets - Book Value of Equity + Market value of equity)/total assets	*(AT + CSHO*PRCC - CEQ)/AT*	Growth opportunity
Cash1	Cash and short-term assets scaled by total assets	*Cash Holdings (CHE/AT)*	Cash holdings
High Cash Holders	A dummy that takes the value of 1 when the firm reports Cash1 that is higher than average; 0 otherwise.	*Cash1*	
ROA	Return on assets	*IB/AT*	Performance
FirmAge	The time since the firm was first listed on Compustat. For the regressions, I use *Log_FrimAge*, which is the natural logarithm of *FirmAge*.	*First year listed in Compustat*	Firm Age
Size	Natural logarithm of total assets	*Log(AT)*	Firm size
Log_Sale	Natural logarithm of sales	*Log(Sales)*	
Large Firm	A dummy that takes the value of 1 when the firm Size that is higher than average; 0 otherwise.	*Size*	
CashFlowSD_10	The rolling standard deviation for the companies' cash flows for the past 10 years (minimum 3 years).	*SD(CashFlow)*	Volatility of cash flows
CashFlowSD_5	The rolling standard deviation for the companies' cash flows for the past 5 years (minimum 3 years).		
NWC	(Working capital - cash and short-term assets) scaled by total assets. *NWC_Orth* is the orthogonal value of *NWC* with respect to leverage.	*(WCAP-CHE)/ AT*	Cash alternative
Payers	A dummy variable that takes the value of 1 if the firm has a payout (dividends or stock repurchases); 0 otherwise	*DVC & PRSTKC*	Payout
DeltaCap1	The natural logarithm of debt and equity issuance - debt and equity retirement/repurchase (any missing value = 0)	*(DLTIS+SSTK-DLTR-PRSTKC)*	Change in Capital
Acquirer	A dummy variable that takes the value of 1 if the firm invests in acquisitions; 0 otherwise	*AQC*	Cash outflows/ Growth opportunity/ Collateral availability
Lev	Total debt scaled by total assets. *Lev_Orth* is the orthognlized value of Lev with respect to *NWC*.	*(DLTT + DLC)/AT*	Risk (higher probability for financial distress)/ Cost of holding cash

Chapter 5 Executives' Characteristics and Payout Policy

JEL Classification: G40, G35, G32, J10

Keywords: Gender Risk-aversion, Age Risk-Aversion, Overconfidence, TMT, Upper echelons theory, Corporate Governance, Payout Levels, Payout Methods

5.1. Introduction

John D. Rockefeller once said "Do you know the only thing that gives me pleasure? It's to see my dividends coming in" (DeAngelo, DeAngelo, and Skinner 2009). Despite his pleasure, Miller and Modigliani (1961) argue that dividends are irrelevant if markets were perfect. No wonder that Black (1976) declares "the harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don't fit together". For this reason, scholars have been investigating the various aspects of the payout policy.

Earlier studies have examined dividends, which used to be the most common, if not the only, payout method. It can be argued that the study of payout policy was limited to dividend levels. This is no longer the case, given the increasing popularity of stock repurchases as a method of distributing cash to shareholders (Skinner 2008). In fact, Grullon and Michaely (2002) argue that shares repurchases have become the largest payout method. Consequently, the payout decisions for companies are no longer limited to deciding whether they distribute cash to their shareholders or not, but also include how to make this distribution (Bonaimé, Harford, and Moore 2017). As a result, the study of the payout policy has expanded to include the payout levels and payout methods.

Many studies have examined the factors that determine payout levels and payout methods (Brav et al. 2005). While these studies make significant contributions to our understanding of the payout policy, they largely limit their investigation to firm, industry, and country characteristics. However, in their synthesis of the payout literature, DeAngelo, DeAngelo, and Skinner (2009) suggest that the existing models, based on the agency theory of cash flow (Jensen 1986) and valuation problems (Myers and Majluf 1984), do not perform well in explaining the choice between payout method (i.e. stock repurchases or dividends). They also emphasise that managerial bias, such as overconfidence, is important in determining the payout policy.

More recent studies have begun to investigate whether managerial characteristics influence firms' payout policies. For example, Nicolosi (2013) finds that the demographic characteristics of the CEO influence the firm's dividend yields. Other studies link CEO overconfidence to stock repurchases completion rates (Andriosopoulos, Andriosopoulos, and Hoque 2013) and payout level (Deshmukh, Goel, and Howe 2013). Also, CEO inside debt positively influences dividend payout (Caliskan and Doukas 2015).

While these studies focus on the CEO,[104] Hambrick and Mason (1984) emphasise the importance of studying the observable characteristics of the top management team (TMT) as a single unit, since CEOs tend to share their responsibilities and authority with their fellow TMT members. Therefore, this chapter examines whether TMT gender and age play a role in determining the payout levels and payout methods.

The first set of analyses examines the influence of managerial gender and age on the amount distributed to the shareholders (payout levels). The results indicate that the proportion of female executives on the TMT and the payout levels are positively related. Given that the alternative to distributing cash is investing it (Caliskan and Doukas 2015), a potential explanation for this is that TMTs that contain more female executives prefer payout to investment due to female risk-aversion or male overconfidence. Further, I find some evidence of a negative relationship between the TMT average age and payout level. It is possible that older TMT are less concerned about their careers, due to their longer records (Serfling 2014; Yim 2013), and thus prefer risker choices (i.e. investments) over payout. Furthermore, I extend this analysis by investigating the roles of CEO and CFO gender and age on the payout amount. I find some evidence that female CFOs are positively associated with the payout level while CFO age is negatively related to it, suggesting that CFOs have a greater influence over the payout level decision.

Additionally, managers need to decide on the payout method after deciding the payout level (Bonaimé, Hankins, and Harford, 2014; Eisdorfer, Giaccotto, and White, 2015). Accordingly, the second part of this chapter investigates whether managerial gender and age are related to the proportion of stock repurchases to the total payout (payout

[104] Another strand of literature considers the influence of the *board's* characteristics on firm payout policy. For example, female directors positively influence payout levels to reduce Jensen's (1986) agency problem (Byoun, Chang, and Kim 2016; Chen, Leung, and Goergen 2017; Pucheta-Martínez and Bel-Oms 2016). Moreover, female directors increase the likelihood of a buyback programme (Evgeniou and Vermaelen 2017), and reduce payout levels (Saeed and Sameer 2017).

flexibility). The analysis shows that the proportion of female executives on the TMT and the flexibility of the payout policy are positively related. Given that relying on stock repurchases improves the financial flexibility of the firm (Bonaimé, Hankins, and Harford 2014), it is possible that TMTs that contain more females prefer to maintain the financial flexibility of the firm since they are less overconfident or more risk-averse. Further, the results indicate that the average age of the TMT and the flexibility of the payout policy are negatively related. This is consistent with the view that younger managers adopt more conservative policies because they do not have a long record of success that can shield them when they fail (Serfling 2014; Yim 2013). The additional analysis shows that CEO and CFO age are negatively related to the flexibility of the payout policy.

Collectively, these results suggest that female managers are associated with a more conservative payout policy by increasing the payout levels and maintaining the financial flexibility of the firm (i.e. not establishing future commitments), consistent with the view that female managers adopt more conservative policies (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). They also suggest that older TMTs adopt a less conservative payout policy by reducing the amount paid to the shareholders and the financial flexibility of the firm, in line with the view that younger managers adopt more conservative policies (Serfling 2014; Yim 2013).

This chapter contributes to several strands of the literature. First, it adds to the studies investigating the effects of various managerial characteristics on payout policy (Andriosopoulos, Andriosopoulos, and Hoque 2013; Deshmukh, Goel, and Howe 2013; Nicolosi 2013). These studies are mainly focused on the CEO. In contrast, this chapter shows that the characteristics of the TMT as a single unit and that of the CFO are also relevant to the payout policy. In doing so, it provides evidence consistent with the view of Hambrick and Mason (1984) that corporate outcomes are better explained when managerial characteristics are considered. Furthermore, by showing that the CFO might be more influential in setting the payout level, this chapter adds to emerging literature examining the influence of CEOs and CFOs on the firm (Chava and Purnanandam 2010; Jiang, Petroni, and Wang 2010; Kim, Li, and Zhang 2011).

Second, conflicting views exist regarding whether stock repurchases are perfect substitute for dividends (DeAngelo, DeAngelo, and Skinner 2000; Grullon and Michaely 2002; Jagannathan, Stephens, and Weisbach 2000). The results in this chapter suggest that different managerial characteristics are systematically related to one payout method or the other, in line with the view that stock repurchases are not perfect substitutes for dividends (Andriosopoulos and Hoque 2013; Chay and Suh 2009).

Third, Jurkus, Park, and Woodard (2011) provide evidence that the percentage of female managers on the TMT is positively related to dividend payout and suggest that this increase is a method by which female managers reduce the agency costs. I extend their work in two directions. In particular, I show that this relationship holds when examining total payout, and offer an alternative explanation drawn from the literature, suggesting that female managers adopt more conservative policies.

Lastly, the chapter adds to a growing body of literature linking managerial gender and age to the riskiness of the corporate polices (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Serfling 2014; Yim 2013). This chapter provides new evidence from the payout policy that females and younger managers are associated with more conservative policies.

The rest of this chapter is organised as follows. Section 5.2 surveys the payout policy literature. Section 5.3 develops the hypotheses. Section 5.4 explains the data used in this chapter. Section 5.5 provides descriptive statistics. Section 5.6 presents the analysis and the results regarding payout levels (5.6.1) and payout methods (5.6.2). Section 5.7 closes the chapter.

5.2. Literature Review

Following the seminal work of Lintner (1956) and Miller and Modigliani (1961), researchers have proposed and examined various theoretical frameworks for payout policy. DeAngelo, DeAngelo, and Skinner (2009) provide an extensive review and synthesis of this literature. The purpose of this section is to present a brief overview of this literature. This section begins by outlining the relevant theoretical and empirical evidence on payout policy, and then proceeds to survey the literature on the relationship between managerial characteristics and payout policy.

5.2.1. Theories and Empirical Evidence on Payout Policy

The work of Lintner (1956) and Miller and Modigliani (1961) is central to the payout policy literature. Lintner (1956) interviews several executives from 28 companies (CEOs, CFOs, treasurers, controllers and directors) and makes several observations. First, firms target a long-term dividend ratio. Second, managers pay more attention to dividend changes than to the amount paid. Third, the changes in dividends are driven by sustainable rather than temporary changes in earnings. Fourth, managers are concerned with reducing dividends and are unwilling to introduce dividend increases that might be reversed in the future. Regarding this, he asserts: "It was equally clear that these elements of inertia and conservatism and the belief on the part of many managements that most stock holders prefer a reasonably stable rate and that the market puts a premium on stability or gradual growth in rate were strong enough that most managements sought to avoid making changes in their dividend rates that might have to be reversed within a year or so" (p.99). This reluctance to cut dividends led to the proposal of the partial adjustment model, which predicts dividends based on previous dividends, earnings, a targeted payout ratio, and an adjustment speed factor. He finds that this model explains 85% of the changes in dividends for his sample.

In direct contrast with Lintner (1956)'s model, which suggests that dividends matter, Miller and Modigliani (1961) theorise that, in a perfect capital market, the payout policy does not matter. This is the case under various assumptions, such as symmetric information, zero tax and bankruptcy costs, and investors' rationality. Their theory also implies that the payout method (i.e. repurchases vs. dividends) does not matter either. However, once the assumptions of the MM-Irrelevancy proposition are relaxed to mimic reality, the payout policy starts to become relevant.

In this context, we can identify two strands of literature. The first relates to payout levels, and the other focuses on the methods by which these cash distributions to the shareholders are made. It is worth noting that many dividends theories may apply to total payout since dividends used to be the dominant payout method (Skinner 2008). In line with this view, Allen and Michaely (2003) argue that both dividends and shares repurchases represent cash distribution to shareholders and create a positive market reaction.

5.2.1.1. Payout Levels

Prior studies investigate payout levels not only from the shareholders' perspective (demand side) but also from that of the managers (supply side). The relevance of the payout level is consistent with Lintner (1956)'s model, and also with Miller and Modigliani (1961)'s proposition, once their assumptions are relaxed. Several theories have been developed and tested to examine the corporate payout policy. In their comprehensive review of the payout policy literature, DeAngelo, DeAngelo, and Skinner (2009) conclude that the framework of information asymmetry that merges the work of Jensen (1986) and Myers and Majluf (1984) explains payout levels and their timing, and to a lesser extent the type of payout (dividend vs. stock repurchase). They also argue that the theories of the demand side (i.e. investors rather than firms' managers) do not explain the size of the cash distributions to the shareholders, the association between the payout level and profit, and the timing of the payout over the lifespan of the firm. This conclusion motivates the research on payout policy from the supply side.

Information Asymmetry

A key assumption in Miller and Modigliani (1961)'s model is information symmetry, which may not hold in reality. Since managers possess more information about the firm than do external investors, they can better gauge the current and future conditions of the firm. Consequently, it is possible that these informed insiders will use dividends as a method for delivering additional information to outsiders, who possess less information about the firm. Miller and Modigliani (1961) argue that changes in dividends influence the stock price, but this is not because dividends are relevant to the value but rather because of the information content released with these changes in dividends. For instance, when managers increase dividends, they signal to the market a positive prospect for the firm's future cash flow. This signal is influential because it is initiated by insiders who have better knowledge of the conditions of the firm. Alternatively, increasing the dividends may send a negative signal to the market. While investors can see an increase in dividends as a sign of better cash flow in the future, they might equally perceive it as a lack of future investment opportunities (Allen and Michaely 2003). That is; investors may perceive cash distribution as an alternative to investments.

Models based on information asymmetry and payout signalling have been developed theoretically and tested empirically. For example, Bhattacharya (1979) and Ross (1977) point to the information advantage of managers and suggest that they use dividends to signal additional information to outsiders. Both studies document that firms with significant levels of information asymmetry paid more dividends to shareholders to signal their future expectations regarding firm performance (Pucheta-Martínez and Bel-Oms 2016). Similarly, Deshmukh, Goel, and Howe (2013) report a strong negative relationship between dividends and assets' tangibility, which serve as a proxy for information symmetry. In contrast, Fama and French (2001) use the information asymmetry hypothesis to explain why smaller firms have a lower propensity to pay dividends. In particularly, smaller firms suffer more from information asymmetry, which hinders their ability to issue securities when they require finance. In turn, this may suggest that such firms follow a pecking-order model and refrain from paying dividends in order to finance their investments. Further, DeAngelo, DeAngelo, and Skinner (1996) study the information content of dividends for a sample of NYSE companies and find no evidence to support the view that dividends carry information related to future performance.

Agency Theory

Jensen and Meckling (1976) propose that, since the interests of managers and shareholders are not always aligned, managers may use firms' resources in ways that benefits themselves rather than investors. This led Jensen (1986) to propose his theory that extends the manager-investor conflict to free cash flow. Indeed, Jensen's (1986) theory relaxes the assumption of market perfection found in (Miller and Modigliani 1961). He asserts that managers are inclined to increase the size of the firm beyond the optimum because of the positive relationship between firm size and managerial compensation. Since growing the firm might come at the cost of value destroying investments, shareholders are predicted to demand a larger payout in order to reduce the resources at management's disposal. Further, Jensen (1986) suggests that stock repurchases financed by debt may create the required incentive to encourage managers to avoid the free cash flow problem. In his view, the disciplining mechanism is the threat of failing to repay the debt or its interest. In a similar vein, Easterbrook (1984) presents a model in which dividends act as a disciplining mechanism for managers. He argues that a higher payout level may push the firm to seek external capital, thereby subjecting the firm to the scrutiny of the market.

Empirically, several scholars have reported that better governance could play a role in payout policy. For instance, the payout policy is influenced by ownership structure (Renneboog and Trojanowski 2011) and investors' protection within the country (La Porta et al. 2000). From the managers' point of view, Brav et al. (2005) report that managers do not see dividends as a mechanism for self-imposing discipline. In fact, 87% of the surveyed executives report that the disciplining of dividends is not an important factor in determining dividend payout. Interestingly, most companies report that dividends do not represent a better disciplining mechanism than stock repurchases, even when acknowledging the financial flexibility associated with the latter.

Life Cycle Theory

Fama and French (2001) document the decline in dividend payments, which they term "the disappearing dividend puzzle". They investigate the firm-specific factors for dividend payers, and whether this decline is due to a change in these characteristics or to other factors. They show that firm size and profitability increase the likelihood of a firm paying dividends, while the availability of investment opportunities reduces their propensity to pay dividends. They also show that firms with "payer" characteristics are now less likely to pay dividends and attribute this to a fall in the perceived advantages of dividends over time. Further, they document a large increase in stock repurchases since the 1980s, and suggest that this rise is not a dividend substitution. This is because most of the repurchases are undertaken by companies that already pay dividends.

The life cycle theory has been studied extensively. For example, DeAngelo, DeAngelo, and Stulz (2006) test the dividend life cycle theory using a sample of US industrial firms and find that firms whose equity is mostly earned (rather than contributed) pay more dividends. In other words, mature firms distribute more cash to their shareholders. Also, Krieger, Lee, and Mauck (2013) suggest that payout policy is better explained by the life cycle of the firm. They report that firms' size, age, and earning volatility are good explanatory variables for payout policy. Notably, the life-cycle of the firm seems to be important in explaining the payout levels and methods too. This is in line with the argument that dividend theories may also explain stock repurchases behaviours (Allen and Michaely 2003).

5.2.1.2. Payout Methods

Turning to payout method, several theoretical models and empirical tests seek to explain the payout method by considering the supply (managers) and demand (investors) sides. For instance, Allen, Bernardo, and Welch (2000) seek to explain the choice of the payout method by looking at tax, under the assumption that managers choose the payout method that minimises the taxation for investors. However, executives suggests that tax systems are not important factors in setting the payout policy, even after dividend tax was lowered in 2003 (Brav et al. 2005). Further, since DeAngelo, DeAngelo, and Skinner (2009) argue that supply side models better explain the payout policy, this subsection focuses on the supply side studies.

Payout Methods: Supply Side

Ofer and Thakor (1987) provide one of the earliest studies on this area. They assert that managers can signal insider information by conducting a payout which can be either dividends or stock repurchases. While these two methods are similar in the sense that they both represent cash outflow which increases the possibility of the firm requiring external funds, shares repurchases represents an additional risk specific to the manager who owns shares in the firm. Precisely, while dividends will provide the managers with cash, which represents a reduction in their investment in the firm, shares repurchases will increase their investment (i.e. exposure) in the firm.[105] They consequently conclude that signalling via repurchases costs more and will only be used when the misevaluation of the firm is larger. In other words, resorting to repurchases signals a larger undervaluation. They confirm this by documenting a better stock price reaction for repurchases over that of dividends, regardless of the payout size.

Extending this argument, if managers' perception about the future outlook of the firm is better than that of the market, managers will resort to repurchases (Allen and Michaely 2003). Based on this argument, one can predict that overconfident managers are more inclined to use buybacks instead of dividends as their payout method. However, a counter argument can be deducted from the sticky nature of dividends. To the extent that dividends are sticky, managers will only use them if they believe that they are sustainable, implying that overconfident managers may in fact use dividends when their perception of the future outlook is positive.

Nonetheless, not all dividends are sticky and commit managers to further payouts. Special dividends represent an exception to the sticky nature of dividends since they should signal that these dividends are not reoccurring. In this vein, Barclay and Smith (1988) observe the percentage of firms in NYSE that participate in different forms of payout between 1983 and 1986. They show that, over this period, the average percentage of firms paying regular dividends was 80%, open market repurchases was 19.27%, intra-firm tender offers was 0.76%, targeted repurchases was 2.81%, and only 2.22% of the firms paid special dividends. This is consistent with the findings of DeAngelo, Deangelo, and Skinner (2000), who assert that special dividends have become "a rare phenomenon" (p.310). They explain this by arguing that special dividends were used to signal that these dividends are temporary rather than

[105] It is worth noting that this argument assumes that managers do not/cannot sell their shares during the repurchasing process.

permanent, as signalled via regular dividends but, over time, special dividends became equally predictable as regular dividends and therefore cease to convey this message. Therefore, to the extent that special dividends are used for signalling purposes, they should disappear.

The sticky nature of dividends has been crucial in the efforts to understand payout policy. For instance, Jagannathan, Stephens, and Weisbach (2000) argue that dividends and repurchases are not complete substitutes but are used differently. This is mainly because of the flexibility of stock repurchases compared to dividends, which have an inherent commitment to future payouts. They suggest that stock repurchases are used to distribute higher unsustainable or non-operating cash flows, while dividends are used to distribute sustainable operating cash flows. They also report that stock repurchases are used when the stock market performance is lower compared with when they pay cash dividends.

Similarly, Guay and Harford (2000) observe that companies use dividends and repurchases for payout purposes and hypothesise that the choice between these two alternatives depends in part on the stability of the cash-flow increases.[106] Since companies are not obligated to actually conduct share repurchases after the announcement, managers may prefer shares repurchases over dividends when they lack confidence about the permanence or scale of the current cash-flow increases. This is because repurchases are less sticky than dividends and therefore more flexible. They confirm this prediction by showing that the cash-flows increases are more permanent for firms that chose dividends over repurchases. Further, this implies that the information content differs between the two payout methods since dividends signal a permanent cash flow. Testing this prediction, they report that the announcement of dividends is followed by a higher return compared to the announcement of share repurchases.

Grullon and Michaely (2002) observe that, in 1999 and 2000, for the first time in history, shares repurchases became the prominent form of payout and proposed that this trend can be attributed to managers substituting their dividends with buybacks.

[106] Guay and Harford (2000) examine the payout announcement rather than the actual cash distribution.

Further, they suggest that stock repurchases are more likely to be initiated by younger firms, further supporting the life-cycle theory. Similarly, Skinner (2008) documents a large increase in stock repurchases. He examines the relationship between earnings and payout policy and shows that it has changed over the last 30 years. He reports that some repurchases are indeed a substitute for dividends. His results show that stock repurchases represent a larger fraction of the changes in the earnings paid to shareholders.

However, Jain, Shekhar, and Torbey (2009) report results that imply that stock repurchases and dividends are not perfect substitutes by studying the determinants of firms’ payout method following their IPOs. Since initiating a payout is received positively by the market, they report that the payout method does not matter to the market, based on their observation that the market return following either of these two announcements does not differ systematically. In other words, investors are indifferent regarding whether they receive their cash payments in dividends or in stock repurchases. Yet, they report that dividends and stock repurchases are adopted by firms with different characteristics.

Andriosopoulos, and Hoque (2013) point out that the study of Jain, Shekhar, and Torbey (2009) only considers firms that are moving from the high to low growth stages since their data are limited to IPO firms. They therefore expand the analysis of the determinants of the choice between shares repurchases and dividends to a sample of European countries. This setting enables them to observe which firm-specific factors determine stock repurchases after controlling for country-specific factors. They report that firm size, dividend level, and ownership concentration influence the announcement of buybacks in these countries. They also report that stock returns do not contribute to the explanation of buyback announcements. However, German firms that are undervalued are more likely to announce a repurchase programme. Cash holdings and firm growth opportunities only influence these announcements in the UK. These findings may indicate that the relationship between firm characteristics and payout policy is context-specific.

Bonaimé, Hankins, and Harford (2014) contend that firms' financial flexibility could be influenced by both the direct risk management and payout decision. To the extent that financial flexibility represents the ability to evade the risk of underinvestment and financial distress, stock repurchases may improve it. Their evidence suggests that hedging and payout decisions are substitutes. In particular, they document that the proportion of stock repurchases to total payout (i.e. payout flexibility) is negatively associated with financial hedging. Consequently, they conclude that stock repurchases function as an operational hedging mechanism.

Overall, two main arguments can be observed with respect to the payout method. The first considers dividends and stock repurchases as substitutes, while the second proposes that these are distinct. The literature seems to support the notion that dividends and stock repurchases are not perfect substitutes. Further, the argument that payout method is better explained by the supply side (DeAngelo, DeAngelo, and Skinner 2009) finds support in the literature. Several firm characteristics seem to influence the payout method.

Prior studies extended the supply side explanations to include managerial characteristics. The next section reviews the relevant literature within this strand, paying particular attention to managerial gender and age - the focus of this thesis.

5.2.2. Executives' Characteristics and Payout Policy

Several studies investigate the influence of gender diversity on payout policy, assuming a relationship between gender diversity and the free cash flow problem, as in (Jensen 1986). This strand of literature is mainly focused on gender diversity at the board level. These studies are motivated by the work of Adams and Ferreira (2009), who document that gender diverse boards devote more effort to monitoring, leading to the prediction that this diversity could reduce the free cash flow problem.

For example, Byoun, Chang, and Kim (2016) report that gender and racially diverse boards have a higher likelihood of paying dividends and are associated with larger dividends. They indicate that diversity at the board level could reduce the shareholder-manager conflict around the free cash flow. In a similar vein, Pucheta-Martínez and Bel-Oms (2016) build on the agency theory and argue that female directors are more likely to push for governance mechanisms, such as dividend payments. They report that the proportion of female directors is positively related to dividend payouts. Similarly, Chen, Leung, and Goergen (2017) argue that female directors are more likely to use dividend payments as a governance device to reduce Jensen's (1986) cash flow problem. They find that the proportion of female directors on the board influences dividends positively, and this relationship holds in companies with weaker governance.

Other studies have incorporated arguments other than the free cash flow problem. For instance, Saeed and Sameer (2017) advance two possibilities with respect to the relationship between board gender diversity and dividends. First, because female directors improve governance and dividend payout is one of its mechanisms, which reduces the excess cash in the hands of management, they argue for a positive relationship between board gender diversity and dividend payouts. Second, since women are more risk-averse and consequently more likely to maintain larger cash balances for precautionary motives, they may reduce their dividend payout in order to maintain a large cash reserve. Using a panel of Indian, Chinese, and Russian firms for the period 2001-2014, their evidence supports the risk-aversion hypothesis of a negative relationship between gender diversity and dividend payouts.

Evgeniou and Vermaelen (2017) focus on stock repurchases announcements and the associated excess returns. They argue that, since female directors improve governance, they are more likely to make a buyback announcement to reduce the free cash flow problem. Alternatively, they contend that, since buybacks are more likely to happen when the company is undervalued and women are less able to spot undervaluation when it occurs (i.e. the male information advantage hypothesis), the higher the percentage of female directors, the less likely the firm is to announce share repurchases. They find support for the first argument by documenting that a higher percentage of female directors increases the likelihood of a buyback programme.

Interestingly, this strand of literature is mainly focused on directors as opposed to managers. Yet, a growing body of literature is investigating the influence of managerial characteristics on corporate payout policy. While the board of directors is the final decision-maker regarding the payout policy, executives could also have an effect on this policy. First, since executives influence other decisions, such as investments (Bertrand and Schoar 2003; Faccio, Marchica, and Mura 2016; Yim 2013), this could have an impact on the cash flow available for distribution. This trade-off between investments and payout has plausible theoretical reasons. Jensen (1986) frames the free cash flow problem as one between managers, who may not use funds wisely (e.g. non-optimal investments), and shareholders, who wish to curb such incentives. Abandoned funds in the company could therefore lead to overinvestment (Allen and Michaely 2003). Fama and French (2001) report that R&D investments and dividend payouts are negatively related, plausibly pointing to a trade-off between payout and R&D investments. Second, managers could also directly influence the corporate payout policy as boards consider the recommendations of the management when setting the corporate policies. DeAngelo, DeAngelo, and Skinner (2009) assert that behavioural bias, such as managerial overconfidence, could play a significant role in determining the payout policy. Therefore, a growing body of literature is investigating the role of managerial characteristics on corporate payout policy.

Jurkus, Park, and Woodard (2011) investigate the effect of the presence of female managers on the TMT on agency costs, with the prediction that female managers reduce the agency costs, based on the findings of Adams and Ferreira (2009).

Although their study does not focus on payout policy, one of their proxies for agency costs is the dividends payout ratio, since it reduces the funds available for overinvestments. Using a sample of 668 firms with 3172 firm-year observations, they find a positive relationship between female representation and the dividend payout, ratio using OLS regressions. However, the significance of this relationship disappears when they consider reverse causality and address endogeneity using a firm-fixed effect and instrumental variable approach.

While their work enhances our understanding, one can argue that using a firm-fixed effect may not consider the fact that female representation does not vary greatly over time, causing this relationship to disappear when investigated within firms. In other words, the influence of female representation is captured with other time-invariant characteristics when employing a firm-fixed effect model (see (Zhou 2001) for a discussion on this methodological issue).

Further, DeAngelo, DeAngelo, and Skinner (2009) call for the broadening of the scope of agency costs to include managerial bias, such as overconfidence or other types of hubris. They argue that this bias produces agency costs that are distinct from those arising from intentional misconduct, which dominates the literature on agency theory. In the context of this chapter, this may imply that, even when the agents (managers) seek to serve the interests of their principles rather than their own interests (i.e. not entrenched and well-intentioned), their level of risk tolerance could play a role in determining the payout levels. Theoretically, different managers could perceive reality differently, leading to different decisions (Hambrick 2007; Hambrick and Mason 1984). For instance, a risk-averse (overconfident) manager could possibly prefer a higher (lower) payout level if the alternative is investments. Assuming bounded rationality, it is possible that both the risk-averse and overconfident managers are seeking to maximise the welfare of their principles, even though they may act differently.[107]

[107] It is also possible that one of these two types of managers (risk-averse vs. overconfident) is closer to the optimal choice.

The influence of risk-tolerance on payout policy has been investigated. Broadly, Bae, Chang, and Kang (2012) propose that, in masculine cultures, managers may prefer a lower dividend policy so that they can use the funds to exploit any investment opportunities that may arise in the future. This argument requires the assumption that firms face a trade-off between investments and payouts. They document that firms located in cultures with high levels of masculinity and uncertainty avoidance are negatively associated with dividends. In contrast, Breuer, Rieger, and Soypak (2014) document that a country's level of risk-aversion and masculinity are positively associated with dividends. While these studies point to the importance of behavioural bias in determining payout levels, a drawback of their settings is the lack of distinguishing between the supply and demand sides of payouts. In particular, whether the driver of such behaviour is the risk-aversion of investors or that of managers is poorly understood. This calls for investigating the influence of managerial risk-related characteristics on payout policy. Indeed, several studies have examined the influence of managerial characteristics on various aspects of the payout policy.

Nicolosi (2013) examines whether CEOs' demographics affect firms' dividends policy in the US. She observes that managers who are married, those with children, Christians, and Republicans follow a high yield dividend policy. This type of manager is also associated with declining firm performance. Nicolosi (2013) concludes that managers with a traditional background are more optimistic and therefore "overuse dividends as a means of signalling superior future firm performance" (p.55). Nonetheless, these results could be interpreted differently. Executives with a traditional background may prefer more conservative policies, such as a higher dividend policy. This is possible because religious (Hilary and Hui 2009) and Republican managers (Hutton, Jiang, and Kumar 2015) are associated with more conservative corporate policies. Further, having children increases the need for financial security, possibly leading to more conservative decisions (Hambrick and Mason, 1984). Meanwhile, a higher payout policy constitutes a more conservative choice (Bernile, Bhagwat, and Yonker 2018; Caliskan and Doukas 2015).

Deshmukh, Goel, and Howe (2013) note that overconfident CEOs may increase the dividends if they believe that the firm will generate better cash flows in the future. Alternatively, overconfident managers may reduce the dividends because of their optimism regarding future investment opportunities. That is, these managers may reduce the payout levels in order to finance investments, given the trade-off between investments and payouts. Using a US sample from 1980 to 1994, they find that overconfident managers reduce the dividends, and also report that the negative relationship between dividend level and growth opportunity differs between firms managed by overconfident managers and others. More precisely, the difference in the dividend payout levels between growth firms and others is weaker for a sample of overconfident managers, indicating that these managers have a more optimistic perception of future investment opportunities.

These studies are mainly focused on dividends. Yet, Fama and French (2001) and Skinner (2008) show that stock repurchases have become a major payout method. Consequently, recent research has started to study the drivers of stock repurchases as well as incorporating stock repurchases when investigating corporate payout levels.

Ben-David, Graham, and Harvey (2007) propose a model in which overconfident managers[108] could: 1) underestimate the volatility of their firms' cash flow; and/or 2) use a lower discount rate compared to unbiased managers. This leads to the empirical implication that overconfident managers invest more than unbiased ones. They report that firms with overconfident CFOs make larger investments and are less likely to pay dividends, while being more likely to conduct shares repurchases. Importantly, they find evidence in line with the argument that overconfident managers do not pay dividends in order to finance investments.

Andriosopoulos, Andriosopoulos, and Hoque (2013) link CEO overconfidence to shares repurchases completion rates, recognising that the announcement of buybacks *per se* may not be followed by an actual transaction. This is because: 1) overconfident managers perceive their firms to be more undervalued; and 2) managers time their repurchases for when the firm is undervalued. The researchers argue that overconfident managers should have a higher completion rate for the announced

[108] Overconfident individuals overestimate the accuracy of their decisions and underestimate risks.

repurchase programme. Using a sample of UK data, they support their argument. They also report that CEO age is positively related to completion rate.

Shu et. al. (2013) propose that, since overconfident managers are more likely to perceive the firm as being undervalued, they might be associated with more stock repurchases. Using a Taiwanese sample, they support their argument by documenting that managerial overconfidence is positively associated with shares repurchases.

Banerjee, Humphery-Jenner, and Nanda (2018) note that the empirical evidence on whether managers time repurchases for when the firm is undervalued is inconclusive. They adopt a similar view, arguing that, since overconfident CEOs overvalue their companies and future investments, they might be more likely to conduct stock repurchases.[109] Importantly, they acknowledge the alternative possibility that overconfident managers may prefer investments over repurchases. They find that these managers repurchase stocks with lower cash holdings and are more responsive to declines in stock prices.

Moreover, Srivastav, Armitage, and Hagendorff (2014) contend that, because debt-based compensation (i.e. inside debt) aligns the interests of the debt holders with those of the managers, CEOs who receive a large proportion of their compensation in debt format are more likely to reduce their payout levels. They suggest that a lower payout level among banks is a conservative policy. As debt holders, CEOs will reduce their payouts in order to maintain a good cash balance to meet their future claims. Using a dataset of US banks from 2007-2011, the researchers find empirical evidence to support their argument. Specifically, they show that CEOs' inside debt causes them to reduce the level of payout through being more likely to cut both dividends and repurchases.

Also, Eisdorfer, Giaccotto, and White (2015) propose that managers with significant pension holdings are less likely to follow a high dividend strategy since this will affect their future pension benefits. Additionally, they hypothesise that managers

[109] It is worth noting that it is possible that managers begin by setting the payout level before setting the payout method (Bonaimé, Hankins, and Harford 2014; Eisdorfer, Giaccotto, and White 2015). Once these decisions have been made, the managers can time the repurchases for when they perceive stock price undervaluation.

decide on the payout method only after deciding on the optimal payout amount. Because of the inherent future commitment associated with dividends, managers with inside debt may be reluctant to choose dividends over repurchases, since this will leave the company with fewer resources to meet their future pension payments. The researchers find evidence that managers with pensions pay fewer dividends, and that inside debt negatively influences the dividends net of stock buybacks. [110]

While Srivastav, Armitage, and Hagendorff (2014) argue that a lower payout policy is conservative – at least in banks – Caliskan and Doukas (2015) consider payout as a substitute for a risker alternative, which is making new investments that can produce positive results. Therefore, they suggest that a higher payout is a conservative policy that a risk-averse manager is likely to adopt. They proxy for CEO risk-aversion using inside debt (pension and deferred compensation) and the sensitivity of equity compensation to changes in stock price (delta). They find that CEOs with high levels of inside debt[111] have a higher propensity to forgo investment opportunities and choose to make a cash distribution via dividends to the shareholders, while the convex compensation (Vega) reduces their propensity to pay. While it is not the focus of their study, the researchers report that CEO age is not a significant determinant of payout policy.

Overall, the existing literature contributes to our knowledge in several ways. Broadly, the influence of managerial characteristics on payout policy is examined using two frameworks; namely, the agency problem and managerial risk-aversion. First, studies drawing on the agency theory predict that managerial characteristics associated with better governance can reduce the free cash flow problem by increasing the payout level. Second, studies building on the managerial risk-aversion or overconfidence frameworks provide contradicting arguments regarding the payout level and payout method. For the payout level, one prediction is that risk-averse managers reduce their payout level in order to maintain higher cash balances for

[110] This variable is measured as (dividends + (stock repurchases – issuance))/ total assets.
[111] Inside debt data are only available from 2006, and therefore are not considered in this study since it will require forgoing a large proportion of the data set used in this chapter (1992-2006).

precautionary reasons,[112] while the other holds that risk-averse managers might pay more in order to avoid the risker alternative of investing in uncertain projects. Similarly, contradictory arguments exist with respect to payout method. From an agency point of view, stock repurchases represent another way to distribute free cash flow in order to curb agency costs. From a risk point of view, a risk-averse manager could prefer shares repurchases, given that repurchases provide financial flexibility. Alternatively, if undervaluation is a precondition for repurchases, overconfident managers are more likely to prefer them since they are more likely to perceive their firms as being undervalued.

This study aims to complement this literature in two ways. First, it overcomes the limitation found in many studies that limits the analysis of payout to dividends only, despite the rise of stock repurchases as a competing payout method (Skinner 2008). Second, it focuses on the effect of TMT gender and age on both payout level and payout method. The next section develops the hypotheses to examine whether managerial gender and age determine payout levels and payout methods.

[112] The underlying assumption of this line of reasoning is that a higher payout is necessarily accompanied by a reduction in cash holdings, which are used to withstand financial distress (i.e. a precautionary motive). While holding cash could be less risky than paying shareholders, it is not the only alternative to payouts. In particular, firms could increase their payouts by reducing their investments while still maintaining, or even increasing, their cash holdings.

5.3. Hypotheses Development

Theoretical reasoning and empirical evidence suggest that managerial risk preferences could play a role in setting corporate policies. Assuming bounded rationality, Hambrick and Mason (1984) argue that managerial observable characteristics could alter managers' perceptions of reality and how they respond to it. In turn, this could affect their risk-taking behaviour. Specific to the payout policy, DeAngelo, DeAngelo, and Skinner (2009) assert that behavioural bias, such as managerial overconfidence, could play a significant role in determining the payout policy. Farre-Mensa, Michaely, and Schmalz (2014) point out that managers observe a relationship between risk and payout policy. The existing literature provides evidence that managerial risk tolerance could influence the outcome of the firm (Bertrand and Schoar, 2003; Cain and McKeon, 2016), particularly the payout policy (Caliskan and Doukas 2015). For example, Deshmukh, Goel, and Howe (2013) report a negative association between CEO overconfidence and dividend payout. They suggest that overconfident managers reduce the payout levels to take advantage of investments. Hence, it is possible that managerial characteristics affecting managerial risk-taking can partly explain the corporate payout policy.

Gender and age are two characteristics that have been theorised and documented as affecting the risk tolerance of individuals and executives. First, scholars in the psychology field have investigated the relationship between gender and risk-taking (see Chapter 2 for details). These studies provide strong evidence that females take less risks than males due to female risk-aversion or male overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). Scholars have advanced the alternative possibility that these findings may not hold for executives, who may differ from the average individual (Faccio, Marchica, and Mura 2016). Empirical evidence supports the idea that female executives are associated with a reduction in corporate risks. This association is explained by female risk-aversion or male overconfidence (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). Consequently, these arguments lead to two empirical predictions. It is possible that managerial gender is unrelated to the conservativeness of the payout policy, given the lack of a systematic difference in risk-taking at the executive level. Otherwise, female executives might be associated with more conservative payout policies.

Second, the psychology literature provides mixed evidence on the relationship between age and risk-taking (Bonem, Ellsworth, and Gonzalez 2015) (see chapter 2 for details). Drawing on several strands of the literature, the investigation of the relationship between executive age and the riskiness of the firm reveals several possibilities (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Older executives may prefer more conservative policies, given that they have a shorter career horizon and accordingly prefer projects whose paybacks appear in the near future. This is also possible since older executives have well-established reputations that reduce their incentive to signal their superior performance. Moreover, Hambrick and Mason (1984) advance the possibility that older executives are more conservative because age is associated with a reduction in cognitive and physical energy, a greater commitment to the present state of the company, and a greater social responsibility, that lead to an additional emphasis on financial security. The empirical implication of these arguments is to find a positive association between managerial age and the conservativeness of the corporate payout policy.

Alternatively, older executives could also adopt more aggressive policies, given that their reputation might protect them should they fail (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Jian and Lee (2011) report a positive market perception of investments associated with reputable managers. To the extent that reputation and age are positively associated, these findings support the argument that older executives could take more risks. As a result, managerial age could be negatively associated with the degree of conservativeness of the payout policy. Further, it is also possible that the relationship between ageing and risk-taking is negative in nature, but is adjusted by mature managers with more experience, since experience is positively associated with risk-taking (Worthy et al. 2011). In this case, it is theoretically possible to observe that no relationship exists between ageing and managerial risk-taking. Empirical studies investigating managerial age support the view that older executives are associated with more conservative policies (Bertrand and Schoar 2003; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), with some exceptions, such as Iqbal (2013).

Furthermore, while the existing studies are mainly focused on the CEO, Hambrick and Mason (1984) and Hambrick (2007) point to the importance of examining executives' characteristics at the TMT level as a single unit. Even when the CEO is the most important decision-maker, they contend that CEOs work within their teams, with whom they share the tasks and responsibilities. They also argue that their approach allows for capturing the central tendency of the team. Their argument assumes that the risk-aversion level of other TMT members (apart from the CEO) could also influence the riskiness of the firm.

This idea finds support in both the psychology and finance literature. First, Wallach, Kogan, and Bem (1962) report that the decisions made by groups are influenced by the risk-taking behaviour of the group members. For example, if a TMT has a risk-averse manager who influences the R&D investment decisions, the firm could reduce their R&D investments, leading to more funds available for shareholders. Also, to the extent that managers function as a team, they may influence the payout policy directly by preferring a more conservative policy. Second, the existing empirical studies show that executives other than the CEO may have more influence over some corporate policies (Aggarwal and Samwick 2003; Bertrand and Schoar 2003; Chava and Purnanandam 2010). Thus, it is important to investigate the influence of executives' characteristics at the TMT level.

5.3.1. Payout Levels and Risks

Farre-Mensa, Michaely, and Schmalz (2014) report that "managers see a connection between risk reduction and dividend increases" (p.112). This chapter adopts the view of Caliskan and Doukas (2015) that a higher payout policy is less risky since the alternative could be investing in risky projects. This is consistent with the finding of Fama and French (2001) that non-dividend payers invest more in R&D. Similarly, Grullon and Michaely (2004) report that firms conducting repurchasing programmes decrease their capital expenditure and R&D investments.[113] Moreover, Grullon, Michaely, and Swaminathan (2002) report a decline in systematic risks for firms that increase their dividends and an increase for those that reduce them.[114] Similarly, Fama and French (2002) find that higher payout levels are related to lower systematic risks. Also, Allen and Michaely (2003) suggest, based on a review of the literature, that the existing evidence points to a decline in investments following repurchases announcements. Building on these arguments, Caliskan and Doukas (2015) consider payout as a substitute for risker alternatives and report that risk-averse managers pay more dividends in order to avoid the risker choice of investments. They find similar results when examining total payouts (dividends + repurchases). Moreover, firms with dividend payouts are less constrained since they could reduce their dividends in order to boost their funds (Brown, Fazzari, and Petersen 2009). Bliss, Cheng, and Denis (2015) find evidence that firms use payout reduction to finance their projects when a shock occurs to the supply of credit (2009-2010). Studies examining the riskiness of corporate policies have considered higher payout level to be a more conservative choice (Bernile, Bhagwat, and Yonker 2018).

Nevertheless, one may argue that increasing payout reduces the cash held for precautionary reasons, thereby making a larger payout policy a risker choice (Saeed and Sameer 2017). Yet, Caliskan and Doukas (2015) provide a counter argument to this. Firms cannot accumulate cash indefinitely, given that they are located in environments where investor activism and protection is high (e.g. the US market). Thus, managers need to choose between investments and payouts, at some point.[115] Moreover, a risk-averse manager could simultaneously hold cash for precautionary reasons and also increase the payout levels by reducing the amount spent on

[113] Using a large global sample, Fatemi and Bildik (2012) report that firms reduce their dividends due to several factors, including the availability of additional growth opportunities. This may imply that firms consider payouts and investment opportunities simultaneously, further supporting the trade-off argument. Similarly, Boudry, Kallberg, and Liu (2013) uses a sample of Real Estate Investments Trusts (REITs) and document a negative relationship between investment opportunities and stock repurchases.
[114] While they find no evidence of an increase in investments, their investment analysis is limited to capital expenditure, which they found to be stable for both types of firms.
[115] Caliskan and Doukas (2015) provide an excellent anecdotal example. While Apple is known for its substantial cash holdings, it has had to yield to investor demands to distribute cash holdings on several occasions. Importantly, its CEO asserted that the company would distribute cash instead of investing in their own satellites programme, indicating that the company traded investments for payouts.

investments.[116] Accordingly, at least after satisfying the precautionary demand for cash holdings, higher payout levels are safer options since the alternative is risker (i.e. investments).

Given that a higher payout level is a safer choice and managerial risk-preferences could partially influence firms' payout level, it is possible that TMTs with characteristics that increase (decrease) their risk-aversion (overconfidence) are associated with a higher payout policy. Therefore, this chapter proposes two hypotheses with respect to payout level:

H1: *The proportion of female executives in the top management team and the total payout levels are positively associated.*

H2: *The average age of the top management team and the total payout levels are positively associated.*

5.3.2. Payout Methods and Risks

Turning to payout method, this study adopts the view that managers choose the payout amount (payout level) before deciding on the payout method (Bonaimé, Hankins, and Harford 2014; Eisdorfer, Giaccotto, and White 2015). Once the payout level has been set, managers choose whether to distribute this payment in dividends, stock repurchases, or both. Competing arguments exist on whether stock repurchases merely substitute for dividends. Grullon and Michaely (2002) support the dividend substitution theory, suggesting that at least some of the recent rise in shares repurchases as a payout method is substituting for dividends, while other studies argue that dividends and stock repurchases are not perfect substitutes (Andriosopoulos and Hoque 2013; Brav et al. 2005; Jagannathan, Stephens, and Weisbach 2000; Skinner 2008). This chapter adopts the view that these two methods are not perfect substitutes. Although both methods represent cash distribution to the shareholders, a key

[116] It is worth noting that a reduction in payout does not always lead to an increase in cash holdings. Even within the agency framework, Jensen (1986) argues that managers may also invest in projects with negative net present values to increase the size of the firm (i.e. empire building). Despite optimality, this argument points to a possible trade-off between payouts and investments. In this case, it is possible that a risk-averse (overconfident) manager will underestimate (overestimate) the NPV of investments. This could in turn influence both the investments and payouts. Simmilarly, Easterbrook (1984) points to managerial risk-aversion as a source of agency costs.

difference between them relates to their flexibility. From a managerial point of view, dividend payouts are sticky while shares repurchases are more flexible. DeAngelo, DeAngelo, and Skinner (2009) suggest that managers play an important role in the payout policy.

In turn, financial flexibility is a crucial element that could be factored into the decision regarding the payout method. Executives report that financial flexibility is a main motive behind their choice of repurchases over dividends (Brav et al. 2005). Bonaimé, Hankins, and Harford (2014) argue that firms could improve their financial flexibility, defined as the ability to evade financial distress and underinvestment, by means such as active risk management (e.g. hedging activities) and payout flexibility (i.e. a larger proportion of stock repurchases). Their evidence suggests that payout flexibility and hedging are substitutes. Further, Bliss, Cheng, and Denis (2015) document that firms reduced both their dividends and stock repurchases during the credit crises from 2008-2009, but that the reduction in stock repurchase was significantly greater. The larger reduction in stock repurchases further supports the view that this payout method improves financial flexibility. Additionally, DeAngelo, DeAngelo, and Skinner (2009) and Skinner (2008) argue that firms whose earnings are volatile may prefer stock repurchases over dividends. Allen and Michaely (2003) review the empirical evidence and point out that young, risky firms prefer stock repurchases over dividends. Such findings lend support to the notion that managers perceive stock repurchases as a risk management tool. Moreover, Guay and Harford (2000) argue that managers resort to stock repurchases when they lack confidence regarding the stability of the future cash flows. If risk-averse managers are less confident about the future performance of the firm, then they may not choose dividend payout to avoid future dividend cuts. Consequently, one could predict that a risk-averse (overconfident) TMT will devote a larger (smaller) proportion of their total payout to stock repurchase.

Compared to the flexibility of repurchases, the sticky nature of dividends is well-established in the literature. For example, Lintner (1956) notes the sticky nature of dividends and reports that managers are reluctant to make changes to dividends that could be reversed in the future. Similarly, managers refrain from initiating and increasing dividends because of the commitment associated with them (Eisdorfer, Giaccotto, and White 2015). Moreover, Brav et al. (2005) suggest that managers are committed to their historical levels of dividends and that maintaining these levels is more important than other alternatives, such as new investments. While it is argued that firms with dividend payouts are less constrained since they could reduce their dividends in order to boost their funds (Brown, Fazzari, and Petersen 2009), Bonaimé, Hankins, and Harford (2014) note that recent evidence indicates that managers prefer to cut their investments rather than reduce their dividends (Brav et al. 2005; Daniel, Denis, and Lalitha 2008). Yet, managers are unconcerned about smoothing the total payout (DeAngelo, DeAngelo, and Skinner 2009). The existing evidence suggests that firms frequently adjust their stock repurchases level (Guay and Harford 2000; Jagannathan, Stephens, and Weisbach 2000; Skinner 2008), which supports the view that managers choose to pay in stock repurchases to maintain their financial flexibility (Bonaimé, Hankins, and Harford 2014). Consequently, it is possible that TMTs with characteristics related to risk-aversion prefer a higher payout level since it is safer than the other alternatives, such as investing (Caliskan and Doukas 2015), but prefer stock repurchases as a payout method in order to maintain the financial flexibility of the firm (Bonaimé, Hankins, and Harford 2014).

Given that stock repurchases represent a less risky payout method compared to dividends and managerial risk-preferences could partially influence firms' payout method, it might be the case that TMT with characteristics related to risk-aversion (overconfidence) relay more (less) on stock repurchases. Thus, this leads to the following two hypotheses:

H3: *The proportion of female executives in the top management team and the proportion of stock repurchases to total payout are positively associated.*

H4: *The average age of the top management team and the proportion of stock repurchases to total payout are positively associated*.

5.4. Data and Variables

I collect the executives' data from ExecuComp for the period 1992-2013 and complement them with financial data from Compustat. I exclude companies from the financial and utility sectors due to their regulatory environment (Byoun, Chang, and Kim 2016; Nicolosi 2013; Perryman, Fernando, and Tripathy 2016). This procedure results in a sample of 32,831 firm-years. The variables are not always available for all tests, but the maximum number of observations is included.

5.4.1. Dependent Variables: Payout Policy

5.4.1.1. Payout Levels

The first set of hypotheses relates to the amount of corporate payout level. Hence, the first dependent variable considers the amount of the payout policy (i.e. the payout level), regardless of its method. *Payout1* is defined as total payout (dividends and stock repurchases) scaled by total assets (Chen, Leung, and Goergen 2017). This approach allows for considering the level of payout relative to firm size.

5.4.1.2. Flexible Payout

The second set of hypotheses relates to the payout method. Payout methods are decomposed into flexible and non-flexible payouts. Flexible payout are defined as stock repurchases, while dividends represent the inflexible payout method, given their stickiness (Bonaimé, Hankins, and Harford 2014; Lintner 1956).

However, one may argue that some types of dividends do not signal commitments, such as special dividends, but these are arguably immaterial to be considered in this study and have disappeared following the rising popularity of stock repurchases since the 1960s (Skinner 2008).[117] Therefore, following Bonaimé,

[117] To ensure that this trend holds for my sample, I check the data on dividends. For the period 1992-2013, there are 376,923 dividend payments for the entire population of CRSP. Of this figure, special dividends payments are only 4175 (1.1%) based on the classification of Bonaimé, Hankins, and Harford (2014), and only 4729 (1.3%), based on the classification of DeAngelo, Deangelo, and Skinner (2000). Therefore, they are immaterial to this analysis. For more on the dividends' coding scheme, see http://www.crsp.com/products/documentation/distribution-codes.

Item	1992-2013	2002-2013

Hankins, and Harford (2014), Krieger, Lee, and Mauck (2013) and Skinner (2008), *FlexiblePayout* is measured as total stock repurchases in dollars scaled by the sum of dividends and stock repurchases in dollars (total payout).[118] This variable takes the value of one if the entire payout is distributed through repurchases, and zero if it is entirely distributed through dividends. A combination of these two methods results in a value between zero and one. Naturally, this variable is missing for firms that did not conduct any payout.

Moreover, Fama and French (2001) and Skinner (2008) suggest that not all repurchases are dividends substitutes. Firms might repurchase stocks for the purpose of financing the issuance of shares to their employees as part of their compensation. If this is the case, then such repurchases might be better defined as compensation rather than payouts. As a result, I check the robustness of my results by calculating *NetFlexiblePayout*, which is defined as the dollar amounts of stock repurchases net of stock issuance scaled by total payout. In doing so, buybacks that might be compensation are excluded.

5.4.2. Explanatory Variables: Determinants of Payout Policy [119]

5.4.2.1. Variables of Interest

Managerial Gender

The first variable of interest is managerial gender. *PcFemale* is the proportion of female executives to the total number of executives in a firm year as reported on ExecuComp (Baixauli-Soler, Belda-Ruiz, and Sanchez-Marin 2014; Jurkus, Park, and Woodard 2011; Perryman, Fernando, and Tripathy 2016). In some analyses, I use dummy variables. First, *HighFemale* is a dummy variable taking the value of 1 if

Number of Dividends Payments	376,923		271,577	
Special Dividends (1272)	4175	1.1%	2922	1.1%
Special Dividends (1272/1262)	4729	1.3%	3606	1.3%

[118] Since Krieger, Lee, and Mauck (2013) study dividends and how senior citizens may prefer them, they use the inverse of this measure; namely, dividends scaled by total payout.
[119] Further details on the definitions of all managerial variables are available in the data section in Chapter 3.

PcFemale exceeds 50%, and zero otherwise. Second, *MaleFemaleTeam* is a dummy variable that takes the value of 1 if the TMT includes at least one female executive, and zero otherwise.

In the additional analysis, I measure the gender of the CEO and CFO. First, *CEO_Female* is a dummy variable that takes the value of 1 if the CEO is female, and zero otherwise. Similarly, *CFO_Female* is a dummy variable taking the value of 1 if the CFO is female, and zero otherwise. These variables are set to missing when I fail to identify the CEO or CFO.[120]

Managerial Age

The second variable of interest in this study is managerial age. The first measure is *AvgAge*, which is the average age of all executives in a firm year. *AvgAge1* is the natural logarithm of this *AvgAge* and is used in all regressions (Serfling 2014). Secondly, *HighAge* is dummy variable that takes the value of 1 when the average age of a TMT-year is larger than that of the average TMT, and zero otherwise. This variable is set to missing when *AvgAge* is missing.

The additional analysis includes the age of both the CEOs and CFOs. *CEO_Age* is the age of the CEO in years. *CFO_Age* is the age of the CFO in years. In the multivariate analysis, I use the natural logarithms of these two variables, denoted as *Log_CEO_Age* and *Log_CFO_Age*, respectively.

5.4.2.2. Control Variables

The multivariate analyses control for managerial tenure as well as several firm characteristics that have been identified in the literature. All normalised variables are scaled by total assets, as suggested by Kennedy (2003).

Managerial Tenure

Managerial tenure could proxy for managerial entrenchment and ability (Yim 2013). More entrenched managers may hold more cash or increase the size of the firm through additional investments, leading to a lower payout level (Jensen 1986). It is

[120] As discussed in chapter 3, the genders of all executives are available in the database. The challenge, however, relates to the identification of the CEO and CFO. In a sense, this is an advantage of studying the TMT as a single unit, at least when using ExecuComp.

also possible that tenured executives prefer to avoid risky projects, and hence increase the payout levels (Caliskan and Doukas 2015). Equally, managerial tenure could proxy for their career concerns, since tenured managers are more secure (Li, Low, and Makhija 2017). From this perspective, it is possible that less tenured managers may wish to signal their superior performance and thus reduce payout levels so that they invest more to demonstrate their abilities. Additionally, entrenched managers may possibly prefer stock repurchases since it gives them more discretion over future payouts.

Tenure is measured at the TMT level by *Avg_Tenure*, which is the average tenure of all TMT members in the observed year. Following Serfling (2014), I use the natural logarithm of this variable in all regressions (*Log_Avg_Tenure*). For the additional analysis, I introduce *CEO_Tenure,* which is the number of years for which the CEO has held the position. Moreover, *CFO_Tenure* proxies for the number of years during which the CFO has held this position. Multivariate analyses include the natural logarithms of these two variables, denoted as *Log_CEO_Tenure* and *Log_CFO_Tenure*, respectively.

Liquidity

Firms with high liquidity relative to their size are in a better position to distribute cash to their shareholders. Therefore, a positive relationship between firms' liquidity and *Payout* is possible. Additionally, firms with excess cash might pay more in stock repurchases than in dividends because these cash holdings may not be replenished quick enough to meet the next dividend commitment. As a result, it is possible to observe a positive relationship between firm liquidity and *FlexiblePayout* (Bonaimé, Hankins, and Harford 2014). Liquidity is defined as *Cash*1, which is measured as cash and marketable securities scaled by total assets.

Firm Life Cycle

DeAngelo, DeAngelo, and Stulz (2006) find that dividends are normally paid by mature firms. One can extend this argument to suggest that mature firms are more capable of distributing cash to their shareholders, regardless of the method by which these payouts are made. Accordingly, it is possible to observe a positive relationship between firm maturity and *Payout*. Moreover, mature firms are better positioned to establish commitments such as dividends. Thus, a negative relationship between firm maturity and *FlexiblePayout* is possible. Firm life cycle is measured by *Log_FirmAge*, which is the natural logarithm of *FirmAge*. Firm age is proxied for by the time between the observation and the year when the firm was first listed on Compustat, and denoted as *FirmAge* (DeAngelo, DeAngelo, and Stulz 2010).

Growth Opportunity

Firms that have declining investment opportunities should distribute their excess cash to their shareholders (Jensen 1986). Based on this argument, it is possible that firms with low growth opportunity have high *Payout*. Furthermore, firms with high growth potential may be unwilling to commit themselves to dividends because the cost of cutting dividends may deter them from taking value enhancing projects when external finance is costly. Thus, it is possible that firms with high growth potential will rely more on the flexible method of payout (i.e. stock repurchases). The growth opportunity of the firm is measured by *MtB*, which is the market to book ratio (Fama and French 2001).

Cash Flow Uncertainty

Firms that have uncertain cash flows are less able to distribute cash flows to their shareholders so that they can accumulate cash for precautionary reasons (Bates, Kahle, and Stulz 2009). It is possible that cash flow uncertainty and *Payout* are negatively related. In addition, Skinner (2008) and Chay and Suy (2009) argue that firms with uncertain cash flows resort less to inflexible payouts, such as dividends. This is because these firms are less able to commit themselves to the reoccurrence of dividends. Hence, it is possible that cash flow uncertainty and *FlexiblePayout* are positively related. Cash flow uncertainty is measured by *CashFlowSD_10*, which is the rolling standard deviation of the cash flows of the firm in the last ten years, demanding the availability of the cash flows of at least the previous three years. For robustness, *CashFlowSD_5* captures the volatility of the cash flows in a smaller window, which includes the previous five years.

Profitability

Fama and French (2001) show that profitable firms pay more dividends, and argue that this might be due to them having excess funds which should be distributed to reduce the agency costs associated with free cash flows, as noted in (Jensen 1986). Therefore, it is possible to observe a positive relationship between firm profitability and *Payout*. Moreover, firms are more likely to repurchase their stocks following poor performance (Krieger, Lee, and Mauck 2013). Alternatively, firms with higher profitability are more capable of committing themselves to future cash distributions. Consequently, a negative relationship between firm profitability and *FlexiblePayout* is theoretically possible. Profitability is measured by *ROA*, which is income before extraordinary items scaled by total assets.

Information Asymmetry

Firms with high information asymmetry may want to send a signal to assure their investors about the prospect of the firm. As a result, a positive relationship between information asymmetry and *Payout* is possible. Yet, it is equally possible that firms with information asymmetry will prefer to lower their dividends (or payout) to maintain a financial slack (Myers and Majluf 1984). In addition, Allen and Michaely (2003) argue that firms with more asymmetric information are more likely to use dividends over buybacks since dividends send a stronger signal regarding the prospects of the firm. This argument generates the prediction of a negative relationship between information asymmetry and *FlexiblePayout*. The level of information asymmetry is measured by the proportion of intangible assets to total assets in the firm (Deshmukh, Goel, and Howe 2013). Firms with more intangible assets require more information to value, which may be unavailable to external shareholders. *Intang* is measured as intangible assets divided by total assets.

Cash Flow

Free cash flows augment the agency problem, which can be reduced through payouts (Jensen 1986). Firms might increase their payout when they have significant free cash flows. Thus, a positive relationship between cash flows and *Payout* is possible. Furthermore, Skinner (2008) argues for the possibility that managers may increase their stock repurchases when their firms experience cash windfalls. In this case, it is possible that these windfalls will be distributed via repurchases rather than dividends to avoid future commitments. Hence, a positive relationship between cash flow and *FlexiblePayout* is possible. Cash flow is measured by *CashFlow*, which is firms' free cash flow scaled by total assets (Bates, Kahle, and Stulz 2009).

Financial Constrains

Firms' financial constrains are measured by *Lev*, which is total debt scaled by total assets. Firms that are financially constrained might be less able to distribute cash to their shareholders (Saeed and Sameer 2017). It is also possible that leverage and payout are governance mechanisms and hence they substitute for each other (Easterbrook 1984; Jensen 1986). Therefore, a negative relationship between *Lev* and *Payout* is possible. Alternatively, leverage may proxy for the ability to raise external capital (Guney, Ozkan, and Ozkan 2007), or push companies to raise debt (Easterbrook 1984), leading to a positive association between *Lev* and *Payout*. Additionally, constrained firms may not rely on dividends since they may be unwilling to commit themselves to future payouts. Therefore, a positive relationship between *Lev* and *FlexiblePayout* is possible. On the other hand, to the extent that leverage proxies for the ability to raise external capital, levered firms are able to establish commitments. In this case, *Lev* and *FlexiblePayout* might be negatively associated.

Firm Size

Dividend payers are usually large in size (Fama and French 2001). Also, it is possible that firm size is another proxy for firms' life cycle (Fairchild, Guney, and Thanatawee 2014). To the extent that firm size proxies for firms' life cycle and financial ability, a positive relationship between firm size and *Payout* is plausible. Likewise, mature firms might be in a better position to commit themselves to future payments, since they are less constrained (Banerjee, Humphery-Jenner, and Nanda 2018). However, Krieger, Lee, and Mauck (2013) find a negative relationship between the proportion of dividend payout to total payout and firm size (i.e. a positive relationship between size and payout flexibility). Two measures of firm size are used in this study. Firm size is measured by *Size*, which is the natural logarithm of total assets (Skinner 2008). For robustness, *Size* is replaced with *Log_Sale*, which is the natural logarithm of total sales.

Industry

Firms might adopt different payout policies based on their industry. For example, Jain, Shekhar, and Torbey (2009) argue that post-IPO firms that operate in high-tech industries may not prefer dividends because of their sticky nature but prefer repurchases. Yet, it is important for these firms to send signals to the market, given the information asymmetry associated with their projects. They find empirical support for this argument. Given the importance of the industry, this chapter controls for industry classification when examining both the payout level and the payout method. To achieve this, I use two classification schemes: Fama and French's five industry classifications and SIC two digits codes. The former is used for descriptive statistics, while the latter is used to control for time invariant industry effects in regressions (Bonaimé, Hankins, and Harford 2014). All of the variables are summarised in the appendix. The following section provides descriptive statistics for these variables.

5.5. Descriptive Statistics

This section provides descriptive statistics. It begins with an overview of the payout policy over time in terms of its overall level and structure. Then, a description of the trends in executives' gender and age is provided in the context of the payout policy. Finally, this section closes by describing the control variables.

5.5.1. Payout Policy between 1992 and 2013

5.5.1.1. Payout Levels

Table 5.1 describes the trends in payout levels as measured by *Payout* (total payout scaled by total assets). It also shows how total payout and assets evolved over time. Over the sample period, *Payout* has an average of 3.74%. *Payout* increases from the beginning of the sample period before reaching a peak of 6.92% in 2007. All industries reported their highest *Payout* levels in 2007. It is possible that companies committed themselves to these payouts before they become aware of the financial crisis, which resulted in a reduction in firms' total assets due to asset impairment. For example, between 2006 and 2007, the average total payout in nominal terms increased from $410 million to $450 million, while the assets declined from $6,587 million to $6,575 million. During the financial crisis, *Payout* declined to 4.83% in 2008 and reached a low point in 2009, at 2.42%.

Moreover, Table 5.1 shows the trends in *Payout* across Fama and French's five industries over time. The Consumers industry reports the highest average *Payout* at 4.34% for the entire period and seems to maintain the highest payout levels for most of the years. On the other hand, the Manufacturing sector has the lowest payout levels for the entire period, at 3.23%, and seem to report the lowest payout levels over the years. These trends are presented in Figure 5.1, which shows the evolution of payout levels from 1992 to 2013 across Fama and French's five industries. Additionally, Table 5.2 reports the descriptive statistics for the variables used in this study. The average payout in dollar terms is $234 million, while the median is only $8.75 million, with a high standard deviation, indicating that there is a large variation between firm-years in terms of their payout levels. *Payout*, which is total payout scaled by total assets, follows a similar pattern, with an average of 3.74% and a median of 1%.

5.5.1.2. Payout Methods

Table 5.3 summarises the trends related to the payout methods over time and across industries. For the full period, the average of *FlexiblePayout* is 54%. *FlexiblePayout* increased from 27.4% in 1992 to 60% in 2013, reaching a peak of 67.9% in 2007. Notably, the occasional declines in *FlexiblePayout* are accompanied with reductions in the total payout. For example, between 2000 and 2001, *FlexiblePayout* declined from 63% to 55%, while the total payout dropped from $164 million to $150 million. Similar trends are observable during the financial crises. This can be attributed to companies' reluctance to cut their dividends due to their sticky nature, and therefore reduce their overall payout by cutting their stock repurchases (i.e. their flexible payout). That is, stock repurchases seem to be pro-cyclical which might be attributed to their flexibility.

Furthermore, Table 5.3 shows the trends across Fama and French's five industries classification. The HiTec industry reports the highest *FlexiblePayout* in all years, without exception, while the Health industry is ranked second. This might be due to the risky and uncertain nature of these industries, inducing them to rely on a flexible payout method instead of initiating future commitments that may arise with current dividends. Both Consumers and Other report similar averages of around 50%. The Manufacturing sector reports the lowest average of *FlexiblePayout* for all years at 40%. Overall, all industries are increasingly relying on flexible payout methods. Figure 5.2 illustrates the development of *FlexiblePayout* over time and across industries, and indicates that the differences in the payout structure between industries seem to persist over time.

Figure 5.3 shows the nominal values of dividends, stock repurchases, stock repurchases net of stock issuance, and total payout. While dividends resist the cycles of the economy, total payout is pro-cyclical as indicated by the steep decline following the financial crisis. The decline in the total payout is driven by a drop in stock repurchases, indicating that stock repurchases are more flexible than dividends. Figure 5.4 shows dividends and stock repurchases scaled by total assets. Dividends are less volatile compared to stock repurchases. This is in line with the patterns reported in

(Guay and Harford 2000; Jagannathan, Stephens, and Weisbach 2000), which support the argument for the pro-cyclicality of stock repurchases.

Figure 5.5 depicts the payout structure for the full sample. Companies are increasingly using flexible payout (i.e. stock repurchases) while retaining a mixed payout structure. This is consistent with the finding that dividend payers continue to pay their dividends and that stock repurchases are used to increase the cash payouts of companies that pay dividends (Fama and French 2001). Further, Table 5.2 reports the descriptive statistics for the variables in this study. *FlexiblePayout* has 21,940 observations out of 32,831 firm years. This is due to setting *FlexiblePayout* as missing for firms whose *Payout* is zero. Firms that do not have a payout do not have a payout method. Table 5.2 shows that the average of *FlexiblePayout* is 55% and the median is 64%. Interestingly, the median nominal value of dividends is 0, indicating that at least half of the sampled firm-years do not pay dividends. This is not the case for repurchases, whose median is \$0.04 million.[121]

5.5.2. Executives' Gender and Payout Policy

Figure 5.6 shows the percentage of female executives on the TMT (*PcFemale*) across industries and over time. In 1992, *PcFemale* was 1.9% before its significant increase in the following years. In 2011, *PcFemale* reached a peak of 8.2% before its decline to 6% in 2013. Also, Table 5.2 shows that the average *PcFemale* for all firm-years is 5.85%. Nonetheless, the median for *PcFemale* is zero, indicating that 50% or more of all firm-years do not have at least one female executive. In the full sample, 8,621 firm-years have at least one female executive on the TMT, representing 26.2% of all of the firm-years.

The steady increase in *PcFemale* during the period 1992-2011 is similar across all industries. Similarly, all industries reported a decline in the participation of women in the TMT after 2011. *PcFemale* is the highest in the Consumers industry during the sample period. This may reflect the fact that women represent a significant proportion

[121] It is possible that these small buybacks are intended merely to finance stock issued for managers, as argued by Fama and French (2001) and Skinner (2008). I consider this possibility when checking the robustness of my results.

of their customer base. On the other hand, the Manufacturing sector has the lowest *PcFemale* during the sample period.

Importantly, Figure 5.7 reports the average *Payout* (total payout scaled by total assets) for different levels of female participation on the TMT. Firms with no female managers have an average *Payout* of 3.5%. This figure increases to 7.2% for firms with three female executives, before declining again as the number of female managers exceeds three. Nonetheless, both *Payout* and *PcFemale* seem to be industry-specific, as depicted in Figures 5.1 & 5.6. Moreover, Table 5.4 shows that *PcFemale* and *Payout* are positively correlated, which is consistent with *H1*. Furthermore, Table 5.2 provides descriptive statistics for the gender of both CEOs and CFOs. Female CEOs represent 2.2% of all CEO-years compared to 7.2% for CFOs. Both *CEO_Female* and *CFO_Female* are positively correlated to *Payout*, in line with the TMT variable.

Additionally, Figure 5.8 illustrates the average *FlexiblePayout* for firms with different levels of female participation on the TMT. This figure shows that TMTs with more female managers are associated with higher payout flexibility, in line with *H3*, which suggests a positive relationship between female managers and the usage of flexible payout methods. Further, *PcFemale* and *FlexiblePayout* are positively correlated. Similarly, *CEO_Female* and *CFO_Female* are positively correlated with *FlexiblePayout*

5.5.3. Executives' Age and Payout Policy

Figure 5.9 illustrates the trends in the average age of the TMT (*AvgAge*) during the period 1992-2013. *AvgAge* maintained an average of 54 years between 1992 and 2007. This trend may reflect continuous hiring and firing within the sample firms. In 2007, *AvgAge* dropped by two years, to 52 years. This sudden decline might be due to the hiring of new executives after the financial crisis. After 2007, *AvgAge* started to increase again before reaching its previous level of 54 years. Only 29,119 firm-years reported data on the age of their TMTs, as shown in Table 5.2. Moreover, the average age of the executives across all industries is close. *AvgAge* in the Manufacturing sector tends to be slightly higher than that of the full sample, while HiTec firms seem to have slightly younger executives. These industry differences are similar both before and after the crisis in 2007. Yet, the *AvgAge* of executives across industries seem to converge over time.

Figure 5.10 reports the average *Payout* (total payout divided by total assets) for TMTs, based on their *AvgAge* quintiles. The youngest executives in the first age quintile have an average *AvgAge* of 46.3 years. *Payout* increases when the executives' age moves from the first to the second quintile, but this trend is reversed for the next quintiles. Moreover, *AvgAge* and *Payout* are negatively correlated, as indicated in Table 5.4. This is inconsistent with *H2*, which argues for a positive relationship between *AvgAge* and *Payout*. Moreover, Table 5.2 shows that the average CEO is 55.4 years old compared the average CFO, who is 50.4. Both *CEO_Age* and *CFO _Age* are negatively correlated to *Payout*, similar to the correlation between *AvgAge* and *Payout*.

Further, Figure 5.11 shows the average *FlexiblePayout* for TMTs with executives' ages in the four age quintiles. The trend is in the opposite direction to the prediction of *H4*, which proposes a positive relationship between *FlexiblePayout* and *AvgAge*. Also, the correlation between *AvgAge* and *FlexiblePayout* is negative. Consistent with this, the ages of both the CEOs and CFOs are negatively correlated with *FlexiblePayout*. Still, further analysis is required to reduce the risk that these observations are driven by firm- or industry-specific factors.

5.5.4. Control Variable

In this subsection, the control variables are described. Table 5.2 reports the descriptive statistics for the variables used in this chapter, and table 5.4 presents the correlation matrix.

Avg_Tenure represents the number of service years for the average TMT member. The average *Avg_Tenure* is 4.61 years. *CEO_Tenure*, the number of years for which the CEO has held the position, is 7.06 years, on average. *CFO_Tenure*, an estimate of the number of years for which the CFO has served the firm as a CFO, is 4.13 years, on average. Both *Avg_Tenure* and *CFO_Tenure* are positively correlated with *Payout*. This might be explained by the lower career concern among tenured executives, which lowers the need to signal their superior performance (Li, Low, and Makhija 2017). This could in turn make tenured executives trade investments for payouts. Nevertheless, *Payout* and *CEO_Tenure* are negatively correlated.[122] This is consistent with the theoretical view of Yim (2013) that tenured executives might be more entrenched or have more ability, leading to higher cash holdings and investments. Moreover, all tenure variables are negatively correlated with *FlexiblePayout*. It is possible that tenured managers have, or perceive themselves as having, better ability (Yim 2013), reducing the importance of maintaining financial flexibility.

Cash1 is a proxy for liquidity and measured as the sum of cash and short term investments scaled by total assets. The average firm-year holds 16% of its assets in cash, while the median is 9%, indicating that the differences between firm-years are substantial. *Cash1* is positively correlated with *Payout*. Firms with more cash holdings have a higher ability to make a distribution to the shareholders. Further, *Cash1* is positively correlated with *FlexiblePayout.* This is consistent with the view that firms with significant cash holdings prefer to use stock repurchases since their cash balance may not be relinquished to meet the future commitments associated with dividends.

FirmAge is a proxy for firm life cycle. *FirmAge*, which is the time between the observation and the first year when the firms was listed on Compustat, has an average of 23 years and a median of 19 years. *FirmAge* is negatively correlated with *Payout*. This is consistent with the view that mature firms are in a better position to distribute cash to their shareholders (DeAngelo, DeAngelo, and Stulz 2006). Moreover, the correlation between *FirmAge* and *FlexiblePayout* is negative. This is in line with the argument that younger firms are less able to establish future commitments.

Companies have a market to book ratio (*MtB*) that is 2.2 times, on average, with a median value of 1.6 times. This may suggest that the sample firms have growth potential, despite their inclusion on the S&P 1500, which includes well-established firms. Surprisingly, *MtB* and *Payout* are positively correlated, contradicting the argument that firms with diminishing investment opportunities distribute more cash (Jensen 1986). Additionally, the correlation between *MtB* and *FlexiblePayout* is

[122] Interestingly, Chapter 3 and, to a lower extent, Chapter 4 show a similar trend in the alignment between *Avg_Tenure* and *CFO_Tenure*.

positive, in line with the argument that firms with significant investment opportunities prefer to maintain their financial flexibility.

CashFlowSD_10 proxies for cash flow uncertainty. The average of *CashFlowSD_10* is 7%, with a high standard deviation of 53%, indicating that these firms differ in terms of the stability of their cash flow. The correlation between *CashFlowSD_10* and *Payout* is positive, which contrasts with the view that firms with uncertain cash flows avoid payouts (Bates, Kahle, and Stulz 2009). In addition, the correlation between *CashFlowSD_10* and *FlexiblePayout* is positive. This is consistent with the proposition that firms with unstable cash flows may avoid future commitments.

Return on assets (*ROA*) is 3%, on average, with a large variation between firm-years, as evidenced by a standard deviation of 70%. The correlation between *ROA* and *Payout* is positive. Fama and French (2001) suggest that profitable firms distribute more cash in order to reduce the free cash flow problem proposed by Jensen (1986). Similarly, ROA and *FlexiblePayout* are positively correlated. This positive correlation contradicts the argument of Krieger, Lee, and Mauck (2013).

As a proxy for information asymmetry, *Intang* is the proportion of intangible assets to total assets. Its average is 15%, with a median of 8%. The correlation between *Intang* and *Payout* is negative. This is consistent with the view that firms with elevated levels of information asymmetry reduce their payouts in order to maintain financial slack (Myers and Majluf 1984). Also, *Intang* and *FlexiblePayout* are positively correlated. This is inconsistent with the argument of Allen and Michaely (2003) that firms with more information asymmetry may prefer dividends since they provide a stronger signal regarding the prospects of the firm.

CashFlow, which is cash flow scaled by total assets, has a mean of 7% and a median of 9%, with substantial variation between the firm-years, as suggested by the standard deviation of 67%. *CashFlow* is positively correlated to *Payout*, in line with the view that firms with large cash flows increase their payout in order to reduce the agency problem (Jensen 1986). Moreover, *CashFlow* and *FlexiblePayout* are positively correlated. This positive relationship may indicate that firms with cash windfalls are inclined to distribute cash without establishing commitments (Skinner 2008).

Firms have an average *Lev* (debt to total assets) of 23%, with large variations between the observations (standard deviation = 85%). The correlation between *Lev* and *Payout* is positive. It might be the case that levered firms are able to access the debt market, and therefore have less need to keep the cash in the firm. Further, there is a negative correlation between *Lev* and *FlexiblePayout*. Levered firms may prefer not to commit themselves for future payouts, and thus prefer stock repurchases over dividends.

The companies in the sample are large, with average total assets of $5.4 billion dollars and a median of $990 million. This is unsurprising, given that the sample is limited to S&P 1500 companies, which are large in size. The correlation between firm size and *Payout* is positive. In addition, *Size* and *FlexiblePayout* are positively correlated. This positive correlation is similar to the findings of Krieger, Lee, and Mauck (2013).

Some control variables seem to correlate with the dependent variables with different signs from those predicted. This might be due to the lack of controlling for other important factors, which is addressed in the next section. Lastly, the correlation among the independent variables does not point to a high risk of multicollinearity.

The subsequent section presents the analyses for these data in order to answer the research questions developed in the previous section.

5.6. Analyses and Results

This section aims to answer the research questions of this study. The first subsection investigates whether the percentage of female managers on the TMT and the average age of the managers on the TMT play a role in determining the payout levels (payout amount). The second subsection examines the role of these characteristics on the payout method (dividends vs. stock repurchases).

5.6.1. Do Managerial Characteristics influence the Payout Levels?

The analyses begin with a univariate analysis before presenting the multivariate analysis and a battery of robustness checks. Lastly, this section closes with an additional analysis, in which CEO and CFO gender and age are investigated.

5.6.1.1. Univariate analysis

Table 5.5 examines whether *Payout* systematically differs between different groups based on firm-year managerial characteristics. *H1* proposes that the proportion of female executives in the TMT and the payout levels are positively related. Therefore, the sample is split into firms whose *PcFemale* is larger than 50% (*HighFemale*) and all other firms. Companies with a high level of female representation report an average *Payout* of 5.95% while others maintain an average of 3.74%, and this difference is statistically significant (t-statistic = -4.3). Also, firms whose TMTs contain at least one female (*MaleFemaleTMT*) differ systematically from other firms in terms of their payout levels. These TMTs report an average *Payout* of 4.48% compared to 3.51% for other firms (t-statistic = -9.2). These findings are in line with the proposed positive relationship between *Payout* and *PcFemale*.

Similarly, firms run by female CEOs report a higher average *Payout* (5.24%) than other firms (3.93%), and this difference is statistically significant (t-statistic = -3.9). Also, firms with female CFOs report a higher payout (4.97%) level compared to firms with male CFOs (3.96%). This difference in means is statistically significant, with a t-statistic of -4.7. These findings are consistent with a positive relationship between *PcFemale* and *Payout*.

Additionally, firms with TMTs whose average age (*HighAge = 1*) is larger than that of the sample's mean report lower *Payout*. Firms with *HighAge* report an average *Payout* of 3.87% compared to 4.07% for other firms, and this difference is significant (t-statistic = 1.9). This contradicts *H2*, which proposes a positive relationship between TMTs' average age and payout levels.

Furthermore, the first set of hypotheses propose a positive relationship between managerial gender and payout policy since female executives are more risk-averse or less overconfident (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009). It also builds on the proposition of Caliskan and Doukas (2015) that managers trade-off investments with payout as a more conservative choice. Thus, Table 5.6 investigates whether TMTs that contain at least one female manager differ systematically in terms of their investments.

The results indicate that the average TMT, with at least one female member, invests 3.49% of their assets on R&D compared to 3.79% for male-only TMTs. This difference is systematic (t-statistic = 1.98). Moreover, firms that contain at least one female manager invest less in acquisitions (AQ), but this difference is not systematic. Also, TMTs with at least one female manager invest less in CAPEX (5.57%) compared to TMTs containing only males (6.14%). This difference is systematic with a t-statistic of 7.3.[123] These findings are consistent with *H1*, which proposes a positive relationship between female managers and payout levels.

Also, Table 5.7 examines the investments and the payout levels of TMTs with *HighAge* and other TMTs. In doing so, TMTs are split into those above and below the average of *AvgAge*. Firms with older TMTs systematically invest less in R&D, acquisitions, and CAPEX. Meanwhile, their payout is systematically lower, as demonstrated previously. In other words, older TMTs are associated with lower investments and payout. These findings are puzzling[124] and require further analysis

[123] In Tables 5.5 and 5.6, the payout and investment variables are all scaled by total assets, and hence their magnitude is comparable. Interestingly, the sum of the differences in the investments approximately equals the difference in the payout.

[124] Note that, in Chapter 3, the results also indicate that older TMT are associated with lower cash holdings. It is possible that such firms have lower performance. Chowdhury and Fink (2017) show that CEO age distracts the relation between q and R&D.

since they might be driven by other factors that jointly influence corporate policies and managerial age.[125]

Both Table 5.1 and Figure 5.1 show that *Payout* differs across industries. Table 5.8 examines whether these differences are statistically significant. The industry classification used is Fama and French's five industry groups. Firms in the Consumers group have an average *Payout* of 4.3%, while other firms report an average of 3.6%. This difference is significant (t-statistic = -7.2). Companies in the Health, HiTec, and Other sectors do not systematically differ from the rest of the sample in terms of their payout level. Manufacturing firms have an average *Payout* of 3.2% compared to 3.9% for other firms (t-statistic = 6.3). These findings indicate that payout levels are systematically different from some industries, highlighting the importance of considering the industry effect when studying the payout policy.

Overall, the univariate analysis informs this study in several ways. First, consistent with *H1*, the result show that female representation on the TMT is positively associated with payout level. These results could be explained theoretically. Particularly, since managers face a trade-off between payouts and investments, which are risker (Caliskan and Doukas 2015), TMTs containing female executives might be associated with a higher level of payout in order to reduce the risks associated with investments due to female risk-aversion or lower levels of overconfidence (Barber and Odean 2001; Charness and Gneezy 2012; Croson and Gneezy 2009; Hambrick and Mason 1984). Second, older TMTs are associated with lower payout levels, contradicting *H2*. Third, payout levels are industry-specific.

The following subsection examines payout levels using a multivariate analysis, which is informed by the findings of this section.

5.6.1.2. Multivariate analysis

Main Results

[125] For instance, when the other variables are considered in Chapter 4, the association between *AvgAge* and R&D investments disappears.

Several factors have been identified to influence firms' payout levels. Therefore, it is necessary to employ a multivariate analysis to account for these factors when examining the abovementioned hypotheses. *H1* predicts a positive relationship between *PcFemale* and *Payout*, while *H2* proposes a positive relationship between *AvgAge* and *Payout*.

Table 5.9 presents the results of the multivariate analysis. The dependent variable is *Payout*, which is total payout divided by total assets. Also, the models include *PcFemale* and *AvgAge1*, which are the variables of interest, as well as a set of control variables. Since the dependent variable is truncated, both models are estimated using pooled Tobit regressions. Adhikari and Agrawal (2018) argue that the OLS method may be inappropriate for estimating the payout policy models and suggest using Tobit regressions instead. Similarly, Nicolosi (2013) employs a Tobit regression because the dependent variable is censored at zero.

Models 1 and 2 differ with regard to whether they control for industry and year effects or not. Accounting for the industry influence is important because payout policy might be industry-specific. For example, Table 5.8 shows that some industries are systematically different from the rest of the sample in terms of their payout level. TMT characteristics might also be industry-specific. For instance, Figures 5.6 and 5.9 show that TMT characteristics are persistently different across industries. Furthermore, Figure 5.1 indicates that *Payout* is influenced by macro shocks, such as financial crises. Similarly, *AvgAge* declined significantly during the financial crises. Thus, it is important to account for the year influence when examining whether *AvgAge* is related to *Payout*.[126]

In line with *H1*, the coefficient of *PcFemale* is positive and significant at the 1% level, suggesting that the percentage of female executives on the TMT and payout level are positively related. The significance of this relationship holds whether we

[126] I also acknowledge the importance of accounting for the time-invariant firm characteristics, such a firm strategies and policies, but do not estimate the within-firm regressions because managerial characteristics tend to be time invariant (Zhou 2001). In turn, the industry and year fixed effects may allow for some variation within managerial characteristics, while reducing the omitted variable concern. Notice that the industry fixed effects are based on SIC two-digits classifications, resulting in 58 unique industries.

control for the industry and year effects (Model 2) or not (Model 1). Jurkus, Park, and Woodard (2011) find a positive relationship between the percentage of female managers on the TMT and the dividend payout levels in some firms (a proxy for agency costs in their model). Building on the finding of Adams and Ferreira (2009) that female directors improve monitoring, they suggest that gender diversity within the management reduces the agency costs.

While the argument of Jurkus, Park, and Woodard (2011) remains a possible explanation for these findings,[127] this chapter proposes an alternative view. Caliskan and Doukas (2015) suggest that managers trade-off investments with payout since they cannot accumulate cash to infinity. In this trade-off, payout represents a less risky choice compared to investments, which might be reduced by managers who exhibit risk-aversion or increased by those who are overconfident. Further, prior studies suggest that female managers are associated with more conservative choices, due to their higher levels of risk-aversion or lower levels of overconfidence (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013).

Thus, it is possible that TMTs that contain more female managers are more risk-averse, thereby investing less in risky assets. Equally, it might be the case that TMTs containing more males are more overconfident, thereby investing more in risky assets. The trade-off explanation finds support in Chapter 4 as well as in the univariate analysis in this chapter. First, Chapter 4 shows that the proportion of female executives on the TMT is associated with lower R&D investments. Second, the univariate analysis (Table 5.6) suggests that TMTs with a female manager are associated with lower levels of investment.

Additionally, *H2* proposes a positive relationship between *Payout* and *AvgAge*. Yet, Table 5.9 shows that the coefficient of *AvgAge1* is insignificant in Models 1 and 2. These results are inconsistent with the univariate analysis, which shows that TMTs whose age is higher than that of the average TMT are associated with lower payout

[127] See section 5.2.2. for a discussion of the methodology and conclusion of Jurkus, Park, and Woodard (2011).

(Table 5.5). Caliskan and Doukas (2015) find that CEO age does not systematically influence the propensity to conduct a dividend payout.

The lack of a meaningful relationship between the age of the executives and the payout level is theoretically possible. Since a higher payout level is a more conservative choice (Bernile, Bhagwat, and Yonker 2018; Caliskan and Doukas 2015), it might be the case that managerial age does not induce managers to adopt either safer or risker policies. Prior studies suggest that, since people gain experience as they age, this gained experience may offset any age-related reduction in risk tolerance (Rolison, Hanoch, and Wood 2012; Worthy et al. 2011). In other words, it is possible that older TMTs are no different from younger TMTs in terms of their risk-taking behaviour.

In sum, the findings of this analysis are in line with *H1*: *The proportion of female executives in the top management team and the total payout levels are positively associated.* A potential explanation for these findings is that TMTs that contain more female executives adopt more careful policies, since such TMTs might be more risk-averse or less overconfident. However, the findings suggest that TMT average age is not systematically related to the payout level. This is inconsistent with *H2*: *The average age of the top management team and the total payout levels are positively associated.*

The reliability of these findings is checked after the discussion of the control variables in the model.

Control Variables

This section presents the findings regarding the control variables. The results are discussed based on Model 2 in Table 5.9, which accounts for the influence of year and industry. The coefficient of *Log_Avg_Tenure* is positive and significant at the 1% level. This is consistent with the view and findings of Caliskan and Doukas (2015) that tenured managers avoid risk and therefore make larger payouts. The coefficient of *Cash1* is positive but only significant when the influence of industry and year is disregarded. A positive relationship may indicate that firms with significant cash holdings are in a better position to make larger payouts.

Moreover, the coefficient of *Log_FirmAge* is positive and significant at the 1% level. This is consistent with the findings of DeAngelo, DeAngelo, and Stulz (2006), who find that mature firms make more dividend payments. Firm age may proxy for their maturity. To the extent that firms' payout policy is influenced by the life cycle of the firm, it is possible that mature firms make larger payouts.

Interestingly, the coefficient of *MtB* is positive and significant at the 1% level. This is inconsistent with Jensen's (1986) argument that firms with low investment opportunities should payout more. However, Caliskan and Doukas (2015) find similar results. Since the dependent variable includes stock repurchases, firms with growth opportunities may conduct payouts without future commitments which can be reduced when the need for finance arises. Further, this chapter suggests a negative relationship between cash flow volatility (*CashFlowSD_10*) and *Payout*. However, the coefficients of *CashFlowSD_10* are insignificant.[128]

Further, firms with better performance are predicted to distribute more cash to their owners (Fama and French 2001). *ROA*, a proxy for profitability, is positive and significant at the 1% level, which is in line with the proposed positive relationship between profitability and payout. Also, the coefficient of *Intang* is negative and significant at the 1% level, consistent with the view of Myers and Majluf (1984) that firms with a high level of information asymmetry reduce their payout levels in order to maintain financial slack. Moreover, in line with the argument that firms with free cash flows distribute more cash to reduce the agency problems (Jensen 1986), *CashFlow* is positive and significant at the 1% level.

The coefficient of *Lev* is positive and significant at the 5% level. It might be the case that firms' leverage proxies for their ability to raise external capital (Guney, Ozkan, and Ozkan 2007), inducing levered firms to make larger payouts. Otherwise, this relationship may indicate that firms making payouts use leverage to finance their investments. Lastly, the coefficient of *Size*, which is the natural logarithm of total assets, is positive and significant at the 1% level. The positive sign is similar to the

[128] The coefficients of *CashFlowSD_10* are negative and significant in some robustness tests. See, for instance, the average coefficient in Table 5.13.

findings of Fairchild, Guney, and Thanatawee (2014) and Fama and French (2001), who argue that firm size proxies for their life cycle and financial abilities. Both constructs may increase the payout levels.

Robustness Checks

In this section, the hypotheses are re-examined using different specifications and measures to improve the reliability of the findings presented in the main analysis. First, I examine whether the results are sensitive to the measurement of the variables of interest. Therefore, I replace *PcFemale* with the natural logarithm of the number of female managers on the TMT, denoted as *Log_No_Female* [Log(1+number of females)] (Jurkus, Park, and Woodard 2011). I also replace *AvgAge1* with *HighAge*, which is a dummy that takes the value of 1 if the average age of the TMT is higher than that of the average TMT. The results of the analysis are presented in Table 5.10. Consistent with the main analysis and *H1*, the coefficient of *Log_No_Female* is positive and significant at the 1% level. Similarly, the findings on age are similar to those of the main analysis. In particular, the coefficient of *HighAge* remains insignificant.

Second, while Adhikari and Agrawal (2018) and Nicolosi (2013) argue for using Tobit as the preferred estimator for payout regressions, other studies employ OLS (Chen, Leung, and Goergen 2017; Faff et al. 2016; Kulchania 2013). It is worth noting that Brooks (2007) posits that using the OLS estimation is better than others which do not require the normality assumption since violating this assumption in a large sample may not bias OLS. Therefore, I solve the model using pooled OLS to examine whether the results are sensitive to the estimation technique.[129]

The results of this analysis are presented in Table 5.11. Consistent with *H1*, the coefficient of *PcFemale* remains positive and significant at the 1% level. However, and contrary to *H2*, the coefficient of *AvgAge1* is negative and significant. These findings are consistent with those presented in the univariate analysis in Table 5.5,

[129] Importantly, OLS makes it possible to calculate the variance-inflated factor post-estimation. The VIF score does not exceed five for the variable of interest, suggesting that their coefficients are unaffected by multicollinearity.

which shows that firms whose TMT is older than the average TMT are associated with lower payouts.

Third, it is possible that the results are driven by the choice of control variables. Hence, I replace *Size* with *Log_Sale*, which is the natural logarithm of firm sales. This is important to avoid observing a mechanical relationship due to the fact that payout is scaled by total assets while the model controls for total assets. I also replace *CashFlowSD_10* with *CashFlowSD_5*, which is the rolling standard deviation of firm cash flow for the previous five years. The results in Table 5.12 are consistent with those in the main analysis. Specifically, the coefficient of *PcFemale* is positive and significant, in line with *H1*. Also, the coefficient of *AvgAge1* remains insignificant.

Fourth, prior studies examining payout levels have employed the Fama-MacBeth regression (Bae, Chang, and Kang 2012; Chay and Suh 2009; Chen, Leung, and Goergen 2017; Eisdorfer, Giaccotto, and White 2015). This approach considers the possibility of cross-sectional correlations. The results of this analysis are presented in Table 5.13. The average coefficient of *PcFemale* continues to be positive and significant at the 1% level, consistent with the main analysis and *H1*. Yet, the average coefficient of *AvgAge1* is negative and significant at the 1% level. While this finding contradicts the main analysis and *H2*, it is consistent with the findings of the univariate analysis (Table 5.5) and those obtained using OLS regression (Table 5.11).

Fifth, I use a logistic regression to verify the results by investigating whether the proportion of female managers on the TMT and the average age of the TMT influence the likelihood of a firm being an intense payer. To do so, I construct a new dummy variable (*HighPayout*) that takes the value of 1 if *Payout* is larger than the average *Payout* of 3.7%. Table 5.14 presents the results of this analysis, in which *HighPayout* is the dependent variable. The coefficient of *PcFemale* remains positive and significant at the 1% level, in line with the main analysis and *H1*. Nonetheless, the coefficient of *AvgAge1* is negative, with a significance level ranging from the 1% to the 10% level. This is consistent with the findings of the univariate analysis (Table 5.5) and the sensitivity analyses presented in Tables 5.11 and 5.13.

Sixth, it might be the case that the payout for this year is influenced by the dividends of the previous year. This is possible, since previous dividends may represent commitments that are hard to avoid, given the sticky nature of dividends. Intuitively, this year's dividend (which is part of *Payout*) is dependent on the previous year's dividends. To account for this possibility, two variables are included in the regressions in Table 5.15. *Lag_Div_Payer* is a dummy variable that takes the value of 1 if the firm pays dividends in t-1 and is included in Model 1. *Lag_Div_At* is the dividend over total assets in the previous year. The results are consistent with the main analysis. In particular, the coefficient of *PcFemale* is positive and significant at the 1% level, further supporting *H1*, while the coefficient of *AvgAge1* remains insignificant.

Lastly, the analysis presented in Table 5.16 considers the possibility that these results are driven by managerial compensation, given that this factor may be gender- or age-specific. Meanwhile, managerial compensation influences managerial risk-tolerance (Coles, Daniel, and Naveen 2006; Core and Guay 2002). Thus, any observed relationship between managerial characteristics and the riskiness of their choices might be driven by differences in the compensation structures, which may not be randomly distributed across TMTs with different characteristics. Hence, I control for managerial wealth, delta and vega by including *Log_Avg_Wealth*, *Log_Avg_Vega*, and *Log_Avg_Delta*.[130] In line with the main analysis and *H1*, the coefficient of *PcFemale* is positive and significant at the 1% level. Similarly, the coefficient of *AvgAge1* is insignificant.

All in all, the positive association between the proportion of female managers on the TMT and payout levels is robust to these different specifications, further supporting *H1*. These results are consistent with the view that TMTs containing more female executives are more risk-averse or less overconfident (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013), leading such TMTs to prefer payouts over investments. Nevertheless, while the main analysis shows that the average age of the TMT is not systematically related to the payout level, there is some evidence that TMT age and payout levels are inversely related. To the extent that a higher payout policy is a risker choice (Caliskan and

[130] See Section 3.6.2.3 in Chapter 3 for details on these variables.

Doukas 2015), it is possible that older TMTs will not adopt such a policy given their well-established reputation, which may protect them when they fail (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). That is; it plausible to suggest that older TMTs may adopt risker policies, such as favouring investments over payouts.

The subsequent section examines the influence of managerial gender and age at the CEO and CFO levels on the payout level.

5.6.1.3. CEOs versus CFOs: Gender, Age and Payout Levels

The previous section provides robust evidence on a positive association between the proportion of female managers on the TMT and the levels of payout. It also provides some evidence of a negative relationship between the average age of the TMT and the payout levels. This section investigates the relationship between managerial gender, age and payout levels at a finer level; namely, the CEO and CFO.

Table 5.17 provides the results of this analysis. All of the models are estimated using pooled Tobit regression, owing to the truncated nature of the dependent variable (*Payout*). All models control for the industry and year effects in order to absorb their influence. Model 1 contains the CEO characteristics, Model 2 contains the CFO characteristics, and Model 3 includes both. Model 4 controls for managerial compensation and wealth to account for the possibilities discussed in the previous section.

The coefficient of *CEO_Female* is insignificant in all models. This is inconsistent with the positive correlation reported in Table 5.4 and the univariate analysis in Table 5.5, which shows that firms with female CEOs systematically pay their shareholders more. Furthermore, while the coefficient of *CFO_Female* is positive and significant in Model 2 and 3, it loses its statistical significance once we include the compensation and wealth variables. This is interesting since Table 5.4 shows a positive correlation between *CFO_Female* and *Payout*, and the univariate analysis in Table 5.5 shows that firms with female CFOs systematically pay more to their shareholders compared to those with male ones.

These findings may provide support for the argument of UET that managerial characteristics should be investigated at the TMT level (Hambrick 2007; Hambrick and Mason 1984). While the analysis at the TMT level shows that managerial gender is important in determining the payout levels, the separate analysis of CEO and CFO gender suggest that it is less important. However, this might be attributed to the significant reduction in the sample size, especially at the CFO level.

The coefficient of *Log_CEO_Age* is positive and significant at the 5% level in Model 1, but this significance disappears when CFO characteristics are included in the model. In turn, the coefficient of *Log_CFO_Age* is negative and significant once we account for CEO characteristics. These findings may indicate that the influence of the CFO is stronger than that of the CEO, at least with regard to the decision on payout level. While the CEO is the main decision-maker, existing studies indicate that the CFO might have more influence on the financial policies of the firm (Chava and Purnanandam 2010).

Overall, there is weak evidence that the observed positive relationship between the proportion of female executives on the TMT and the payout level is partially driven by the gender of the CFO rather than that of the CEO. Moreover, the observed negative relationship between the average age of the TMT and payout level is partially driven by the age of the CFO. Combined, they indicate that the CFOs exercise a greater influence on the payout amount. It is possible that CEOs delegate this decision to CFOs, given their technical expertise with regard to these types of decisions.

5.6.2. Do Managerial Characteristics influence the Payout Methods?

This section presents the analysis of the relationship between managerial gender and age and the payout method. Following the univariate analysis, a multivariate analysis is presented, followed by several robustness checks. The section ends with an additional analysis that examines the role of the gender and age of the CEO and CFO.

5.6.2.1. Univariate analysis

The analysis begins with a univariate analysis examining whether the payout structure differs systematically between firms with different managerial characteristics

(Table 5.18) and firms within different industries (Table 5.19). *H3* proposes a positive relationship between *PcFemale* and *FlexiblePayout* (the proportion of stock repurchases to total payout), while *H4* proposes a positive relationship between *AvgAge* and *FlexiblePayout*.

First, firms whose TMTs contain at least 50% female members (*HighFemale* = 1) have 66.8% *FlexiblePayout* compared to 54.7% for other firms, and this difference is statistically significant (t-statistic = -3.8). Second, firms who employ at least one female manager on their TMT (*MaleFemaleTMT*) make 62.2% of their payout through stock repurchases compared to 52.1% for other firms, and this difference is statistically significant (t-statistic = -15.7). These results support the prediction in *H3* that female representation in the TMT is positively associated with the proportion of stock repurchases to total payout, due to their flexibility. It is possible that the association between female managers and stock repurchases is related to female risk-aversion or male overconfidence (Barber and Odean, 2001; Charness and Gneezy, 2012; Croson and Gneezy, 2009), since stock repurchases do not entail future commitments and therefore maintain the financial flexibility of the firm (Bonaimé, Hankins, and Harford 2014).

Also, firms with female CEOs report an average *FlexiblePayout* of 61.7% compared to 55.3% for firms with male ones. This difference is significant, with a t-statistic of -3.3. Similarly, firms with female CFOs report an average *FlexiblePayout* of 61.9% compared to 56.8% for firms whose CFO is female (t-statistic = -4.2). These findings are similar to those for the TMT level as a single unit.

Moreover, firms whose managers are older than the average TMT (*HighAge = 1*) are associated with lower payout flexibility. Specifically, firms with *HighAge* report an average *FlexiblePayout* of 48.6% compared to 63.9% for other firms, and this difference is statistically significant (t-statistic = 26.4). These findings challenge the prediction of *H4*, which proposes that older TMTs are associated with a higher proportion of stock repurchases to total payout.

This can be explained both theoretically and econometrically. First, it is possible that older managers take more risks because they have longer records that can protect them should they fail (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Second, it is also possible that this relationship is observed due to variables omission. For instance, Table 5.3 shows that the Manufacturing industry has the lowest average *FlexiblePayout* while Figure 5.9 shows that *AvgAge* is persistently higher for TMTs in the Manufacturing sector. Hence, it might be the case that this relationship is mainly driven by the industry, which influences both the payout method and managerial age. I test for this possibility.

Table 5.3 and Figure 5.2 suggest that *FlexiblePayout* might be industry-specific. Table 5.19 examines the statistical significance of the differences in the payout structure across industries. This analysis is based on Fama and French's five industry groups. The Consumers industry has an average *FlexiblePayout* of 51.9% compared to 55.9% for the rest of the sample, and this difference is systematic (t-statistic = 6.4). Firms in the Health sector conduct 66.7% of their payouts through *FlexiblePayout* compared to 53.8% for the rest of the sample. The t-statistic for this difference is -12.3. Similarly, HiTec firms have an average *FlexiblePayout* of 72.3% compared to 49.9% for the rest of the sample, and this difference is significant (t-statistic = -33.5). Both Health and HiTec firms are more risky than other firms, given the nature of their business. This might explain their dependency on flexible payout methods to avoid the commitment associated with dividends. Further, the Manufacturing sector has an average *FlexiblePayout* of 40.5% compared to 60.3% for the rest of the sample, and this difference is statistically significant (t-statistic = 31.8). Also, firms in the Other group do not systematically differ from the rest of the companies. Meanwhile, Table 3.8 (Chapter 3) shows that *AvgAge* is systematically different across industries.

Overall, this analysis shed light on several important issues. First, it provides preliminary results for a positive relationship between female managers and *FlexiblePayout*, in line with *H3*. Second, contrary to *H4*, it shows that older TMTs are associated with lower *FlexiblePayout*. However, while this relationship is theoretically possible, it might be observed due to the omission of an important variable. Thus, these insights are used in the following subsection to inform the analysis.

5.6.2.2. Multivariate analysis

Main Results

This section uses a multivariate analysis to further examine whether managerial gender and age are related to payout method. *H3* points to a positive relationship between *PcFemale* and *FlexiblePayout*, while *H4* predicts a positive relationship between *AvgAge1* and *FlexiblePayout*.

To examine these propositions, *FlexiblePayout* is regressed on *PcFemale* and *AvgAge1* as well as a set of control variables. Given that *FlexiblePayout* is left censored at zero, the model is estimated with a pooled Tobit regression.[131] The difference between Models 1 and 2 relates to controlling for the industry and year fixed effects. In Model 2, industry and year dummies are included to account for the time-invariant industry characteristics as well as year-specific influence. The descriptive statistics and univariate analysis suggest that not only is *FlexiblePayout* industry-specific, but so are managerial characteristics. Hence, controlling for industry effect is necessary.[132] Moreover, given that tax regimes could be driving the choice of dividends over repurchases, it is important to introduce year dummies, which control for the time variation in tax systems over the years (e.g. tax changes in a given year) and for changes in investors preferences for dividends over repurchases or *vice versa* (Bonaimé, Hankins, and Harford 2014). Thus, Model 2 includes year dummies to absorb the year-effects.

The results of this analysis are presented in Table 5.20. Consistent with *H3*, the coefficient of *PcFemale* is positive and significant at the 1% and 5% levels, indicating that the percentage of female managers on the TMT and *FlexiblePayout* are positively related. This relationship holds in both models. These findings are consistent with those of the univariate analysis, presented in Table 5.18. This finding might be explained by the arguments presented in developing the hypothesis.

[131] I check the sensitivity of the results to a change in the estimator later in this chapter.
[132] The industry fixed effects are based on SIC two-digits classifications (Bonaimé, Hankins, and Harford 2014)

In particular, dividends and repurchases differ in that the later provides financial flexibility. Unlike dividends, which are sticky (Lintner 1956), using stock repurchases as a payout method provides the firm with the flexibility necessary to evade the risks of underinvestment and financial distress (Bonaimé, Hankins, and Harford 2014). Hence, it is possible that TMTs who are more risk-averse or less overconfident about the future prefer stock repurchases over dividends.

In turn, existing studies suggest that TMTs make decisions together (Hambrick 2007; Hambrick and Mason 1984), and that the risk-aversion of a team member affects that of the other members of the team (Wallach, Kogan, and Bem 1962). Furthermore, existing studies provide evidence that females are more risk-averse or less overconfident than males (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013). Therefore, the positive association between the percentage of female managers on the TMT and the flexibility of the payout could be attributed to the increased (decreased) levels of risk-aversion (overconfidence) of TMTs containing more female executives. For instance, it is possible that a risk-averse TMT will emphasize the need to maintain financial flexibility since they overestimate the likelihood or degree of future financial distress. Alternatively, an overconfident TMT may overestimate their ability to overcome future downturns, allowing such TMTs to commit themselves to future payouts through dividends.

Moreover, *H4* proposes a positive relationship between *AvgAge* and *FlexiblePayout.* However, Table 5.20 shows that the coefficient of *AvgAge1* is negative and significant at the 1% level, suggesting that the average age of the managers on the TMT and *FlexiblePayout* are negatively associated. This relationship holds in Models 1 and 2. Further, these findings are consistent with those of the univariate analysis (Table 5.18), which shows that firms with older TMTs rely less on the flexible payout method.

While these results are inconsistent with *H4*, a negative relationship between the average age of the TMT and the flexibility of the payout method is theoretically possible, as discussed in section 5.3. Specifically, existing studies suggest that older executives could adopt risker policies since they have well-established reputations that can protect them in case of failure (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). As a result, younger TMTs may not prefer dividends, given the commitments associated with them. Intuitively, if relying on stock repurchases provides the financial flexibility that can aid TMTs to withstand future distress (Bonaimé, Hankins, and Harford 2014), it is possible that younger TMTs will rely more on this method, given that they do not have long success records that can protect them should they fail to overcome such distress.

Overall, the findings in this section support *H3*: *The proportion of female executives in the top management team and the proportion of stock repurchases to total payout are positively associated.* Nevertheless, they reject *H4*: *The average age of the top management team and the proportion of stock repurchases to total payout are positively associated*. Instead, the average age of the TMT and the proportion of stock repurchases to total payout are negatively and significantly related.

The next section discusses the control variables, before checking the reliability of these findings.

Control Variables

Table 5.20 shows the results for the main analysis of the determinants of *FlexiblePayout*. The coefficients of the control variables are mainly discussed based on Model 2, which includes both industry and year fixed effects. The coefficient of *Log_Avg_Tenure* is positive and significant at the 1% level but no longer significant once we account for the industry and year fixed effects in Model 2. Further, the coefficient of *Cash1* is positive and significant at the 1% level. These results are consistent with those of Bonaimé, Hankins, and Harford (2014) and may indicate that cash-rich firms distribute their excess cash via repurchases, since their cash holdings may not be replenished sufficiently quickly to meet the future commitment arising from current dividends.

Moreover, the coefficient of *Log_FirmAge* is negative and significant at the 1% level. This is consistent with the notion that mature firms are in a better position to establish future commitments. Interestingly, the coefficient of *Mtb* is insignificant. This is interesting since it is expected that growth firms, having substantial investments, may emphasise the need to maintain their financial flexibility.[133] Also, the coefficient of *CashFlowSD_10* is positive and significant at the 1% level. This is consistent with the view of Skinner (2008) and Chay and Suy (2009) that firms with less stable cash flows prefer stock repurchases over dividends in order to maintain their financial flexibility.

Additionally, the coefficient of *ROA* is negative and significant at the 1% level. It might be the case that firms repurchase their shares when they underperform (Krieger, Lee, and Mauck 2013). More, the coefficient of *Intang* is positive and significant at the 1% level. This is inconsistent with the view of Allen and Michaely (2003) that firms with higher levels of information asymmetry prefer dividends, since they provide a stronger signal of the prospects of the firm. It is possible that *Intang* may captures different constructs besides information asymmetry, such as the riskiness of the firm. For instance, intangible assets can arise from acquisitions or R&D activities, both of which are risky (Serfling 2014). If this is the case, then it is plausible that firms with risky operations will rely more on flexible payout methods.

Furthermore, the coefficient of *CashFlow* is positive and significant at the 1% level. This fits the argument of Skinner (2008) that firms make repurchases when they observe cash windfalls. In doing so, they distribute these additional flows without establishing future commitments. Also, the coefficient of *Lev* is negative and significant at the 5% level, after controlling for the influence of industry and year. If leverage proxies for the ability to raise debt, firms that can raise external finance might be in a better position to establish future commitments. Lastly, the coefficient of *Size* is positive and significant at the 1% level. Krieger, Lee, and Mauck (2013) find similar results.

Robustness Checks

In this section, the hypotheses related to the payout method are tested using different specifications to enhance the reliability of the results.

[133] In fact, some models presented in the robustness checks show a negative coefficient for *MtB*, calling for a better understanding of the determinants of the payout method.

First, I check whether the results are sensitive to changes in the estimation method. Following Bonaimé, Hankins, and Harford (2014), I estimate the model using pooled OLS, with the standard errors corrected for heteroscedasticity. Although the dependent variable is truncated, it is acceptable to violate the normality assumption with larger samples since the OLS estimates may not be biased (Brooks 2007). The results of this analysis are presented in Table 5.21. The coefficients of *PcFemale* are positive and significant at the 1% and 5% levels, while the coefficients of *AvgAge1* are negative and significant at the 1% level. These results suggest that the findings of the main analysis are not specific to using the Tobit regression.

Second, the results presented in the main analysis might be specific to the measures used for female representation on the TMT or TMT average age. Hence, I substitute *PcFemale* with the natural logarithm of the number of female managers on the TMT, (*Log_No_Female*) and *AvgAge1* with *HighAge*, which is a dummy taking the value of 1 if the average age of the TMT exceeds that of the average TMT. Table 5.22 shows that the coefficients of *Log_No_Female* are positive and significant at the 1% and 5% levels. Similarly, the coefficients of *HighAge* are negative and significant at the 1% level. These findings indicate that the main findings are not specific to the gender and age measures used in the main analysis.

Third, it is possible that some of the stock repurchases are conducted to finance the issuance of shares as part of employees compensations (Fama and French 2001; Skinner 2008). In such cases, stock repurchases cease to be a payout method and become part of managerial compensation. Therefore, I replace *FlexiblePayout* with *NetFlexiblePayout*, which is defined as stock repurchases net of stock issuance scaled by total payout (stock repurchases and dividends). Table 5.23 shows that the coefficients of *PcFemale* are positive and significant at the 1% levels, while the coefficients of *AvgAge1* are negative and significant at the 1% level. Thus, the main findings continue to hold after accounting for stock repurchases that are used to finance compensation plans.

Fourth, it might be the case that prior dividend payments affect the payout mix for this year. Table 5.24 presents the analysis that controls for previous commitments. Specifically, two variables are introduced. First, *Lag_Div_Payer* is a dummy variable that takes the value of 1 if the firm pays dividends in t-1 and is included in Model 1. Second, *Lag_Div_At* is the dividends for the previous year scaled by the total assets of that year. The results remain in line with the main findings. The coefficients of *PcFemale* are positive and significant at the 5% levels, and the coefficients of *AvgAge1* are negative and significant at the 1% level. Thus, the main findings are robust to accounting for previous commitments.

Fifth, Table 5.25 examines whether the main findings are sensitive to the measurement of two control variables. *Size* is replaced by *Log_Sale*, which is the natural logarithm of firm sales. This is important since many independent variables are scaled by total assets, while Size is the natural logarithm of total assets. Also, *CashFlowSD_10* is replaced by *CashFlowSD_5*, which is the rolling standard deviation of the cash flow for the last five years. The coefficients of *PcFemale* are positive and significant at the 1% and 5% levels. Likewise, the coefficients of *AvgAge1* are negative and significant at the 1% level. Therefore, the results are not sensitive to the measurement of these two control variables.

Sixth, Table 5.26 presents the results based on Fama and Macbeth (1973)'s two step procedure. The average coefficient of *PcFemale* is positive and significant at the 1% level. Also, the average coefficient of *AvgAge1* is negative and significant at the 1% level. Thus, the results continue to hold when using panel estimators.

Lastly, Table 5.27 controls for managerial wealth and compensation, by including *Log_Avg_Wealth*, *Log_Avg_Vega*, and *Log_Avg_Delta*.[134] The results show that the coefficients of *PcFemale* are positive and significant at the 1% and 10% levels. Also, the coefficients of *AvgAge1* are negative and significant at the 1% level. Therefore, the results continue to hold after accounting for managerial wealth and compensation.

In sum, the positive relationship between the percentage of female executives on the TMT and payout flexibility holds across all tests, in line with *H3*. This is consistent with the view that TMTs with more female managers are more risk-averse

[134] See Chapter 3, Section 3.6.2, for details on these variables.

or less overconfident (Barber and Odean 2001; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013; Khan and Vieito 2013), and therefore prefer stock repurchases over dividends in order to maintain the financial flexibility of the firm to withstand future distress (Bonaimé, Hankins, and Harford 2014). Moreover, consistent with the main analysis, the robustness checks continue to reject *H4* and show a negative and relationship between the average age of the TMT and payout flexibility. This is in line with the notion that younger TMTs may not have long records of success that can protect them should they fail (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), and thus adopt conservative policies such as maintaining the financial flexibility of the firm by relying more on stock repurchases when distributing cash to their shareholders (Bonaimé, Hankins, and Harford 2014).

5.6.2.3. CEOs versus CFOs: Gender, Age and Payout Method

The evidence in the previous section suggests that TMT gender and age are related to the firm choice of payout method. Specifically, the proportion of female executives on the TMT is positively related to the proportion of stock repurchases to total payout (*FlexiblePayout*), while the average age of the TMT and proportion of stock repurchases to total payout are negatively related. This section extends the chapter by examining the role of gender and age on payout flexibility at the CEO and CFO levels.

Prior studies indicate that these two executives exercise substantial influence over corporate policies (Chava and Purnanandam 2010; Kim, Li, and Zhang 2011). Hence, one may gain further insights by examining how the gender and age of the CEO and CFO separately affect the payout method. Following these studies, I estimate the equations for CEOs and CFOs separately as well as for these two executives together. Table 5.28 presents the results of this analysis. All models account for industry and year fixed-effects, and are estimated using pooled Tobit regression because of the truncated nature of the dependent variable. Model 1 includes the characteristics of the CEO; Model 2 includes the characteristics of the CFO; Model 3 includes the characteristics of both; and Model 4 controls for managerial compensation and wealth to consider the possibilities discussed earlier in this chapter.

In Models 1, 3, and 4, the coefficients of *CEO_Female* are negative and significant. These results are inconsistent with those of the univariate analysis (Table 5.18), which shows that firms with female CEOs use stock repurchases more than cash dividends. The coefficient of *CFO_Female* is also negative and significant in Models 3 and 4. These results also contrast those reported in the univariate analysis, which shows that firms with female CFOs have statistically higher *FlexiblePayout* than other firms. These results represent an anomaly that requires further investigation in the future.[135]

Looking at the age of both CEOs and CFOs, the coefficient of *Log_CEO_Age* is negative and significant at the 1% level across all models. Also, the coefficient of *Log_CFO_Age* is negative and significant at the 1% level in Models 3 and 4 only. These results suggest that the observed relationship between the average age of the TMT and *FlexiblePayout* is influenced by the age of both the CEOs and CFOs.

In sum, this section shows that female CEOs and CFOs are negatively associated with *FlexiblePayout*, an anomaly that calls for further research. This is an anomaly since the results of the main analysis provide robust evidence of a positive association between the percentage of female executives and *FlexiblePayout*. Additionally, the ages of both CEOs and CFOs are negatively related to *FlexiblePayout*, suggesting that the negative relationship between managerial age and *FlexiblePayout* at the TMT level is, at least partially, driven by both the CEOs and CFOs.

5.6.3. Summary of the Main Results

The main findings of this chapter are as follows. First, the proportion of female executives on the TMT is positively associated with the payout level and the flexibility of the payout method. One possible explanation is that TMTs with more female

[135] I perform several un-tabulated tests with the aim of understanding this anomaly, including the following. First, I use pooled OLS to estimate model 3. Neither *CEO_Female* nor *CFO_Female* are significant. I obtain similar results from using a pooled OLS on Model 4. Second, when Models 3 and 4 are estimated using Fama-MacBeth's regression, the coefficient of *CEO_Female* is insignificant, while the coefficient of *CFO_Female* becomes positive and significant. Such findings might be more in line with the findings of the univariate analysis, the TMT level analysis, and the discussed theories. However, Tobit regressions might be more appropriate, given that the dependent variable is left-censored.

managers adopt a conservative payout policy, given that TMTs with more females are more risk-averse or less overconfident. Second, I find some evidence of a negative relationship between the average age of the TMT and payout levels, as well as robust evidence of a negative relationship between TMT average age and the flexibility of the payout policy. A potential explanation for these results is that younger TMTs prefer a more conservative payout policy since they do not have established reputations that may insulate them from adverse career developments should their policy fail.

5.7. Conclusion

There is a growing body of literature that suggests that managerial characteristics play an important role in determining financial policies, including payout policy. This strand of literature improves our knowledge on payout policy and further supports the argument that payout policy is better explained by the supply side (DeAngelo, DeAngelo, and Skinner 2009). Notably, this literature is focused on the characteristics of the CEOs and directors. Yet, Hambrick and Mason (1984) stress the importance of examining the characteristics of the TMT as a single unit. They suggest that CEOs share their responsibilities with other senior managers, giving them some influence over corporate decisions. As a result, this study examines the impact of TMT managerial characteristics as a single unit on payout policy.

Consistent with the view that managers decide on the payout amount before deciding on the payout method (Bonaimé, Hankins, and Harford, 2014; Eisdorfer, Giaccotto, and White 2015), this chapter begins by examining the payout level. Caliskan and Doukas (2015) suggest that, at some point, managers need to decide whether to invest or distribute cash to their shareholders. Within this trade-off, investments are risker than payouts, leading to the prediction that risk-averse (overconfident) managers are positively (negatively) related to the payout level. Given that female managers might be more risk-averse or less overconfident (Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013), I hypothesise a positive relationship between the proportion of female managers on the TMT and payout level. Further, given the recent evidence that older managers are associated with more conservative corporate policies (Li, Low, and Makhija 2017; Serfling 2014; Yim 2013), I hypothesise a positive relationship between TMT average age and the payout level of the firm.

Using a large data set of S&P 1500 companies for the period 1992-2013, I find that the percentage of female executives on the TMT and payout level are positively related. This is consistent with the view that TMTs that contain more female executives adopt more conservative policies due to female risk-aversion or male overconfidence. However, contrary to my prediction, the analysis provides some evidence that TMT average age and payout level are negatively related. A possible explanation is that older TMTs have longer success records, which can protect them in the case of failure, thereby enabling them to adopt risker choices. In an additional analysis, I find some evidence suggesting that the CFO is more influential in setting the payout level. In particular, I find evidence that only the gender and age of the CFO are systematically related to the payout level. Female CFOs (CFO age) is positively (negatively) related to the amount distributed to the shareholders.

I then investigate whether managerial gender and age are related to the flexibility of the payout policy. Given the sticky nature of dividend payouts, the stock repurchases method improves the financial flexibility of the firm, thereby reducing the possibility of future financial distress (Bonaimé, Hankins, and Harford 2014). As a result, I hypothesise that the percentage of female executives on the TMT and the TMT average age are positively related to the proportion of stock repurchases to total payout, given the recent evidence that females and older managers adopt more conservative policies (Faccio, Marchica, and Mura 2016; Serfling 2014).

Consistent with my prediction, the analysis shows that the percentage of female managers on the TMT and the flexibility of the payout method are positively related. A possible explanation is that TMTs that contain more female executives are more risk-averse or less overconfident, emphasising the need to maintain the financial flexibility of the firm. Conversely, I find that the average age of the TMT and payout flexibility are negatively related. A possible explanation is that older managers take more risks since they have well-established reputations that can protect their careers should they fail. Surprisingly, the results suggest that both female CEOs and CFOs are negatively associated with the flexibility of the payout policy, an anomaly that calls for further research. On the other hand, the age of both CEOs and CFOs are negatively related to the flexibility of the payout policy, suggesting that these two executives play a role in determining the payout method.

The findings of this chapter are important for policy-makers when considering regulations related to gender diversity within corporations and those related to extending the retirement age. Furthermore, boards tasked with hiring and compensating TMT members could also benefit from these findings.

Table 5.1

Payout Levels across Industries and over Time

This table shows the means of total payout and total assets in nominal dollar values. It also shows *Payout* over time and across the F&F 5 Industry groups. *Payout* is total payout (dividends and stock repurchases) divided by total assets.

YEAR	Total Payout	ASSETS	Payout					
			Full Sample	Consumers	Health	HiTec	Manufacturing	Others
1992	77	2,944	2.74%	2.92%	2.87%	1.80%	2.71%	3.69%
1993	76	2,954	2.58%	2.89%	2.83%	1.98%	2.95%	1.85%
1994	79	2,969	2.59%	2.95%	2.06%	2.42%	2.76%	2.13%
1995	104	3,013	2.64%	2.62%	1.96%	1.97%	3.86%	1.76%
1996	106	3,117	2.97%	3.08%	2.42%	2.23%	3.66%	3.07%
1997	123	3,218	3.03%	3.47%	2.44%	2.26%	3.71%	2.82%
1998	148	3,509	4.02%	4.78%	2.86%	3.63%	4.38%	3.54%
1999	156	4,222	3.95%	5.65%	3.31%	2.87%	3.63%	3.89%
2000	165	4,975	3.27%	3.97%	3.13%	2.77%	3.25%	3.11%
2001	150	5,286	2.37%	2.61%	2.62%	2.25%	2.12%	2.39%
2002	142	5,251	2.64%	2.95%	4.55%	2.35%	1.75%	2.78%
2003	149	5,577	2.62%	3.10%	3.39%	2.52%	2.01%	2.40%
2004	220	6,027	3.44%	4.24%	3.93%	3.34%	2.44%	3.48%
2005	355	6,570	4.90%	5.32%	5.73%	5.24%	3.62%	5.03%
2006	410	6,587	5.79%	6.99%	5.55%	5.56%	4.37%	6.57%
2007	450	6,575	6.92%	7.68%	5.80%	7.10%	4.80%	9.57%
2008	343	6,566	4.83%	4.62%	3.97%	6.26%	3.79%	4.73%
2009	204	6,838	2.42%	2.41%	2.88%	2.71%	1.61%	2.89%
2010	318	7,553	3.95%	5.34%	4.27%	3.97%	2.34%	3.89%
2011	424	8,291	5.04%	6.31%	4.46%	5.29%	3.65%	4.94%
2012	433	8,957	5.01%	6.42%	5.19%	5.22%	3.84%	3.92%
2013	521	9,767	4.60%	5.21%	4.11%	5.53%	3.76%	3.53%
Average	**234**	**5,489**	**3.74%**	**4.34%**	**3.65%**	**3.60%**	**3.23%**	**3.73%**

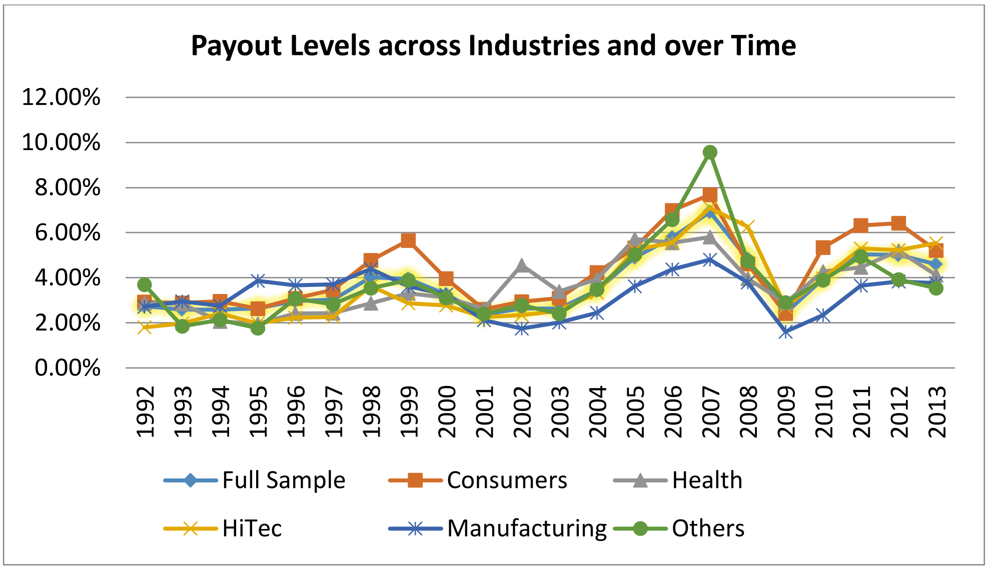

Figure 5.1 Payout Levels across Industries and over Time

Table 5.2: Descriptive Statistics

The sample consists of 32,831 firm year observations for all firms available on ExecuComp for 1992-2013, excluding financial and utility firms. Executive data are obtained from ExecuComp, and the financial data are from Compustat. *Total Payout* is the dollar amount of firm payout regardless of its format. *Dividends* is the dollar amount of the firms' dividend. *Repurchases* is the dollar amount of firms' repurchases. *Payout* is total payout scaled by total assets. *FlexiablePayout* is stock repurchases scaled by total payout. *PcFemale* is the percentage of female executives on the TMT. *CEO_Female* is a dummy taking the value of 1 if the CEO is female. *CFO_Female* is a dummy taking the value of 1 if the CFO is female. *AvgAge* is the average age of the executives on the TMT in years. *CEO_Age* is the age of the CEO in years. *CFO_Age* is the age of the CEO in years. *Avg_Tenure* is the average tenure of the executives on the TMT. *CEO_Tenure* is the tenure of the CEO. *CFO_Tenure* is the tenure of the CFO. *Cash1* is cash and short-term assets scaled by total assets. *FirmAge* is the number of years since the firm was included on Compustat. *MtB* is the market to book ratio. *ROA* is the return on assets. *Intang* is intangible assets scaled by total assets. *CashFlow* is the cash flow of the firm scaled by total assets. *Lev* is total debt scaled by total assets. *Assets* is the dollar amount of total assets. In all variables, all available observations are included. All variables are defined in the appendix.

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Total Payout	32,831	$234.89	$8.75	$1187.60	$0.00	$45025.00
Dividends	32,831	$96.07	$0.00	$545.62	$0.00	$36968.00
Repurchases	32,831	$141.54	$0.04	$798.92	$0.00	$35734.00
Payout	32,831	0.04	0.01	0.09	0	3.5
FlexibalePayout	21,940	0.55	0.64	0.42	0	1
PcFemale	32,831	0.06	0	0.11	0	1
CEO_Female	29,542	0.022	0	0.148	0	1
CFO_Female	25,064	0.072	0	0.259	0	1
AvgAge	29,119	53.32	53	5.6	31	88
CEO_Age	28,232	55.458	55	7.64	27	96
CFO_Age	15,524	50.408	50	6.966	26	87
Avg_Tenure	32,820	4.614	4.167	2.629	1	22
CEO_Tenure	29,542	7.057	5	7.351	0	61
CFO_Tenure	25,064	4.128	3	5.15	0	44
Cash1	32,646	0.16	0.09	0.18	0	1
FirmAge	32,831	23.486	19	16.35	0	64
MtB	32,050	2.2	1.64	2.44	0.2	151.18
CashFlowSD_10	31,281	0.071	0.04	0.536	0	57.232
ROA	32,633	0.03	0.05	0.7	-103	35.51
Intang	32,831	0.15	0.08	0.18	0	0.93
CashFlow	30,402	0.07	0.09	0.67	-100	0.73
Lev	32,524	0.23	0.2	0.85	0	120.94
Assets	32,655	$5482.93	$989.68	$23266.25	$0.00	$797769.00

Table 5.3

Payout Methods across Industries and over Time

This table shows the means of stock repurchases and total payout in nominal dollar values over time. It also shows *FlexiablePayout* over time and across the F&F 5 Industry groups. *FlexiablePayout* is stock repurchases scaled by total payout.

YEAR	Repurchases	Total Payout	FlexiablePayout					
			Full Sample	Consumers	Health	HiTec	Manufacturing	Others
1992	22.78	76.57	27.39%	26.85%	44.16%	48.91%	17.88%	19.09%
1993	24.90	75.66	28.81%	26.44%	53.70%	46.96%	17.69%	26.68%
1994	27.78	78.53	32.90%	32.32%	46.35%	50.62%	22.10%	32.10%
1995	47.02	104.32	36.29%	33.27%	48.13%	50.86%	28.57%	37.38%
1996	55.18	105.78	44.28%	40.80%	59.20%	61.40%	35.50%	41.49%
1997	76.34	123.15	53.06%	47.90%	56.63%	69.89%	46.27%	52.82%
1998	99.29	148.12	60.92%	59.31%	64.54%	71.09%	54.74%	60.65%
1999	105.77	156.33	62.11%	62.35%	66.99%	76.16%	47.71%	69.01%
2000	108.15	164.93	63.61%	64.01%	68.44%	77.33%	51.14%	66.92%
2001	91.08	150.05	55.11%	53.31%	65.00%	77.68%	37.05%	56.44%
2002	84.40	142.40	58.40%	54.83%	74.17%	79.65%	33.88%	66.80%
2003	92.93	148.84	56.74%	55.63%	71.31%	75.92%	33.42%	62.36%
2004	143.53	220.44	55.69%	54.39%	68.34%	75.54%	35.36%	55.22%
2005	236.45	354.67	60.83%	58.61%	68.81%	77.56%	45.94%	59.62%
2006	314.86	410.48	65.11%	59.06%	70.90%	80.03%	54.43%	67.36%
2007	337.08	450.18	67.88%	64.59%	73.24%	81.15%	57.01%	66.56%
2008	238.05	343.34	66.34%	59.27%	74.92%	81.79%	54.45%	65.26%
2009	98.83	204.36	50.78%	43.57%	72.06%	71.03%	29.53%	51.91%
2010	197.05	318.07	58.05%	58.05%	72.78%	72.62%	40.35%	55.26%
2011	292.69	424.42	64.05%	63.73%	79.74%	76.80%	47.03%	61.47%
2012	269.64	432.50	59.84%	58.13%	69.65%	72.92%	48.59%	53.35%
2013	335.44	520.66	60.07%	56.32%	71.41%	72.87%	49.77%	55.16%
Average	**150**	**234.3**	**54.01%**	**51.49%**	**65.48%**	**70.40%**	**40.38%**	**53.77%**

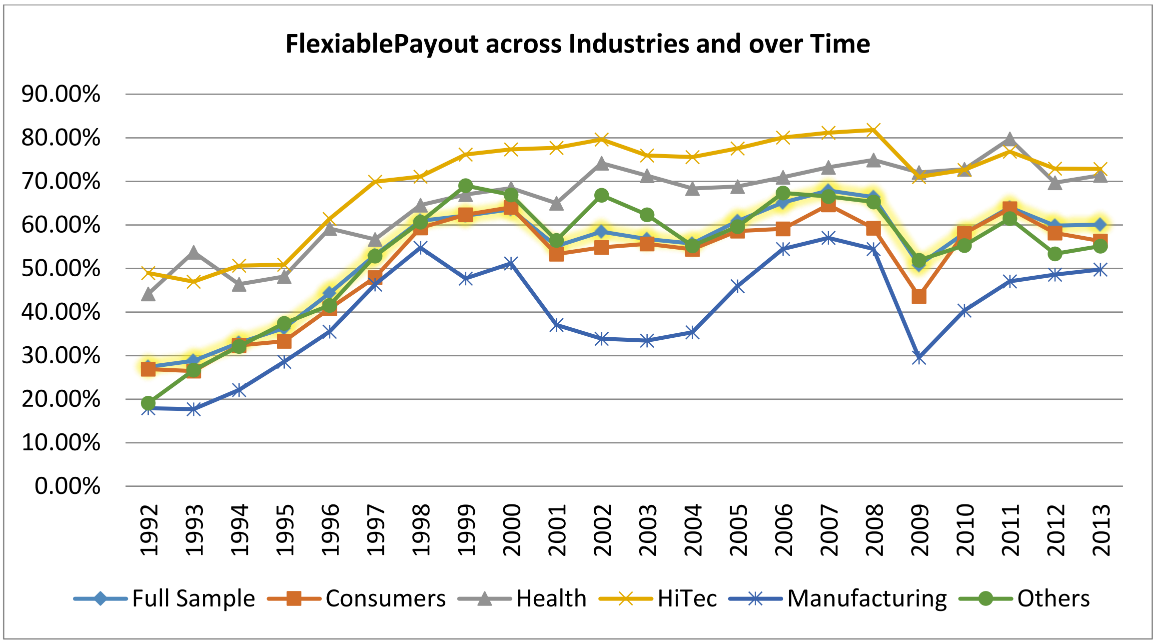

Figure 5.2 The Proportion of Stock Repurchases to Total Payout across Industries and over Time

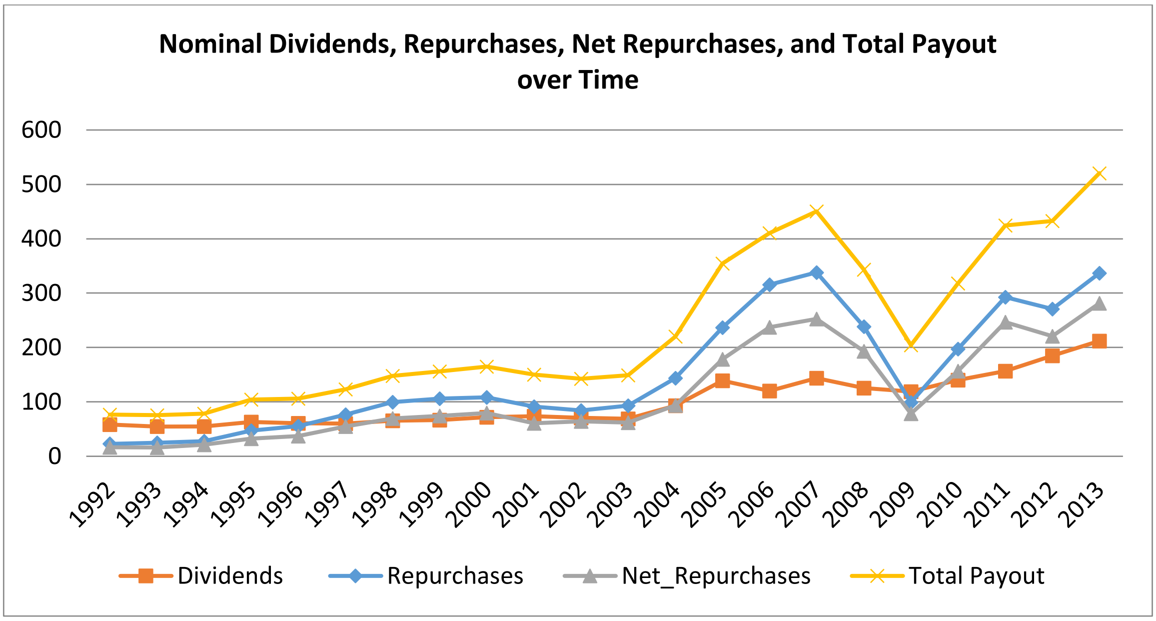

Figure 5.3 Nominal Dividends, Repurchases, Net Repurchases, and Total Payout over Time

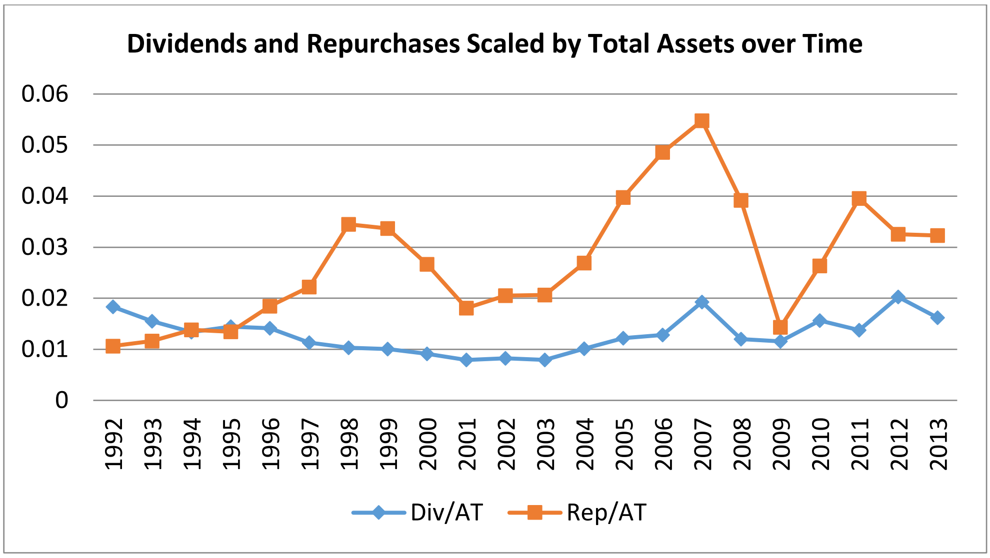

Figure 5.4 Dividends and Repurchases Scaled by Total Assets over Time

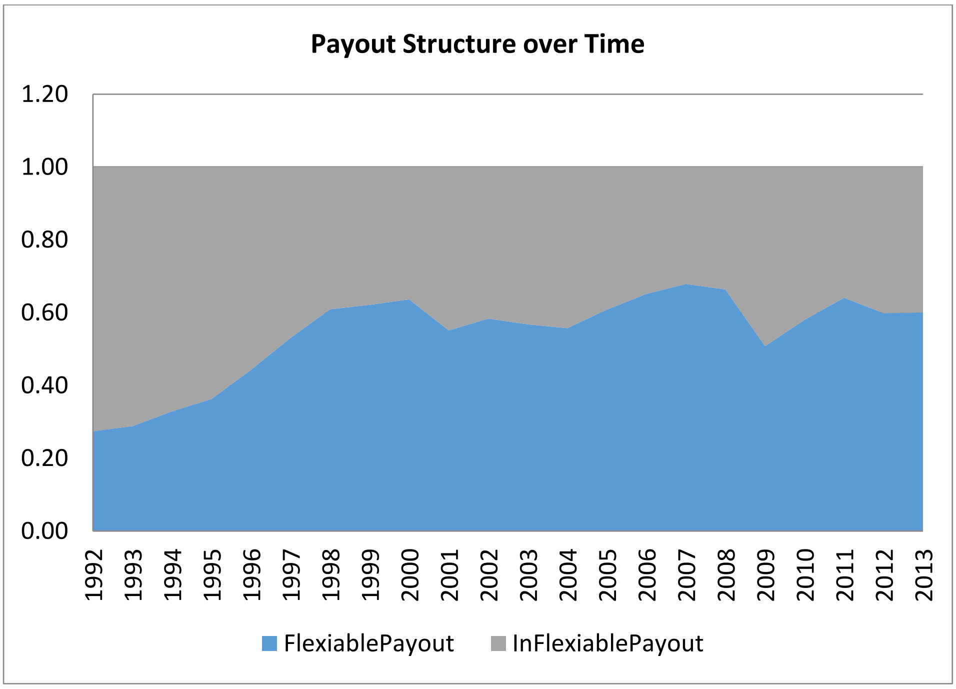

Figure 5.5 Payout Structure over Time

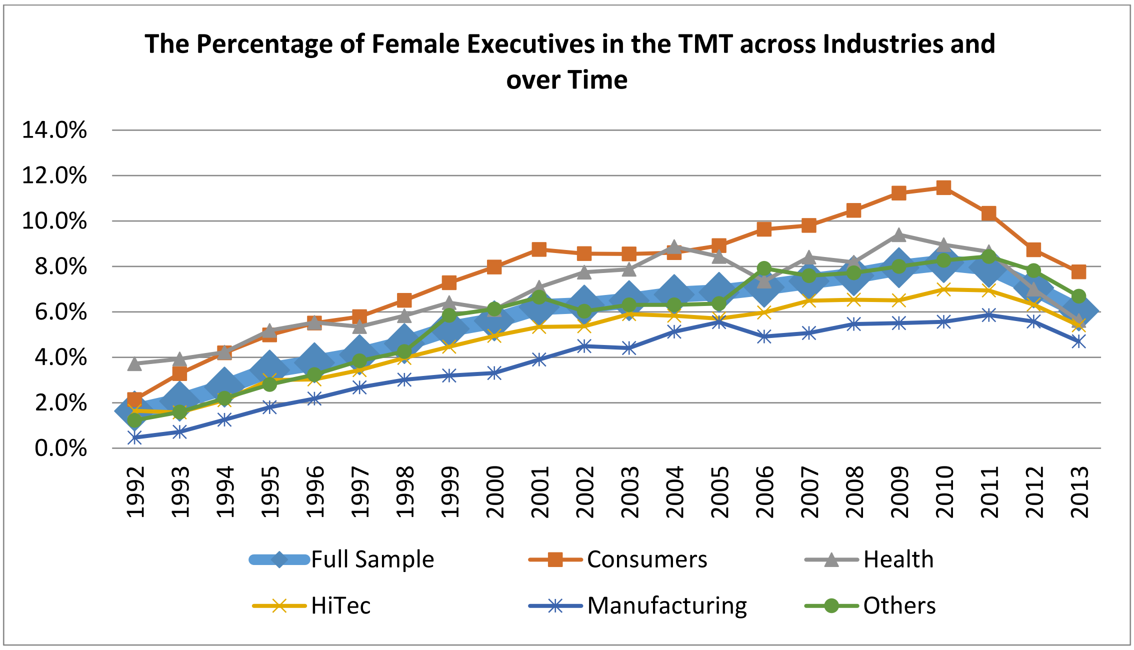

Figure 5.6 The Development of Female Representation in TMTs across Industries and over Time

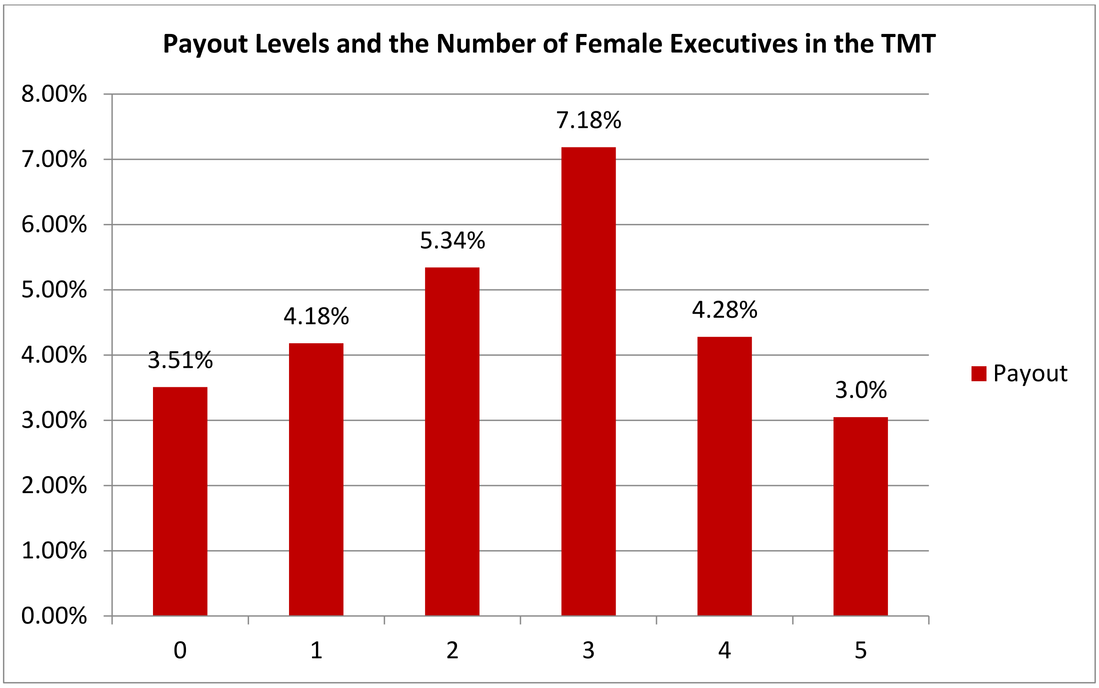

Figure 5.7 Payout Levels and the Number of Female Executives in the TMT

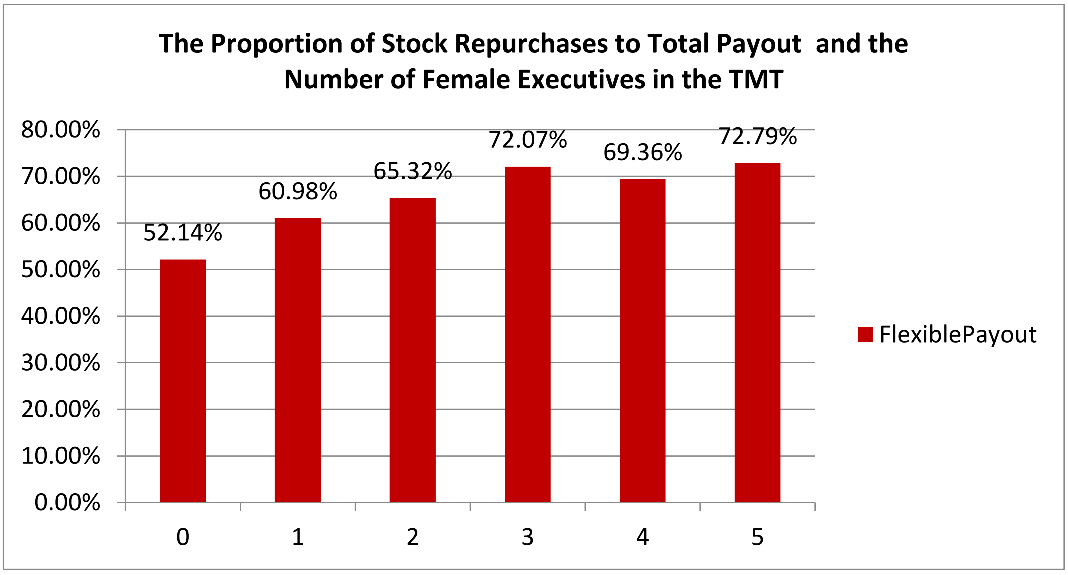

Figure 5.8 The Proportion of Stock Repurchases to Total Payout and the Number of Female Executives in the TMT

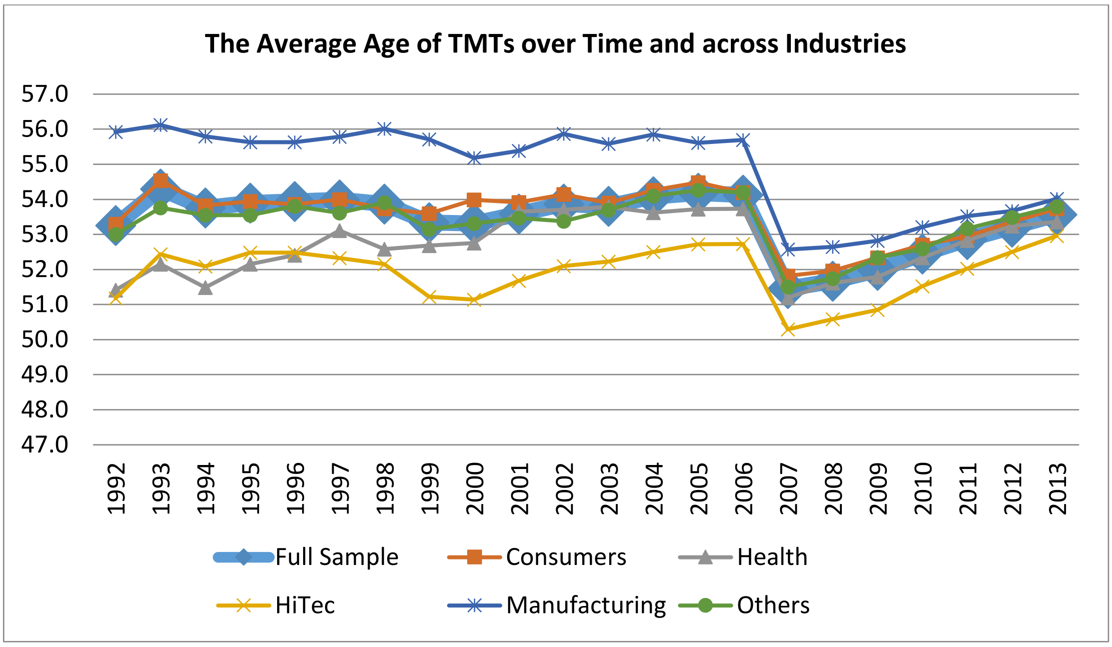

Figure 5.9 The Average Age of TMTs over Time and across Industries

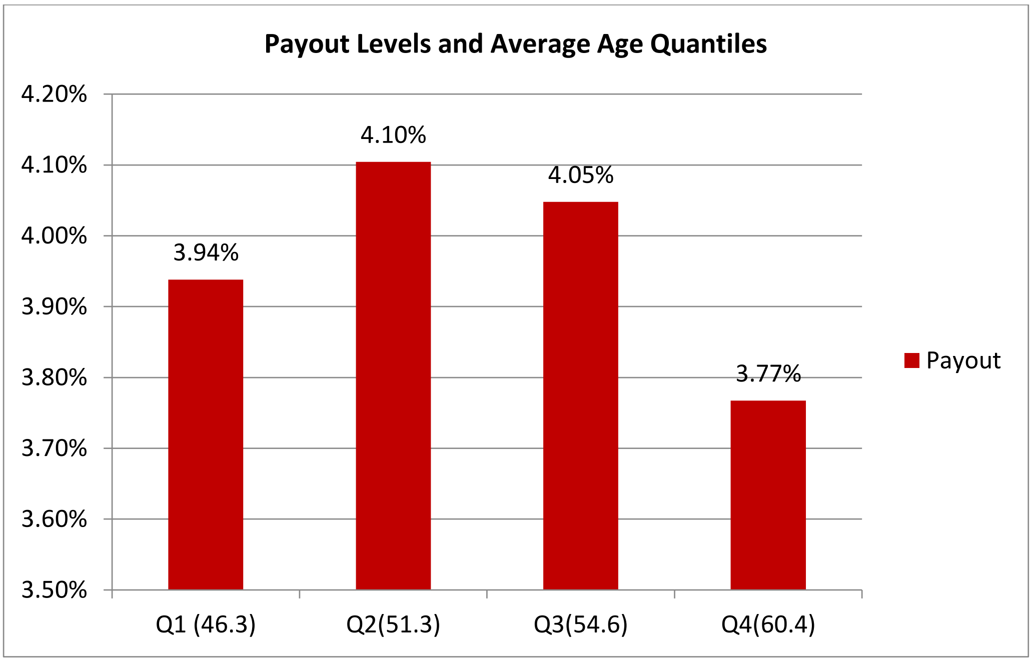

Figure 5.10 Payout Levels and Average Age Quantiles

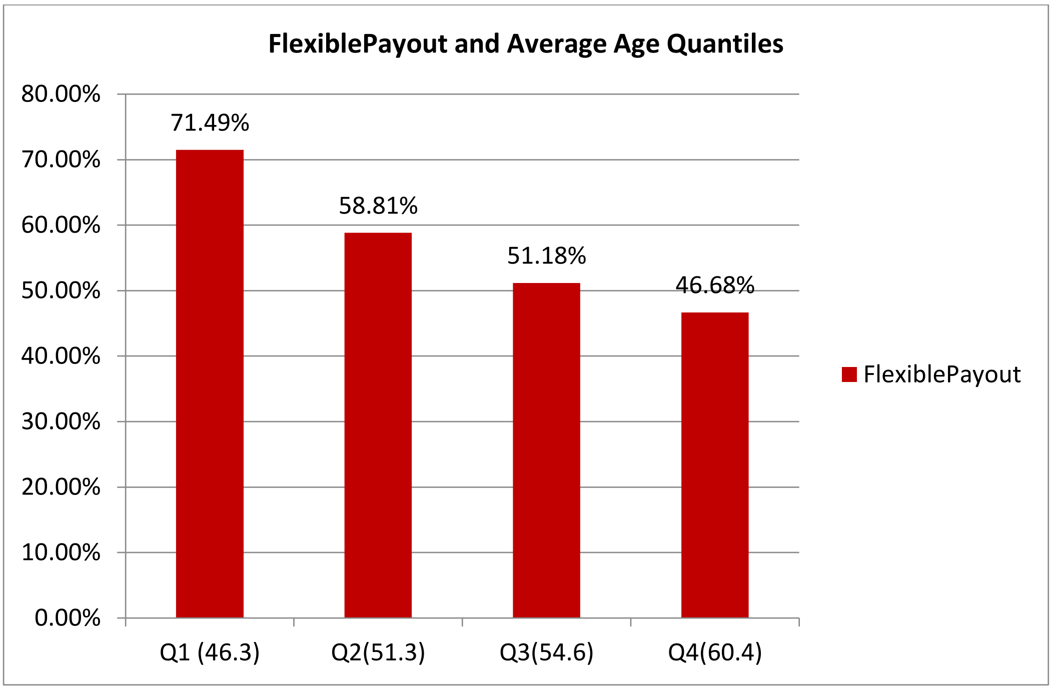

Figure 5.11 Flexible Payout and Average Age Quantiles

Table 5.4. Correlation Matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Payout																			
2	FlexiblePayout	0.178																		
3	PcFemale	0.057	0.06																	
4	CEO_Female	0.005	0.004	0.333																
5	CFO_Female	0.032	0.012	0.453	0.026															
6	AvgAge1	-0.065	-0.205	-0.079	-0.033	-0.033														
7	Log_CEO_Age	-0.064	-0.139	0	-0.05	0.003	0.578													
8	Log_CFO_Age	-0.012	-0.099	-0.05	-0.008	-0.077	0.538	0.164												
9	Log_Avg_Tenure	0.026	-0.033	-0.004	-0.015	0.008	0.315	0.206	0.178											
10	Log_CEO_Tenure	-0.041	-0.002	-0.03	-0.083	-0.015	0.183	0.403	0.051	0.306										
11	Log_CFO_Tenure	0.007	-0.008	-0.041	-0.062	-0.007	0.176	0.101	0.246	0.395	0.195									
12	Cash1	0.198	0.19	0.059	0.018	0.036	-0.154	-0.094	-0.064	-0.043	0.039	-0.023								
13	Log_FirmAge	-0.044	-0.266	-0.015	0.004	-0.021	0.34	0.179	0.241	0.313	-0.008	0.084	-0.164							
14	MtB	0.413	0.088	0.009	-0.022	0.056	-0.11	-0.094	-0.014	-0.022	-0.002	0.022	0.335	-0.138						
15	CashFlowSD_10	0.004	0.027	-0.007	-0.003	-0.004	-0.032	-0.041	-0.029	-0.039	-0.024	-0.026	0.022	-0.059	0.036					
16	ROA	0.326	0.008	0.01	-0.014	0.034	0.031	0.003	0.057	0.054	0.006	0.039	0.109	0.001	0.422	-0.066				
17	Intang	-0.049	0.067	0.029	0.025	0.024	-0.04	-0.053	0.011	0.027	-0.029	0.019	-0.225	-0.011	-0.078	-0.005	-0.037			
18	CashFlow	0.138	0.17	0.027	-0.006	0.023	-0.047	-0.036	-0.009	0.001	0.002	0.008	0.004	-0.095	0.317	-0.061	0.6	-0.019		
19	Lev	0.037	-0.064	-0.018	0.016	-0.018	0.032	0.011	-0.001	-0.021	-0.037	-0.034	-0.336	0.016	-0.116	0.054	-0.143	0.172	-0.119	
20	Size	-0.034	-0.106	-0.002	0.001	0.028	0.196	0.099	0.149	0.183	-0.065	0.045	-0.249	0.359	-0.105	-0.056	0.047	0.19	-0.008	0.243

Table 5.5
Difference in Means for Payout Levels (TMT Subsamples)

This table shows the differences in total payout as measured by *Payout*, which is total payout scaled by total assets. The data are based on the full sample. *HighFemale* denotes teams in which females represent 50% or more of the members. *CEO_Female* and *CFO_Female* denote companies with a female CEO and female CFO, respectively. *MaleFemaleTeam* is for TMTs with at least one female manager. *HighAge* denotes teams whose executives' average age exceeds that of the full sample.

TMT Characteristics	Yes	No	Difference	T-statistic
HighFemale	5.95%	3.74%	-2.21%	-4.3625
MaleFemaleTMT	4.48%	3.51%	-0.98%	-9.1674
CEO_Female	5.24%	3.93%	-1.31%	-3.9195
CFO_Female	4.97%	3.9%	-1.02%	-4.7128
HighAge	3.87%	4.06%	0.19%	1.9020

Table 5.6
Difference in Means for Investments (Gender Subsamples)

This table shows the difference in the investments made by firms whose TMTs include a female and those with only male members *RD1* is R&D investments scaled by total assets. *AQ* is acquisitions scaled by total assets. *CAPEX* is capital expenditure scaled by total assets.

Firm Characteristics	TMT with a Female		Difference	T-statistic
	Yes	No		
RD1	3.49%	3.79%	0.30%	1.9846
AQ	2.73%	2.82%	0.09%	1.0396
CAPEX	5.57%	6.14%	0.57%	7.3558

Table 5.7
Difference in Means for Investments (Age Subsamples)

This table shows the differences in the investments made by firms whose TMTs are older than the average TMT and those who are younger. *RD1* is R&D investments scaled by total assets. *AQ* is acquisitions scaled by total assets. *CAPEX* is capital expenditure scaled by total assets.

Firm Characteristics	HighAge		Difference	T-statistic
	Yes	No		
RD1	3.00%	4.17%	1.17%	7.9770
AQ	2.63%	2.97%	0.35%	4.3229
CAPEX	5.71%	5.92%	0.22%	3.0867

Table 5.8

Difference in Means for Payout Levels (Industry Subsamples)

This table shows the difference in total payout, measured by *Payout,* across the F&F 5 industry grouping. *Payout* is defined as the total payout scaled by total assets

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	4.33%	3.56%	-0.77%	-7.1642
Health	3.69%	3.77%	0.08%	0.5279
HiTec	3.70%	3.79%	0.08%	0.7756
Manufacturing	3.24%	3.93%	0.69%	6.2671
Other	3.78%	3.76%	-0.01%	-0.1052

Table 5.9

Tobit Regressions estimating the Determinants of Payout Levels (Main Model)

$$Payout = \propto + \beta_1 PcFemale + \beta_2\ AvgAge1 + \beta_3\ Controls + \beta_4 Industry\,\&\,Year\ Dummies\ +\ \varepsilon$$

The dependent variable for all models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0466*** **	**0.0282*** **
	(0.0066)	(0.0068)
AvgAge1	**-0.0007**	**0.0055**
	(0.0070)	(0.0072)
Log_Avg_Tenure	**0.0130*** **	**0.0171*** **
	(0.0017)	(0.0023)
Cash1	**0.0139* **	**0.0113**
	(0.0072)	(0.0075)
Log_FirmAge	**0.0216*** **	**0.0189*** **
	(0.0013)	(0.0013)
MtB	**0.0107*** **	**0.0093*** **
	(0.0011)	(0.0010)
CashFlowSD_10	**0.0001**	**0.0003**
	(0.0011)	(0.0010)
ROA	**0.0469*** **	**0.0438*** **
	(0.0112)	(0.0107)
Intang	**0.0028**	**-0.0252*** **
	(0.0034)	(0.0045)
CashFlow	**0.1293*** **	**0.1205*** **
	(0.0276)	(0.0279)
Lev	**0.0103** **	**0.0109** **
	(0.0051)	(0.0052)
Size	**0.0055*** **	**0.0067*** **
	(0.0005)	(0.0006)
Constant	**-0.1490*** **	**-0.1503*** **
	(0.0285)	(0.0354)
Observations	26,230	26,230
Pseudo R2	-0.1343	-0.2008
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.10

Tobit Regressions estimating the Determinants of Payout Levels (Alternative Measure for Gender and Age)

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the natural logarithm of the number of female executives on the TMT in a firm year (*Log_No_Female*), a dummy variable that takes the value of 1 if the average age of the top executives exceeds that of all TMTs (*HighAge*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
Log_No_Female	**0.0145*** **	**0.0098*** **
	(0.0019)	(0.0019)
HighAge	**-0.0019**	**-0.0006**
	(0.0013)	(0.0014)
Log_Avg_Tenure	**0.0134*** **	**0.0178*** **
	(0.0016)	(0.0023)
Cash1	**0.0132* **	**0.0108**
	(0.0072)	(0.0075)
Log_FirmAge	**0.0218*** **	**0.0190*** **
	(0.0013)	(0.0013)
MtB	**0.0107*** **	**0.0093*** **
	(0.0011)	(0.0010)
CashFlowSD_10	**0.0001**	**0.0003**
	(0.0011)	(0.0010)
ROA	**0.0471*** **	**0.0439*** **
	(0.0112)	(0.0107)
Intang	**0.0023**	**-0.0254*** **
	(0.0034)	(0.0045)
CashFlow	**0.1296*** **	**0.1207*** **
	(0.0277)	(0.0279)
Lev	**0.0103** **	**0.0110** **
	(0.0051)	(0.0052)
Size	**0.0055*** **	**0.0067*** **
	(0.0005)	(0.0006)
Constant	**-0.1523*** **	**-0.1277*** **
	(0.0081)	(0.0213)
Observations	26,230	26,230
Pseudo R2	-0.1349	-0.2012
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.11

OLS Regressions estimating the Determinants of Payout Levels

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

	(1)	(2)
VARIABLES	Model 1	Model 2
PcFemale	**0.0391*** **	**0.0210*** **
	(0.0051)	(0.0053)
AvgAge1	**-0.0181*** **	**-0.0099* **
	(0.0052)	(0.0053)
Log_Avg_Tenure	**0.0085*** **	**0.0088*** **
	(0.0013)	(0.0017)
Cash1	**0.0158*** **	**0.0076**
	(0.0048)	(0.0049)
Log_FirmAge	**0.0094*** **	**0.0081*** **
	(0.0007)	(0.0007)
MtB	**0.0101*** **	**0.0090*** **
	(0.0009)	(0.0009)
CashFlowSD_10	**-0.0007**	**-0.0006**
	(0.0004)	(0.0004)
ROA	**0.0165** **	**0.0149** **
	(0.0074)	(0.0068)
Intang	**0.0021**	**-0.0238*** **
	(0.0025)	(0.0032)
CashFlow	**0.0103**	**0.0090**
	(0.0104)	(0.0094)
Lev	**-0.0068*** **	**-0.0059** **
	(0.0026)	(0.0025)
Size	**0.0025*** **	**0.0032*** **
	(0.0004)	(0.0004)
Constant	**0.0263**	**0.0012**
	(0.0207)	(0.0271)
Observations	26,230	26,230
R-squared	0.0624	0.1054
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.12

Tobit Regressions estimating the Determinants of Payout Levels (Alternative Controls)

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. *CashFlowSD_5* replaces *CashFlowSD_10*, and *Log_Sale* replaces *Size*. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(3) Model 2
PcFemale	**0.0436*** **	**0.0283*** **
	(0.0065)	(0.0068)
AvgAge1	**-0.0013**	**0.0030**
	(0.0070)	(0.0072)
Log_Avg_Tenure	**0.0120*** **	**0.0168*** **
	(0.0016)	(0.0023)
Cash1	**0.0280*** **	**0.0241*** **
	(0.0070)	(0.0073)
Log_FirmAge	**0.0186*** **	**0.0167*** **
	(0.0013)	(0.0013)
MtB	**0.0105*** **	**0.0091*** **
	(0.0011)	(0.0010)
CashFlowSD_5	**-0.0001**	**0.0002**
	(0.0014)	(0.0013)
ROA	**0.0443*** **	**0.0413*** **
	(0.0109)	(0.0104)
Intang	**0.0058* **	**-0.0206*** **
	(0.0034)	(0.0044)
CashFlow	**0.1171*** **	**0.1086*** **
	(0.0279)	(0.0283)
Lev	**0.0088* **	**0.0093* **
	(0.0051)	(0.0052)
Log_Sale	**0.0089*** **	**0.0093*** **
	(0.0006)	(0.0007)
Constant	**-0.1607*** **	**-0.1533*** **
	(0.0285)	(0.0353)
Observations	26,221	26,221
Pseudo R2	-0.1446	-0.2084
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.13

Fama-MacBeth Regression estimating the Determinants of Payout Levels

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The maximum observations available are included. The Fama-MacBeth standard errors are shown in parentheses.

VARIABLES	(1) Model 1
PcFemale	**0.0337*** **
	(0.0059)
AvgAge1	**-0.0191*** **
	(0.0060)
Log_Avg_Tenure	**0.0024**
	(0.0027)
Cash1	**0.0083**
	(0.0070)
Log_FirmAge	**0.0078*** **
	(0.0014)
MtB	**0.0149*** **
	(0.0018)
CashFlowSD_10	**-0.0166* **
	(0.0095)
ROA	**0.1348*** **
	(0.0276)
Intang	**-0.0051* **
	(0.0028)
CashFlow	**-0.0700** **
	(0.0322)
Lev	**0.0178**
	(0.0108)
Size	**0.0010**
	(0.0008)
Constant	**0.0413* **
	(0.0208)
Observations	26,230
Average R-squared	0.1860

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.14

Logistic Regressions estimating the Determinants of Propensity of High Payout Levels

The dependent variable is *HighPayout*, which takes the value of 1 if *Payout* exceeds the average *Payout*. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The models are estimated using a logistic regression. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**1.1160*** **	**0.6785*** **
	(0.1346)	(0.1457)
AvgAge1	**-0.5036*** **	**-0.3211* **
	(0.1565)	(0.1679)
Log_Avg_Tenure	**0.2475*** **	**0.3105*** **
	(0.0323)	(0.0408)
Cash1	**0.7028*** **	**0.6162*** **
	(0.1115)	(0.1281)
Log_FirmAge	**0.3820*** **	**0.3536*** **
	(0.0260)	(0.0283)
MtB	**0.0982*** **	**0.0638*** **
	(0.0117)	(0.0121)
CashFlowSD_10	**-0.3700** **	**-0.1573**
	(0.1607)	(0.1308)
ROA	**10.4436*** **	**10.0791*** **
	(0.2904)	(0.2966)
Intang	**0.6817*** **	**-0.1758* **
	(0.0836)	(0.1054)
CashFlow	**-0.2499** **	**-0.2466*** **
	(0.1006)	(0.0907)
Lev	**-0.7171*** **	**-0.8185*** **
	(0.0922)	(0.0981)
Size	**0.1909*** **	**0.2489*** **
	(0.0110)	(0.0123)
Constant	**-2.7265*** **	**-3.9685*** **
	(0.6129)	(0.8183)
Observations	26,230	26,161
Pseudo R2	0.1427	0.1885
Industry FE	NO	YES
Year FE	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.15

Tobit Regressions estimating the Determinants of Payout Levels (Controlling for Previous Commitments)

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. The models are augmented by measures of previous payout commitments. *Lag_Div_Payer* is a dummy variable that takes the value of 1 if the firm paid dividends in t-1. *Lag_Div_At* is dividends scaled by total assets in t-1. The models are estimated using a censored regression (Tobit), and control for both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0282*** **	**0.0285*** **
	(0.0068)	(0.0069)
AvgAge1	**0.0063**	**0.0050**
	(0.0074)	(0.0073)
Log_Avg_Tenure	**0.0171*** **	**0.0172*** **
	(0.0023)	(0.0023)
Cash1	**0.0114**	**0.0109**
	(0.0075)	(0.0075)
Log_FirmAge	**0.0189*** **	**0.0189*** **
	(0.0013)	(0.0013)
MtB	**0.0093*** **	**0.0093*** **
	(0.0010)	(0.0010)
CashFlowSD_10	**0.0003**	**0.0003**
	(0.0010)	(0.0010)
ROA	**0.0438*** **	**0.0433*** **
	(0.0107)	(0.0106)
Intang	**-0.0252*** **	**-0.0252*** **
	(0.0045)	(0.0045)
CashFlow	**0.1206*** **	**0.1186*** **
	(0.0279)	(0.0279)
Lev	**0.0109** **	**0.0105** **
	(0.0052)	(0.0052)
Size	**0.0067*** **	**0.0067*** **
	(0.0006)	(0.0006)
Lag_Div_Payer	**-0.0010**	
	(0.0013)	
Lag_Div_At		**0.0019**
		(0.0096)
Constant	**-0.1532*** **	**-0.1499*** **
	(0.0362)	(0.0355)
Observations	26,229	26,058
Pseudo R2	-0.2009	-0.1980
Industry FE	YES	YES
Year FE	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.16

Tobit Regressions estimating the Determinants of Payout Levels (Controlling for Delta, Vega, and Wealth)

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are augmented with the natural logarithms of average delta, average vega, and average wealth for the TMT. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0458*** **	**0.0286*** **
	(0.0061)	(0.0063)
AvgAge1	**-0.0088**	**0.0053**
	(0.0069)	(0.0070)
Log_Avg_Tenure	**0.0119*** **	**0.0126*** **
	(0.0016)	(0.0023)
Log_Avg_Delta	**0.0551*** **	**0.0489*** **
	(0.0066)	(0.0064)
Log_Avg_Vega	**0.0041*** **	**0.0064*** **
	(0.0008)	(0.0008)
Log_Avg_Wealth	**-0.0525*** **	**-0.0465*** **
	(0.0060)	(0.0058)
Cash1	**0.0044**	**-0.0071**
	(0.0072)	(0.0077)
Log_FirmAge	**0.0159*** **	**0.0141*** **
	(0.0012)	(0.0012)
MtB	**0.0086*** **	**0.0078*** **
	(0.0011)	(0.0010)
CashFlowSD_10	**-0.0087**	**-0.0104**
	(0.0077)	(0.0073)
ROA	**0.3123*** **	**0.2951*** **
	(0.0382)	**(0.0384)**
Intang	**-0.0039**	**-0.0337*** **
	(0.0035)	(0.0048)
CashFlow	**-0.1246** **	**-0.1251** **
	(0.0531)	(0.0542)
Lev	**0.0272** **	**0.0317** **
	(0.0127)	(0.0136)
Size	**-0.0009**	**-0.0014* **
	(0.0007)	(0.0007)
Constant	**0.1693*** **	**0.1035*** **
	(0.0387)	(0.0390)
Observations	24,407	24,407
Pseudo R2	-0.2143	-0.2753
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.17

Tobit Regressions estimating the Determinants of Payout Levels (CEO/CFO)

The dependent variable for all of the models in this panel is *Payout* for each firm in year t. *Payout* is defined as total payout scaled by total assets. The models are estimated using a censored regression (Tobit). Model 1 includes *CEO_Female*, a dummy taking the value of 1 if the CEO is female, *Log_CEO_Age*, the natural logarithm of *CEO_Age*, and a set of controls. Model 2 includes *CFO_Female*, a dummy taking the value of 1 if the CFO is female, *Log_CFO_Age*, the natural logarithm of *CFO_Age*, and a set of controls. Model 3 includes the CEO and CFO variables, and Model 4 is expanded by the inclusion of executives' compensation and wealth variables as controls. All models include year and industry dummies, based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) CEO	(2) CFO	(3) CEO/CFO	(4) CEO/CFO
CEO_Female	**-0.0024**		**-0.0067**	**-0.0013**
	(0.0041)		(0.0052)	(0.0053)
CFO_Female		**0.0070***	**0.0063***	**0.0059**
		(0.0037)	(0.0037)	(0.0039)
Log_CEO_Age	**0.0133****		**0.0006**	**0.0007**
	(0.0054)		(0.0084)	(0.0091)
Log_CFO_Age		**-0.0137**	**-0.0177****	**-0.0163***
		(0.0085)	(0.0079)	(0.0084)
Log_CEO_Tenure	**-0.0026*****		**-0.0024****	**-0.0027****
	(0.0007)		(0.0012)	(0.0014)
Log_CFO_Tenure		**0.0042*****	**0.0046*****	**0.0040*****
		(0.0012)	(0.0012)	(0.0013)
Log_CEO_Delta				**0.0298*****
				(0.0058)
Log_CFO_Delta				**0.0218*****
				(0.0054)
Log_CEO_Vega				**0.0022****
				(0.0011)
Log_CFO_Vega				**0.0022**
				(0.0016)
Log_CEO_Wealth				**-0.0255*****
				(0.0051)
Log_CFO_Wealth				**-0.0211*****
				(0.0044)
Cash1	**0.0128***	**0.0181**	**0.0146**	**0.0091**
	(0.0075)	(0.0115)	(0.0115)	(0.0131)
Log_FirmAge	**0.0200*****	**0.0197*****	**0.0174*****	**0.0169*****
	(0.0012)	(0.0024)	(0.0019)	(0.0020)
MtB	**0.0088*****	**0.0096*****	**0.0087*****	**0.0083*****
	(0.0010)	(0.0020)	(0.0020)	(0.0023)
CashFlowSD_10	**0.0004**	**0.0013**	**0.0015**	**-0.0190**
	(0.0009)	(0.0013)	(0.0012)	(0.0176)
ROA	**0.0454*****	**0.2467*****	**0.3124*****	**0.3282*****
	(0.0109)	(0.0390)	(0.0384)	(0.0436)
Intang	**-0.0236*****	**-0.0238*****	**-0.0212*****	**-0.0289*****
	(0.0043)	(0.0063)	(0.0059)	(0.0064)
CashFlow	**0.1387*****	**-0.0044**	**-0.0721**	**-0.0995***
	(0.0252)	(0.0545)	(0.0497)	(0.0553)
Lev	**0.0131*****	**0.0166****	**0.0151****	**0.0492*****
	(0.0043)	(0.0073)	(0.0065)	(0.0183)
Size	**0.0062*****	**0.0063*****	**0.0054*****	**-0.0021***
	(0.0005)	(0.0008)	(0.0007)	(0.0012)
Constant	**-0.1646*****	**-0.0646**	**-0.0244**	**0.0884**
	(0.0315)	(0.0710)	(0.0787)	(0.0688)
Observations	23,454	11,698	10,850	9,478
Pseudo R2	-0.1894	-0.3418	-0.3379	-0.3742
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.18

Difference in Means for Payout Method (TMT Subsamples)

This table shows the differences in *FlexiablePayout*, which is stock repurchases scaled by total payout. The data are based on the full sample. *HighFemale* denotes teams in which females represent 50% or more of the members. *CEO_Female* and *CFO_Female* denote companies with a female CEO and female CFO, respectively. *MaleFemaleTeam* denotes TMTs with at least one female manager. *HighAge* denotes teams whose executives' average age exceeds than that of the full sample.

TMT Characteristics	Yes	No	Difference	T-statistic
HighFemale	66.84%	54.71%	-12.13%	-3.7775
MaleFemaleTMT	62.22%	52.14%	-10.08%	-15.73
CEO_Female	61.67%	55.29%	-6.39%	-3.2963
CFO_Female	61.95%	56.80%	-5.15%	-4.2256
HighAge	48.65%	63.97%	15.32%	26.4429

Table 5.19

Difference in Means for Payout Method (Industry Subsamples)

This table shows the differences in *FlexiablePayout* across F&F's 5 industry groups. *FlexiablePayout* is defined as stock repurchases scaled by total payout.

F&F 5 Groups	Yes	No	Difference	T-statistic
Consumers	51.91%	55.95%	4.04%	6.4237
Health	66.69%	53.78%	-12.91%	-12.3319
HiTec	72.35%	49.89%	-22.46%	-33.5115
Manufacturing	40.52%	60.29%	19.76%	31.8533
Other	54.80%	54.81%	0.01%	0.0125

Table 5.20

Tobit Regressions estimating the Determinants of Payout Method (Main Model)

$$FlexiblePayout = \propto + \beta_1 PcFemale + \beta_2\ AvgAge1 + \beta_t Year\ \&\ Industry\ Dummies\ +\ \varepsilon$$

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

	(1)	(2)
VARIABLES	Model 1	Model 2
PcFemale	**0.2411*** **	**0.0753** **
	(0.0324)	(0.0322)
AvgAge1	**-0.4819*** **	**-0.2580*** **
	(0.0387)	(0.0386)
Log_Avg_Tenure	**0.1028*** **	**-0.0033**
	(0.0079)	(0.0095)
Cash1	**0.7022*** **	**0.5506*** **
	(0.0271)	(0.0305)
Log_FirmAge	**-0.1582*** **	**-0.1409*** **
	(0.0064)	(0.0065)
MtB	**0.0006**	**-0.0031**
	(0.0037)	(0.0037)
CashFlowSD_10	**0.0163*** **	**0.0139*** **
	(0.0036)	(0.0035)
ROA	**-0.4826*** **	**-0.4534*** **
	(0.0670)	(0.0657)
Intang	**0.2870*** **	**0.1316*** **
	(0.0197)	(0.0242)
CashFlow	**1.2112*** **	**1.1604*** **
	(0.0991)	(0.0964)
Lev	**-0.0306**	**-0.0556** **
	(0.0241)	(0.0229)
Size	**0.0073*** **	**0.0111*** **
	(0.0026)	(0.0027)
Constant	**2.4702*** **	**0.9740*** **
	(0.1527)	(0.1904)
Observations	18,509	18,509
Pseudo R2	0.1043	0.1645
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.21

OLS Regressions estimating the Determinants of Payout Method

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry fixed effect is based on SIC two digits. In all specifications, the maximum observations available are included. The VIF test for all models does not exceed 5. The exception is for the fixed effect dummies. The Huber-White standard errors, corrected for heteroscedasticity, are shown in parentheses.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.1958*** **	**0.0678** **
	(0.0264)	(0.0263)
AvgAge1	**-0.4133*** **	**-0.2313*** **
	(0.0304)	(0.0304)
Log_Avg_Tenure	**0.0792*** **	**-0.0059**
	(0.0061)	(0.0077)
Cash1	**0.6014*** **	**0.4796*** **
	(0.0221)	(0.0248)
Log_FirmAge	**-0.1384*** **	**-0.1217*** **
	(0.0051)	(0.0051)
MtB	**-0.0022**	**-0.0043**
	(0.0030)	(0.0030)
CashFlowSD_10	**0.0130*** **	**0.0109*** **
	(0.0031)	(0.0030)
ROA	**-0.4577*** **	**-0.4316*** **
	(0.0560)	(0.0552)
Intang	**0.2285*** **	**0.1172*** **
	(0.0160)	(0.0197)
CashFlow	**1.0513*** **	**1.0142*** **
	(0.0761)	(0.0752)
Lev	**-0.0103**	**-0.0218**
	(0.0190)	(0.0182)
Size	**0.0020**	**0.0046** **
	(0.0020)	(0.0021)
Constant	**2.3096*** **	**1.1742*** **
	(0.1203)	(0.1380)
Observations	18,509	18,509
R-squared	0.1825	0.2610
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.22

Tobit Regressions estimating the Determinants of Payout Method (Alternative Measure for Gender and Age)

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the natural logarithm of the number of female executives in the TMT in a firm year (*Log_No_Female*), a dummy variable that takes the value of 1 if the average age of the top executives exceeds the average age for all TMTs (*HighAge*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

	(1)	(2)
VARIABLES	Model 1	Model 2
Log_No_Female	**0.0792*** **	**0.0236** **
	(0.0093)	(0.0093)
HighAge	**-0.0847*** **	**-0.0465*** **
	(0.0075)	(0.0075)
Log_Avg_Tenure	**0.1008*** **	**-0.0052**
	(0.0079)	(0.0095)
Cash1	**0.7119*** **	**0.5546*** **
	(0.0270)	(0.0305)
Log_FirmAge	**-0.1613*** **	**-0.1422*** **
	(0.0064)	(0.0065)
MtB	**0.0016**	**-0.0025**
	(0.0037)	(0.0037)
CashFlowSD_10	**0.0165*** **	**0.0140*** **
	(0.0038)	(0.0035)
ROA	**-0.4886*** **	**-0.4571*** **
	(0.0670)	(0.0656)
Intang	**0.2912*** **	**0.1328*** **
	(0.0197)	(0.0242)
CashFlow	**1.2195*** **	**1.1647*** **
	(0.0994)	(0.0965)
Lev	**-0.0312**	**-0.0557** **
	(0.0242)	(0.0230)
Size	**0.0078*** **	**0.0114*** **
	(0.0026)	(0.0027)
Constant	**0.5980*** **	**-0.0327**
	(0.0274)	(0.1156)
Observations	18,509	18,509
Pseudo R2	0.1037	0.1643
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.23

Tobit Regressions estimating the Determinants of Payout Method (Alternative Measure for Payout Flexibility)

$$NetFlexiblePayout = \propto + \beta_1 PcFemale + \beta_2\ AvgAge1 + \beta_t Year\ \&\ Industry\ Dummies +$$

The dependent variable for all of the models in this panel is *NetFlexiblePayout* for each firm in year t. *NetFlexiblePayout* is defined as stock repurchases net of stock issuance, scaled by total payout. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.3612*****	**0.1428*****
	(0.0413)	(0.0410)
AvgAge1	**-0.5544*****	**-0.2830*****
	(0.0502)	(0.0499)
Log_Avg_Tenure	**0.1265*****	**0.0074**
	(0.0101)	(0.0123)
Cash1	**0.7850*****	**0.6527*****
	(0.0373)	(0.0414)
Log_FirmAge	**-0.1632*****	**-0.1487*****
	(0.0081)	(0.0081)
MtB	**-0.0097***	**-0.0141*****
	(0.0052)	(0.0053)
CashFlowSD_10	**0.0688**	**0.0532**
	(0.0699)	(0.0744)
ROA	**-0.3517*****	**-0.3431*****
	(0.0919)	(0.0913)
Intang	**0.3163*****	**0.1370*****
	(0.0258)	(0.0315)
CashFlow	**1.5199*****	**1.4638*****
	(0.1444)	(0.1390)
Lev	**-0.0246**	**-0.0629****
	(0.0330)	(0.0316)
Size	**0.0139*****	**0.0204*****
	(0.0033)	(0.0035)
Constant	**2.5130*****	**0.7878*****
	(0.1993)	(0.2411)
Observations	16,321	16,321
Pseudo R2	0.0807	0.1342
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.24

Tobit Regressions estimating the Determinants of Payout Method (Controlling for Previous Commitments)

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are augmented by measures of previous payout commitments. *Lag_Div_At* is dividends scaled by total assets in t-1. *Lag_Div_Payer* is a dummy variable that takes the value of 1 if the firm paid dividends in t-1. The models are estimated using a censored regression (Tobit), and control for both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.0796****	**0.0750****
	(0.0323)	(0.0322)
AvgAge1	**-0.2577*****	**-0.2583*****
	(0.0387)	(0.0389)
Log_Avg_Tenure	**-0.0054**	**-0.0032**
	(0.0095)	(0.0095)
Cash1	**0.5551*****	**0.5506*****
	(0.0305)	(0.0305)
Log_FirmAge	**-0.1403*****	**-0.1409*****
	(0.0065)	(0.0065)
MtB	**-0.0031**	**-0.0031**
	(0.0037)	(0.0037)
CashFlowSD_10	**0.0139*****	**0.0139*****
	(0.0034)	(0.0035)
ROA	**-0.4508*****	**-0.4534*****
	(0.0656)	(0.0657)
Intang	**0.1371*****	**0.1316*****
	(0.0242)	(0.0242)
CashFlow	**1.1555*****	**1.1604*****
	(0.0964)	(0.0964)
Lev	**-0.0576****	**-0.0555****
	(0.0230)	(0.0229)
Size	**0.0112*****	**0.0111*****
	(0.0027)	(0.0027)
Lag_Div_At	**0.0055**	
	(0.0678)	
Lag_Div_Payer		**0.0003**
		(0.0068)
Constant	**0.9625*****	**0.9750*****
	(0.1919)	(0.1914)
Observations	18,394	18,508
Pseudo R2	0.1651	0.1645
Industry FE	YES	YES
Year FE	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.25

Tobit Regressions estimating the Determinants of Payout Method (Alternative Controls)

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge*), and the determinants found in the previous literature as controls. *CashFlowSD_5* replaces *CashFlowSD_10*, and *Log_Sale* replaces *Size*. The models are estimated using a censored regression (Tobit), and control for both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(2) Model 2
PcFemale	**0.2373*** **	**0.0747** **
	(0.0324)	(0.0322)
AvgAge1	**-0.4823*** **	**-0.2564*** **
	(0.0388)	(0.0386)
Log_Avg_Tenure	**0.1022*** **	**-0.0026**
	(0.0079)	(0.0095)
Cash1	**0.7180*** **	**0.5553*** **
	(0.0275)	(0.0309)
Log_FirmAge	**-0.1611*** **	**-0.1385*** **
	(0.0064)	(0.0065)
MtB	**0.0004**	**-0.0032**
	(0.0037)	(0.0037)
CashFlowSD_5	**0.0152*** **	**0.0130*** **
	(0.0022)	(0.0022)
ROA	**-0.4889*** **	**-0.4508*** **
	(0.0672)	(0.0653)
Intang	**0.2918*** **	**0.1426*** **
	(0.0196)	(0.0241)
CashFlow	**1.1992*** **	**1.1510*** **
	(0.0987)	(0.0958)
Lev	**-0.0289**	**-0.0487** **
	(0.0237)	(0.0227)
Log_Sale	**0.0105*** **	**0.0077*** **
	(0.0026)	(0.0028)
Constant	**2.4571*** **	**0.9836*** **
	(0.1528)	(0.1904)
Observations	18,507	18,507
Pseudo R2	0.1045	0.1641
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.26

Fama-MacBeth Regression estimating the Determinants of Payout Method

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The maximum observations available are included. Fama-MacBeth's standard errors are shown in parentheses.

VARIABLES	(1) Model 1
PcFemale	**0.1418*** **
	(0.0327)
AvgAge1	**-0.3581*** **
	(0.0314)
Log_Avg_Tenure	**-0.0113**
	(0.0129)
Cash1	**0.5470*** **
	(0.0212)
Log_FirmAge	**-0.1231*** **
	(0.0120)
MtB	**-0.0023**
	(0.0055)
CashFlowSD_10	**0.4697** **
	(0.1958)
ROA	**-0.5509*** **
	(0.1318)
Intang	**0.1780*** **
	(0.0294)
CashFlow	**1.1735*** **
	(0.1145)
Lev	**-0.0217**
	(0.0186)
Size	**0.0040**
	(0.0037)
Constant	**2.1416*** **
	(0.1135)
Observations	18,509
Average R-squared	0.1962

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.27

Tobit Regressions estimating the Determinants of Payout Method (Controlling for Delta, Vega, and Wealth)

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. All models include the percentage of female executives in a firm year (*PcFemale*), the natural logarithm of the average age of the top executives (*AvgAge1*), and the determinants found in the previous literature as controls. The models are augmented with the natural logarithms of average delta, average vega, and average wealth for the TMT. The models are estimated using a censored regression (Tobit). Model 1 has no fixed effects, while Model 2 has both industry and year fixed-effects. The industry dummies are based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) Model 1	(3) Model 2
PcFemale	**0.2074*** **	**0.0547***
	(0.0322)	(0.0321)
AvgAge1	**-0.4598*** **	**-0.2273*** **
	(0.0396)	(0.0395)
Log_Avg_Tenure	**0.0801*** **	**-0.0245** **
	(0.0082)	(0.0098)
Log_Avg_Delta	**-0.0220**	**-0.0069**
	(0.0254)	(0.0240)
Log_Avg_Vega	**0.0550*** **	**0.0483*** **
	(0.0042)	(0.0041)
Log_Avg_Wealth	**0.0364**	**0.0240**
	(0.0222)	(0.0208)
Cash1	**0.6492*** **	**0.5046*** **
	(0.0283)	(0.0316)
Log_FirmAge	**-0.1521*** **	**-0.1384*** **
	(0.0067)	(0.0067)
MtB	**-0.0152*** **	**-0.0162*** **
	(0.0038)	(0.0038)
CashFlowSD_10	**0.0768**	**0.0664**
	(0.0630)	(0.0667)
ROA	**-0.5213*** **	**-0.5032*** **
	(0.0585)	(0.0567)
Intang	**0.2309*** **	**0.0904*** **
	(0.0203)	(0.0249)
CashFlow	**1.1423*** **	**1.1044*** **
	(0.0925)	(0.0893)
Lev	**-0.0373**	**-0.0542** **
	(0.0243)	(0.0233)
Size	**-0.0264*** **	**-0.0213*** **
	(0.0035)	(0.0037)
Constant	**2.3134*** **	**0.8328*** **
	(0.1862)	(0.2194)
Observations	17,350	17,350
Pseudo R2	0.1198	0.1782
Industry FE	NO	YES
Year FE	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.28

Tobit Regressions estimating the Determinants of Payout Method (CEO/CFO)

The dependent variable for all of the models in this panel is *FlexiblePayout* for each firm in year t. *FlexiblePayout* is defined as stock repurchases and scaled by total payout, and set to missing if the total payout is zero. The models are estimated using a censored regression (Tobit). Model 1 includes *CEO_Female*, a dummy taking the value of 1 if the CEO is female, *Log_CEO_Age*, the natural logarithm of *CEO_Age*, and a set of controls. Model 2 includes *CFO_Female*, a dummy taking the value of 1 if the CFO is female, *Log_CFO_Age*, the natural logarithm of *CFO_Age*, and a set of controls. Model 3 includes the CEO and CFO variables, and Model 4 is expanded by the inclusion of executives' compensation and wealth variables as controls. All models include year and industry dummies, based on SIC two digits. In all specifications, the maximum observations available are included.

VARIABLES	(1) CEO	(2) CFO	(3) CEO/CFO	(4) CEO/CFO
CEO_Female	**-0.0408***		**-0.0310*****	**-0.0052***
	(0.0233)		(0.0026)	(0.0027)
CFO_Female		**-0.0149**	**-0.0102*****	**-0.0202*****
		(0.0176)	(0.0025)	(0.0026)
Log_CEO_Age	**-0.2358*****		**-0.2522*****	**-0.1645*****
	(0.0307)		(0.0010)	(0.0011)
Log_CFO_Age		**-0.0288**	**-0.0334*****	**-0.0766*****
		(0.0408)	(0.0010)	(0.0011)
Log_CEO_Tenure	**0.0070***		**0.0094*****	**0.0008**
	(0.0042)		(0.0016)	(0.0017)
Log_CFO_Tenure		**-0.0009**	**-0.0000**	**-0.0093*****
		(0.0058)	(0.0017)	(0.0018)
Log_CEO_Delta				**0.0013***
				(0.0007)
Log_CFO_Delta				**0.1049*****
				(0.0010)
Log_CEO_Vega				**0.0409*****
				(0.0009)
Log_CFO_Vega				**-0.0326*****
				(0.0011)
Log_CEO_Wealth				**-0.0045*****
				(0.0004)
Log_CFO_Wealth				**-0.0373*****
				(0.0005)
Cash1	**0.5471*****	**0.4389*****	**0.4326*****	**0.4192*****
	(0.0324)	(0.0449)	(0.0101)	(0.0115)
Log_FirmAge	**-0.1408*****	**-0.1403*****	**-0.1307*****	**-0.1439*****
	(0.0067)	(0.0098)	(0.0012)	(0.0013)
MtB	**-0.0055**	**-0.0100**	**-0.0128*****	**-0.0371*****
	(0.0043)	(0.0062)	(0.0014)	(0.0014)
CashFlowSD_10	**0.0130*****	**0.0106*****	**0.0100*****	**0.1601*****
	(0.0031)	(0.0038)	(0.0005)	(0.0092)
ROA	**-0.5252*****	**-0.5796*****	**-0.5967*****	**-0.5784*****
	(0.0700)	(0.0779)	(0.0140)	(0.0149)
Intang	**0.1276*****	**0.0876*****	**0.0798*****	**0.0188****
	(0.0254)	(0.0332)	(0.0079)	(0.0085)
CashFlow	**1.3329*****	**1.2029*****	**1.2846*****	**1.2173*****
	(0.1151)	(0.1299)	(0.0208)	(0.0220)
Lev	**-0.0643****	**0.0142**	**0.0024**	**0.0278*****
	(0.0263)	(0.0293)	(0.0084)	(0.0092)
Size	**0.0114*****	**0.0068***	**0.0087*****	**-0.0296*****
	(0.0028)	(0.0038)	(0.0005)	(0.0006)
Constant	**0.8416*****	**0.1069**	**-1.0045*****	**-0.7205*****
	(0.1753)	(0.3965)	(0.0040)	(0.0044)
Observations	16,600	8,194	7,632	6,754
Pseudo R2	0.1673	0.1574	0.1610	0.1939
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix: Descriptions of the Variables

Managerial Variables

Variable	Definitions	Proxy For	Source
PcFemale	Percentage of female executives to total number of executives available in the database	Managerial Gender	ExecuComp
HighFemale	A dummy variable that takes the value of 1 if *PcFemale* is larger than 50%; 0 otherwise.	Managerial Gender	ExecuComp
MaleFemaleTeam	A dummy variable that takes the value of 1 if the TMT has at least one female manager; 0 otherwise.	Managerial Gender	ExecuComp
Log_No_Female	The natural logarithm of the number of female executives in the TMT.	Managerial Gender	ExecuComp
CEO_Female	A dummy that equals 1 if the CEO is female; 0 otherwise.	Managerial Gender	ExecuComp
CFO_Female	A dummy that equals 1 if the CFO is female; 0 otherwise.	Managerial Gender	ExecuComp
AvgAge	Average age of all executives available. For the regressions, I use the log of this value.	Managerial Age	ExecuComp
HighAge	A dummy variable that takes the value of 1 if *AvgAge* of the team is higher than that of the sample; 0 otherwise.	Managerial Age	ExecuComp
CEO_Age	The age of the CEO. For the regressions, I use the Log of this value.	Managerial Age	ExecuComp
CFO_Age	The age of the CFO. For the regressions, I use the Log of this value.	Managerial Age	ExecuComp
Avg_Tenure	The average tenure of all TMT members. The natural logarithm of this variable is used in regressions.	Managerial Tenure	ExecuComp
CEO_Tenure	The tenure of the CEO. The natural logarithm is used in regressions.	Managerial Tenure	ExecuComp
CFO_Tenure	The tenure of the CFO. Regressions include the natural logarithm of this value.	Managerial Tenure	ExecuComp
Log_Avg_Delta	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the stock price of the firm.	Performance-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CEO_Delta	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the stock price of the firm.	Performance-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CFO_Delta	The natural logarithm of the dollar change in the wealth of the CFO per a 1 percent change in the stock price of the firm.	Performance-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_Avg_Vega	The natural logarithm of the average dollar change in the wealth of the TMT per a 1 percent change in the standard deviation of the stock price of the firm	Risk-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CEO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm	Risk-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CFO_Vega	The natural logarithm of the dollar change in the wealth of the CEO per a 1 percent change in the standard deviation of the stock price of the firm	Risk-based compensations	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_Avg_Wealth	The natural logarithm of the average dollar value of the TMT executives' wealth in the firm.	Executives Wealth	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CEO_Wealth	The natural logarithm of the dollar value of the CEO executives' wealth in the firm.	Executives Wealth	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/
Log_CFO_Wealth	The natural logarithm of the dollar value of the CFO executives' wealth in the firm.	Executives Wealth	Dr.Lalitha Naveen Temple University, USA https://sites.temple.edu/lnaveen/data/

Financial Variables From Compustat			
Variable	**Definitions**	**Data Items**	**Proxy For**
Payout	(Dividends + Repurchases) scaled by total assets (any missing value = 0)	*(DVC + PRSTKC)/AT*	Payout Level
HighPayout	A dummy variable that takes the value of 1 if *Payout* is larger than the average *Payout* of 3.7%; 0 otherwise.	*Based on Payout*	Payout Level
FlexiblePayout	Total stock repurchases in dollars scaled by the sum of dividends and stock repurchases in dollars (total payout). When a firm does not have any payout, this variable is missing.	*PRSTKC/(DVC+PRSTKC)*	Payout method
NetFlexiblePayout	The dollar amounts of stock repurchases net of stock issuance scaled by total payout.	*PRSTKC-SSTK/(DVC+PRSTKC)*	Payout method
Lag_Div_Payer	A dummy variable that takes the value of 1 if the firm had paid dividend in the previous year; 0 otherwise.	*DVC*	Previous Commitments
Lag_Div_At	Total dividends of the previous year scaled by total assets of the previous year.	*DVC*	Previous Commitments
Cash1	Cash and short term assets scaled by total assets	*Cash Holdings (CHE/AT)*	Cash holdings
FirmAge	The time since the firm was first listed in Compustat. In regressions, I use Log_FrimAge, which is the natural logarithm of FirmAge.	*First year listed in Compustat*	Firm Age
MtB	(Book value of assets - Book Value of Equity + Market value of equity) / total assets	*(AT + CSHO*PRCC - CEQ)/AT*	Growth opportunity
Size	Natural logarithm of total assets	*Log(AT)*	Firm size
Log_Sale	Natural logarithm of sales	*Log(Sales)*	
CashFlow	(Operating income before depreciation - Interests and related expenses - Income taxes - Dividends) scaled by total assets	*(OIBDP-XINT-TXT-DVC)/AT*	Cash flow
ROA	Return on assets	*IB/AT*	Performance
CashFlowSD_10	The rolling standard deviation for the companies' cash flows for the past 10 years (minimum 3 years).	*SD(CashFlow)*	Volatility of cash flows
CashFlowSD_5	The rolling standard deviation for the companies' cash flows for the past 5 years (minimum 3 years).		
RD1	Research and development expenses scaled by total assets (any missing value = 0)	*XRD/AT*	Growth Opportunity/Liquidity demands/ Information asymmetry
CAPEX	Capital expenditure scaled by total assets (any missing value = 0)	*CAPX/AT*	Cash outflows/ Growth opportunity/ Collateral availability
AQ	Acquisitions scaled by total assets, any missing value = 0	*AQC/AT*	Cash outflows/ Growth opportunity/ Collateral availability
Lev	Total debt scaled by total assets. *Lev_Orth* is the orthognlized value of *Lev* with respect to *NWC*.	*(DLTT + DLC)/AT*	Risk (higher probability for financial distress)/ Cost of holding cash
Intang	Intangible assets scaled by total assets	*INTAN/AT*	Collateral Availability/ Information asymmetry

Chapter 6 Conclusion

This thesis has examined whether the gender and age of the senior managements of the firm affect their corporate policies. This analysis is underpinned by the argument that corporate policies are determined by a combination of upper echelon, firm, and industry characteristics (Hambrick and Mason 1984). Existing empirical studies provide evidence that managerial characteristics and traits are related to corporate policies (Bertrand and Schoar 2003; Malmendier and Tate 2005a; Malmendier, Tate, and Yan 2011).

Two motives underlie the analysis of managerial gender and age in particular. First, changes in the business environment indicate that managerial gender and age are expected to change in the foreseeable future. Governments are pushing for regulations to enhance gender diversity within corporations and extend the retirement age to accommodate the rise in life expectancy and decline in birth rate (Brooks et al. 2018). These changes call for investigating the impact of managerial gender and age on corporate decisions.

Second, existing studies suggest that these two characteristics influence risk-taking behaviour. On gender, Chapter 2 of this thesis and Charness and Gneezy (2012) review existing studies within the phycology literature and conclude that female take less risks than males. This has led to the question of whether this difference persists among managers since it is possible that the documented difference at the individual level does not persist beyond the glass ceiling (Faccio, Marchica, and Mura 2016). Existing studies mainly document that female CEOs and CFOs are associated with less risky firms (Elsaid and Ursel 2011; Faccio, Marchica, and Mura 2016; Huang and Kisgen 2013). However, Berger, Kick, and Schaeck (2014) find that female participation on the executive board is associated with an increase in banks' portfolio risks. More recently, Peltomäki, Swidler, and Vähämaa (2018) find that female CFOs are associated with higher total risks and risker corporate policies, suggesting that the documented gender-based difference might be due to a confounded effect with age.

As a result, further empirical analysis is needed to understand whether female managers are associated with more conservative policies.

Moreover, the literature summarised in Chapter 2 shows that the relationship between ageing and risk-taking at the individual level is poorly understood. At the managerial level, scholars have advanced several arguments (Hambrick and Mason 1984; Li, Low, and Makhija 2017; Serfling 2014; Yim 2013). Older managers might be more conservative, given that their career horizon is shorter and therefore they may be unwilling to commit themselves to risker options whose benefits could appear in the future. Further, older managers may avoid risker choices to protect their self-ego, or because they do not have to signal their superior performance, given that they have longer records of success. Yet, the tendency of older managers to be more risk-averse could be offset by their longer experience, which induces them to take more risks (Worthy et al. 2011). Alternatively, since their previous achievements could protect them should they fail, older managers may take risker decisions. While Yim (2013), Serfling (2014), and Li, Low, and Makhija (2017) show that older CEOs are associated with more conservative policies, Iqbal (2013) find that younger CEOs are more likely to adopt a more conservative choice. Consequently, further analysis is needed to understand whether managerial age is related to the riskiness of corporate policies.

Notably, with the exception of Berger, Kick, and Schaeck (2014), prior studies at the executive level are mainly focused on the CEO. However, Hambrick and Mason (1984) advance the notion that CEOs do not work alone, but rather together with teams, whose characteristics also matter in determining the outcome of the firm. This thesis extends existing studies by incorporating the views of Hambrick and Mason (1984) and examining whether managerial gender and age in the TMT are related to corporate policies.

Following Chava and Purnanandam (2010), who examine the impact of managerial compensation on the riskiness of corporate financial policies, the selected policies are theoretically and empirically related to the riskiness of the firm. This approach allows for generating plausible predictions regarding the relationship between managerial characteristics and these corporate polices. It also provides an assurance that the risk-based explanations are plausible when these characteristics are consistently related to risker choices across the different corporate policies.

Thus, this thesis investigates three corporate financial policies; namely, cash holdings (Chapter 3), R&D investments (Chapter 4), and payout policies (Chapter 5). First, the precautionary motive for holding cash is well-established in the literature (Bates, Kahle, and Stulz 2009; Keynes 1936; Opler et al. 1999). Second, R&D investments are risky since they are associated with certain costs and highly uncertain outcomes (Abdel-Khalik 2014; Hirshleifer, Low, and Teoh 2012). Third, the payout policy includes two decisions: setting the payout level and selecting the payout method (Eisdorfer, Giaccotto, and White 2015). Since the alternative to payout is investment, higher payout levels is a conservative choice (Caliskan and Doukas 2015). Further, given the sticky nature of dividends, relying upon stock repurchases improves the financial flexibility of the firm (Bonaimé, Hankins, and Harford 2014), plausibly a conservative choice. Hence, it is reasonable to expect that TMTs whose characteristics are related to risk-aversion (overconfidence) are associated with more conservative (aggressive) corporate financial policies.

To test these arguments, I start by collecting executives' data from ExecuComp for the period 1992-2013. These data are complemented by financial data drawn from Compustat. Following the literature on corporate policies, observations related to utility and financial firms are excluded, given that these have different regulations. Consistent with Hambrick and Mason (1984) and Perryman, Fernando, and Tripathy (2016), I calculate the proportion of female executives on the TMT. Additionally, I calculate the average age of the TMT. Using this dataset, I examine whether the proportion of female executives on the TMT and the average age of the TMT are related to the investigated corporate policies. Moreover, I hand-collect additional data to identify the CEOs and CFOs and determine their gender and age. These data are used for additional analyses within every chapter in order to gain a better understanding of the impact of these two executives on corporate policies. The key findings can be summarised as follows.

6.1. Executives' Characteristics and Cash Holdings

The first empirical chapter (Chapter 3: Executives' Characteristics and Cash Holdings) examines whether managerial gender and age are related to cash holdings. It begins by providing descriptive statistics. I document that female participation in TMTs increased from 1.6% in 1992 to 8.2% in 2010, before declining to 6% in 2013. This contrasts with the assumption that female participation in corporate leadership is increasing over time. While the average age remained stable over time, a significant decline in 2007 is observed, suggesting that older managers were replaced by younger ones during the financial crisis. I also document that firms continue to hoard cash, on average. Moreover, the univariate analysis shows that managerial gender and age are industry-specific, thereby highlighting the importance of the industry effect when examining the relationship between managerial characteristics and cash holdings.

Using pooled OLS, the multivariate analysis shows that the proportion of female executives on the TMT is positively associated with cash holdings. This finding is robust to different measures for cash holdings and control variables, different measures for female representation on the TMT, accounting for outliers, using Fama-MacBeth's regressions, and to controlling for managerial compensation and wealth. Given the precautionary motive for holding cash, these findings may suggest that TMTs with more female managers are more risk-averse or less overconfident. The additional analysis suggests that female CEOs are positively associated with cash holdings, suggesting that the positive relationship between the percentage of female managers on the TMT and cash holdings is partially driven by the CEO.

Further, the analysis shows that the average age of the TMT and cash holdings are negatively related. This finding persists under different robustness checks. Given that cash is held for precautionary reasons, it is possible that older TMTs may take more risks since they are less concerned about their careers due to their well-established reputations. The additional analysis shows that CEO age and CFO age are negatively related to cash holdings, indicating that the negative relationship between the average age of the TMT and cash holdings is driven by both the CEOs and CFOs. This is consistent with the view of Hambrick and Mason (1984) that managers other than the CEO matter in determining corporate policies.

These findings contribute to the literature in several ways. First, consistent with the view of Hambrick and Mason (1984), they show that corporate cash holdings are determined by a combination of managerial, firms, and industry characteristics. Second, Adhikari (2018) documents a positive association between the percentage of female managers on the TMT and cash holdings. This chapter extends his findings by providing an alternative explanation and showing that this relationship holds even after accounting for factors such as age. Moreover, prior studies suggest that both female CEOs and CFOs are associated with higher cash holdings (Elsaid and Ursel 2011; Peltomäki, Swidler, and Vähämaa 2018; Zeng and Wang 2015). Using a larger and hand-collected dataset, this chapter shows that only female CEOs are positively associated with cash holdings. Third, this study provides the first evidence that the average age of the TMT and cash holdings are negatively related. Moreover, prior studies provide mixed evidence on the existence and direction of the relationship between CEO and CFO age and cash holdings (Bertrand and Schoar 2003; Orens and Reheul 2013; Peltomäki, Swidler, and Vähämaa 2018). After addressing some of the drawbacks of these studies, the findings indicate that both CEO and CFO age are negatively related to cash holdings.

6.2. Executives' Characteristics and R&D Investments

The second empirical chapter (Chapter 4: Executives' Characteristics and R&D Investments) studies whether managerial gender and age are related to R&D investments. The descriptive statistics show that R&D investments, as a percentage of total assets, declined over the sample period, while the nominal figure continues to increase. Further, R&D investments are industry-specific, as indicated in the univariate analysis. These findings are taken into consideration when performing the multivariate analysis.

After controlling for firm characteristics and industry and year effects, the pooled OLS regression suggests that the proportion of female executives on the TMT and R&D investments are negatively related. These results hold when using the Fama-MacBeth and pooled Tobit estimators. They are also robust to different measures of R&D investments and control variables, and also to controlling for managerial wealth and compensation. Given the riskiness of R&D investments, these findings may indicate that TMTs that contain more female managers are more risk-averse or less overconfident and therefore reduce their R&D investments. The additional analysis suggests that firms with both female CEOs and female CFOs are associated with lower R&D investments. This in line with the argument of Hambrick and Mason (1984) that executives other than the CEO are influential in setting corporate policies.

Additionally, the multivariate analysis suggests that the average age of the TMT is largely unrelated to R&D investments. On the surface, this may support the view of Worthy et al. (2011) that experience increases risk-tolerance and thus offsets the decline in the risk-tolerance associated with ageing. Nevertheless, the additional analysis indicates that CEO age (CFO age) is negatively (positively) related to R&D investments. Consequently, the main findings may not support the view of Worthy et al. (2011).

These findings contribute to the literature in several ways. First, they provide new evidence on R&D policy, supporting the view of Hambrick and Mason (1984) that corporate outcomes are determined by a combination of upper echelon, firm, and industry characteristics. Second, consistent with the prediction that female managers avoid risky investments, these findings provide new evidence by showing that the percentage of female managers on the TMT is negatively related to R&D investments. Moreover, Elsaid and Ursel (2011) and Peltomäki, Swidler, and Vähämaa (2018) provide contrasting evidence on the relationship between female CEOs and CFOs. These findings contribute to this debate by using a larger dataset complemented by hand-collection and showing that both female CEOs and female CFOs are negatively associated with R&D investments. Third, this study complements the literature by showing that the negative relationship between CEO age and R&D investments continues to hold after accounting for relevant factors simultaneously. More importantly, I document that CFO age is negatively related to R&D investments. Therefore, this study points to an advantage in examining managerial characteristics at the TMT level, as advocated by Hambrick and Mason (1984).

6.3. Executives' Characteristics and Payout Policy

The third empirical chapter of this thesis (Chapter 5: Executives' Characteristics and Payout Policy) investigates whether managerial gender and age are related to payout levels and the choice of payout methods. The descriptive statistics show that payout levels are pro-cyclical, largely due to changes in stock repurchases rather than dividends. Further, both the univariate and multivariate analysis suggest that payout levels and methods are industry-specific.

The first set of analyses examines whether managerial gender and age are related to payout levels, defined as the sum of dividends and stock repurchases scaled by total assets. The univariate analysis indicates the female executives are associated with lower investments and a higher payout level, consistent with the view of Caliskan and Doukas (2015) that there is a trade-off between investment and payout. Further, using a pooled Tobit regression, the results indicate that the percentage of female executives on the TMT and total payout are positively related. These results persist under different robustness checks. This may indicate that TMTs with more females are more risk-averse or less overconfident, choosing to distribute cash over investing it. Moreover, the additional analysis provides some evidence that only female CFOs are associated with a higher payout policy, suggesting that CFOs are more influential in setting the payout levels. This is also consistent with the view of Hambrick and Mason (1984) that managers other than the CEO are important in setting corporate policies.

Further, I find some evidence that the average age of the TMT and payout levels are negatively related. Given the trade-off between investments and payout levels, it is possible that older TMTs may choose to invest rather than distribute cash, possibly assuming that their reputation will shield them from future failures. When investigating the relationship at the CEO and CFO levels, I find some evidence that CFO age to be negatively related to payout level. Hence, this further supports the findings on gender that CFOs may matter more in setting payout levels.

The second set of analyses investigates whether managerial gender and age are related to payout methods. I calculate the flexibility of the payout method as the proportion of stock repurchases to total payout. I find a positive relationship between the percentage of female managers on the TMT and the proportion of stock repurchases to total payout. These results are robust to several tests. This finding may suggest that TMTs that contain more females may be more risk-averse or less overconfident, avoiding the commitments associated with dividends to maintain the financial flexibility of the firm.

Moreover, I find that the average age of the TMT is negatively related to the flexibility of the payout policy. A possible explanation is that younger TMTs have more career concerns due to their shorter career records and therefore seek to maintain the financial flexibility of the firm to avoid future failures. Further, the additional analysis shows that both CEO and CFO age are negatively associated with the proportion of stock repurchases to total payout.

The key contributions of this chapter include documenting that managerial gender and age are related to the amount paid to shareholders and to the method of payment by which these amounts are distributed to the shareholders. Prior studies on the influence of executives' gender and age on payout policies are limited. One exception is Jurkus, Park, and Woodard (2011) who find a positive relationship between the percentage of female executives on the TMT and dividend payouts, a proxy for agency costs in their study. In contrast, this chapter shows that the percentage of female executives on the TMT and total payout are positively related. Also, I suggest that it is equally possible that this positive association is due to female risk-aversion or male overconfidence. Moreover, to the best of my knowledge, this is the first study to examine and document that the average age of the TMT is related to payout policy. Additionally, to the best of my knowledge, this is the first study that links executives' gender and age to the flexibility of payout policy.

6.4. Implications and Future Research

Overall, the findings of this thesis suggest that the gender and age composition of TMTs could have implications for corporate financial policies. These findings could benefit policy-makers and board members. For example, policy-makers considering the regulations related to gender diversity within corporations and also those related to retirement age may account for the potential impact of these on the riskiness of corporate policies. In a similar way, boards tasked with hiring and compensating managers may incorporate these findings into their decisions. For instance, increasing female representation may represent a tool for curbing excessive risk-taking within corporations.

Moreover, the findings of this thesis also point to avenues for future research. First, the findings indicate that female executives are associated with more conservative corporate financial policies. While these findings are robust, they might be sample-specific (i.e. the American context). This possibility stems from the debate within the psychology literature on the underlying reasons for the difference between males and females in terms of risk-taking behaviour. For example, while Eckel and Grossman (2002) and Fehr-Duda, De-Gennaro, and Schubert (2006) argue that this difference could be attributed to differences in weighing probabilities or evolutionary reasons, Cárdenas et al. (2012) provide evidence suggesting that it is rather due to gender equality. In turn, gender equality differs across cultures. Consequently, whether the findings of this thesis hold in other cultures is an empirical question that could enhance our understanding of the ramifications of the simultaneous increase in female representation on corporations and on gender equality levels.

Second, a similar argument can be applied to managerial age. To the extent that age-based risk-taking behaviour is determined by career concerns, the findings of this study might be sample-specific. Both life expectancy and retirement age differ from one country to another, leading to different career concerns at the same age. Hence, examining managerial age in different contexts could lead to a better understanding of whether the age-based difference is related to managerial career concern or simply to age, which may directly affect how we think and take risks, as reviewed in Chapter 2.

Third, future studies should consider the implications of the reported relationship between managerial gender and age and the riskiness of corporate policies. For example, it is unclear whether the reduction of the riskiness of corporate policies associated with female representation on the TMT leads to better or worse performance or firm value. Within this thesis, I adopt the view of Khan and Vieito (2013) and Perryman, Fernando, and Tripathy (2016), who suggest that a less risky path does not equate sub-optimal performance. Traditional finance theories maintain the view that less risks lead to lower performance, given the rationality of managers. Yet, once this assumption is relaxed, it is possible that a risk-averse manager may accept less risks than optimal, leading to a reduction in the risk-adjusted return of the firm. Equally, it is possible that an overconfident manager will take more risks than optimal, leading to a reduction in the risk-adjusted return. As argued in the thesis, the association between female managers and the conservativeness of corporate policy could be explained by male overconfidence or female risk-aversion. Distinguishing between these two explanations requires an examination of the impact of these policy changes on firms' values and performance.

Fourth, prior studies examined the impact of managerial gender and age on the riskiness of corporate policies at the CEO level. In this study, I filled this gap by examining the relationship at the CFO and TMT levels. This analysis shows that other executives matter too, in line with the view of Hambrick and Mason (1984). Future studies examining the various impacts of managerial characteristics could also incorporate other executives in their analyses to provide a better understanding of how these characteristics may relate to corporate policies at different levels. For example, Chapter 4 shows that CEO age and CFO age relate to R&D investments in different directions. Further empirical and theoretical work is necessary to demonstrate whether this divergence holds in other contexts and to understand the underlying reasons for it.

Finally, while the results of this study suggest that the percentage of female managers on the TMT is positively related to the flexibility of the payout policy, both female CEOs and CFOs are negatively related to it. This divergence represents an anomaly that is difficult to understand. Future studies might utilise larger datasets, including those from multiple markets, to explore this difference and arrive at a definitive conclusion.

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