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Title Page (with Author Details)

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Sudip Datta*, Trang Doan†, Francesca Toscano‡

March 20, 2023

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Keywords: Top executive gender; Gender-based decision making; Value of corporate cash holdings; Corporate culture.

JEL Classification: G32; G41

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June 18, 2023

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1 Introduction

Does top executives' gender determine the value of corporate cash holdings? Identifying the determinants of value of corporate cash holdings has gained increasing importance as cash balances of U.S. corporations have risen sharply over the last few decades.[1] Prior research attributes female top executives' gender-based traits, such as more ethical sensitivities, less overconfidence, and lower risk tolerance, to corporate outcomes. For example, this body of literature documents that top executive gender influences investment decisions (Huang and Kisgen, 2013), corporate risk-taking and capital allocation (Faccio, Marchica, and Mura, 2016), debt structure choice (Datta, Doan, and Toscano, 2021), firm performance (Amore, Garofalo, and Minichilli, 2014), bank loan contracting (Francis, Hasan, and Wu, 2013), and access to inside information (Inci, Narayanan, and Seyhun, 2017). However, the effect of female top executives on the market value of corporate cash holdings remains undocumented.

The value of cash holdings to shareholders is affected by corporate governance policies (see, e.g., Pinkowitz, Stulz, and Williamson, 2006; Dittmar and Mahrt-Smith, 2007; Kalcheva and Lins, 2007), firms' financial constraints (Faulkender and Wang, 2006; Pinkowitz and Williamson, 2007; Denis and Sibilkov, 2010), financial reporting practices and accounting conservatism (Louis, Sun, and Urcan, 2012), the degree of firm diversification (Tong, 2011), and the existence of predatory threats (Chi and Su, 2016).[2] As far as the effect of gender on corporate cash holding is concerned, previous research focuses exclusively on the level of corporate cash holdings (see, e.g., Adhikari, 2018; Doan and Iskandar-Datta, 2020).

Arguably, understanding the determinants of the market value of corporate cash holdings is

[1] Bates, Kahle, and Stultz (2009) find that the average cash-to-assets ratio for U.S. firms has more than doubled from 1980 to 2006 and attribute this time trend to an economy-wide increase in idiosyncratic risk.

According to Moody's Investor Service, total year-end cash holdings at U.S. non-financial firms have grown significantly from $0.72 trillion in 2007 to $2.12 trillion as of June 30, 2020.

"*Cash and short-term investments on corporate balance sheets globally are at an all-time high of $6.84 trillion, according to data from S&P Global, extrapolated from second-quarter earnings reports.*" (Companies are Hoarding Record Cash amid Delta Fears, Wall Street Journal, August 16, 2021).

[2] Further, the marginal dollar of cash is often valued at well below $1.00 and tends to increase within high growth industries, such as computer software and pharmaceuticals (see, e.g., Faulkender and Wang, 2006; Pinkowitz and Williamson, 2007).

as important as studying the factors affecting the level of cash because they are fundamentally different. In fact, it is possible to envision a scenario where a firm has a high level of cash and is assigned a low market value for its cash holdings. In other words, it is not possible to extrapolate the effect on the level of cash holding based on the marginal value of cash and vice-versa. Recognizing the difference in the determinants of the level and value of cash holdings, previous literature has examined these two aspects of cash holdings as separate topics.[3]

Our study contributes to the existing literature by focusing on the effect of top executive gender on the market *value* of cash holdings and by developing and testing two competing hypotheses. The first hypothesis is rooted in the idea that female top executives are more risk-averse and tend to adopt more cautious behaviors that may adversely affect the shareholders' wealth. Following this line of argument, the market value of cash holdings is expected to be negatively affected by the presence of females managing the firm. Providing tension, our alternative hypothesis is based on the reasoning that female top executives' gender-based traits permeate all aspects of corporate decision-making leading to well-established beneficial outcomes that cumulatively affect the value that the market associates with the firms' accumulated cash. In the following sections, we test these two hypotheses by invoking the gender-based, behavioral/psychological traits commonly attributed to female top executives (CEO and/or CFO).

Using a sample of 14,518 firm-year observations during the period 1992-2018, we test the causal relationship between top executive gender and shareholders' value of corporate cash holdings. Using the valuation approach of Faulkender and Wang (2006), we estimate the marginal value of additional cash by computing excess equity returns. We find that female top executives are associated with significantly higher valuations for cash holdings. More specifically, we find that the marginal value of one dollar to shareholders in firms run by female executives is *$1.39*, while the comparable

[3]Prior literature has distinctively looked at the determinants of the firms' level of cash and market value of cash. For instance, several papers have looked at the role of economic policy uncertainty on the firm decision to hold cash. Among these, Duong, Nguyen, Nguyen, and Rhee (2020) look at the role of economic policy uncertainty on the corporate decision to hold cash and find that firms tend to accumulate more cash in periods of economic uncertainty to mitigate the negative impact that uncertainty may have on capital investments and firm innovation outputs. Interestingly, Bu, Karpuz, Xiao, and Zhao (2022) find that markets place a lower value on firms' cash holdings due to the reduced investments and the increased agency costs triggered by policy-related economic uncertainties.

value is *$0.90* for their male counterparts. We find similar results when we separate female CEOs from female CFOs. The marginal value of cash holdings to shareholders in firms run by female CEOs (CFOs) is *$1.56* (*$1.47*) compared to *$0.94* (*$0.91*) of firms managed by males. Our results are robust to using different definitions of changes in cash holdings, inclusion of executive-specific information, and controlling for firm-fixed effects.

We show that one possible mechanism for the documented results is represented by corporate culture. We show that transitions from male to female top executives are associated with higher corporate cultural values and that female top executives exert a direct positive effect on the market value of cash holdings as well as an indirect effect through the cultural environment they are able to foster. Further analysis reveals that the positive effect of female executives on the value of cash holdings is stronger in financially unconstrained firms and in firms with a cash distributing regime. These findings support the notion that females are better at reducing agency conflicts and their presence minimizes the risk of any opportunistic resource misappropriation in firms that are more exposed to such managerial misbehavior. Additionally, we find that the effect of females on the value of cash holdings is magnified in firms with weak corporate governance policies and audit quality, which supports the notion that female executives' greater ethical sensitivities act as a substitute for monitoring activities emanating from corporate governance and audit mechanisms.

Endogeneity can be a potential issue with our findings because female executives could self-select into firms with characteristics correlated with the value of cash holdings. Hence, to alleviate any such concern we conduct four robustness checks. First, we use a difference-in-differences approach that analyzes the value of corporate cash holdings before and after transitions from a male to a female executive with a control sample of male-to-male transitions, in the spirit of Huang and Kisgen (2013). Second, following Faccio et al. (2016), we apply Heckman's (1979) two-stage model to deal with the potential selection bias. Third, we report results for the propensity score matching approach to compare the value of cash holdings across pairs of female firm-years and matched male firm-years with almost identical observables. Finally, we conduct a placebo analysis by randomly assigning the gender of the top executives and then examining the effect on shareholder value. Our

baseline results are robust to all these empirical strategies.[4]

To the best of our knowledge, this is the first paper to link top executive gender to the market value of cash holdings. Previous literature has looked at the gender-based differences in accounting, economic, and financial decision-making and their impact on a variety of firm decisions and outcomes. However, it has neglected to consider the role that female top executives may have on the market value of cash holdings, a distinct issue from the mere accumulation of cash, that has implications for both the firm and the investors. Similarly, prior works have investigated the determinants of the market value of cash holdings but there has been no attention towards the effects that executive gender may play on such market value. Finally, another novelty of our study is that it is also the first paper to establish that corporate culture plays a role in the market assigned value for corporate cash holdings. Recently, Graham, Grennan, Harvey, and Rajgopal (2022) state that "*Among the items that executives believe drive value, corporate culture is the most under-researched.*" Our analysis also contributes towards this end.

We document a substantially higher marginal value of corporate cash holding assigned to female-led firms. Our analysis establishes that an indirect channel for this difference can be attributed to the female executives' beneficial influence on corporate culture. However, we contend that the remainder, and likely most, of the difference can be arguably attributed to the well-documented gender-based female traits permeating all aspects of corporate decision-making and the associated positive outcomes that manifest in the incremental value of corporate cash holdings. More specifically, our finding of a substantial difference in the market's valuation of corporate cash holdings can be rationalized by the fact that gender-based executive behavioral/psychological traits are expected to permeate all forms of corporate decision making. To this end, previous studies have documented significant differences for a myriad of corporate outcomes based on the gender of the top executives (see, e.g., Huang and Kisgen, 2013; Francis, Hasan, and Wu, 2013; Faccio, Marchica, and Mura, 2016; Li and Zheng, 2019; Griffin, Li, and Zu, 2020; Srinidhi, Gul, and Tsui, 2011, among others).

[4] When we separate female CEOs from female CFOs, we observe that the results for female CFOs are consistently more statistically significant than those for female CEOs. The result is likely to be driven by the small sample size of female CEOs compared to female CFOs.

These studies document the various beneficial outcomes of female executives' decisions. We reason that our findings capture the market's assessment of these cumulative gender based corporate decisions and outcomes that get reflected in the value of corporate cash holdings, an issue not yet investigated in prior works. We fill this gap in the literature.

The paper is organized as follows. We discuss the main hypotheses in Section 2. In Section 3, we detail the sample selection process. In Section 4, we describe our baseline results. In Section 5, we test the robustness of our findings with alternate identification strategies. Section 6 explores the corporate culture channel. Section 7 focuses on specific subsamples of interest. Section 8 concludes.

2 Hypotheses development

In this section, we develop hypotheses to test whether top executive gender determines the value of corporate cash holdings. In doing so, we invoke the gender-based personality differences that previous researchers have identified to be typically associated with females relative to their male counterparts, which results in executive gender being an important determinant of corporate financial decision-making and outcomes. Specifically, our hypotheses focus on the link between female top executive(s) and the value of corporate cash holdings and the possible mechanism driving our results.

2.1 Executive gender, risk-aversion, overconfidence, and the value of cash holdings

Managerial risk aversion can affect firms on many dimensions. Past research shows that females are more risk-averse than males, both in general settings (Hersch, 1996; Pacula, 1997) and financial settings (Levin, Snyder, and Chapman, 1988; Bajtelsmit and VanDerhei, 1997; Hinz, McCarthy, and Turner, 1997; Jianakoplos and Bernasek, 1998; Sunden and Surette, 1998). Specifically, female executives adopt safer corporate policies (see, e.g., Francis et al., 2013; Faccio et al., 2016) and female investors tend to be more cautious in their investment (see, e.g., Hudgens and Fatkin, 1985;

Johnson and Powell, 1994; Bernasek and Shwiff, 2001) and lending (Delis, Hasan, Iosifidi, and Ongena, 2020) choices.

Opler, Pinkowitz, Stulz, and Williamson (1999) show that from an investment perspective, cash holdings are less risky than investing in projects and, as a consequence, risk-averse CEOs may have a tendency to accumulate cash to minimize the firm's risk exposure. On the flip side, they also find that cash holdings are negative NPV projects because interest income from cash holdings are subject to double taxation, and also cash on deposit earns a return less than the firm's cost of capital. This implies that risk-averse CEOs accumulating excessive cash holdings do that at the expense of the shareholder wealth. Based on the above reasoning, and given that females exhibit a greater degree of risk aversion compared to males, firms run by female top executives should result in lower market valuations of their cash holdings.

In conjunction with risk aversion, executive behavioral biases, such as overconfidence, are significant determinants of firm outcomes (see, for instance, Bertrand and Schoar, 2003; Malmendier and Tate, 2005, 2008; Hirshleifer, Low, and Teoh, 2012; Huang and Kisgen, 2013) contributing to the distinction between male and female executives in corporate decision-making. Specifically, overconfidence is one of the most prominent behavioral biases that translates into the CEO's overestimation of future cash flows.[5] Existing literature on CEO overconfidence has primarily focused on investment (Malmendier and Tate, 2005, 2008), financing (Malmendier et al., 2011), capital structure (Ben-David, Graham, and Harvey, 2013), debt issuance (Huang and Kisgen, 2013), debt maturity (Huang, Tan, and Faff, 2016), performance (Doan and Iskandar-Datta, 2018), innovation (Hirshleifer et al., 2012), earnings management forecasts (Hribar and Yang, 2015), payout policies (Deshmukh, Goel, and Howe, 2013), stakeholder commitments (Phua, Tham, and Wei, 2018), and common stock trade behavior (Barber and Odean, 2001). Aktas, Louca, and Petmezas (2019) find that overconfident CEOs increase the value of cash holdings, especially for firms exposed to the so-called underinvestment problem (i.e., financially constrained firms).[6] As women are generally

[5] Malmendier and Tate (2005) argue that overconfident CEOs perceive their firm to be undervalued by the market. Further, Malmendier, Tate, and Yan (2011) find that overconfident CEOs misperceive the cost of capital required by rational creditors and equity investors for providing external financing to the firm.

[6] Aktas et al. (2019) conduct their analysis by requiring data on outstanding options held by a CEO that are

less overconfident than men (e.g., Estes and Hosseini, 1988; Barber and Odean, 2001; Huang and Kisgen, 2013; Doan and Iskandar-Datta, 2018), we expect female top executives will lower the value of corporate cash holdings. Hence, based on the above discussion regarding gender-based traits of risk aversion and less overconfidence expected from female executives, we propose *Hypothesis 1A*:

Hypothesis 1A: *To the extent that female top executives are more risk averse and less overconfident, a firm managed by a female top executive is associated with lower value for corporate cash holdings.*

2.2 Executive gender-based traits, corporate decisions, and the value of cash holdings

Female led firms can benefit on several dimensions. Female gender-based traits are expected to permeate all dimensions of corporate decision-making and can manifest in substantially different and more beneficial corporate outcomes. As discussed earlier, previous studies document superior corporate outcomes by female-led firms along with a myriad of dimensions, such as, corporate financial and investment decisions (Huang and Kisgen, 2013), favorable bank loan terms (Francis, Hasan, and Wu, 2013), lower leverage, less volatile earnings, and greater chance of survival (Faccio, Marchica, and Mura, 2016), and lower earnings manipulation (Srinidhi, Gul, and Tsui, 2011). Furthermore, propensity of women for ethical behavior and higher moral standards is well documented in the literature. Females are more concerned about fairness (Peterson and Seligman, 2003), empathy and integrity (Chun, 2005), and tend to be more trust-worthy and respectful of rules and regulations (Baldry, 1987; Barnett, Bass, and Brown, 1994; Fallan, 1999; Beu, Buckley, and Harvey, 2003). The greater ethical sensitivity of women compared to men extends to multiple sectors and professions, such as auditors (Bernardi and Arnold, 1997; Larkin, 2000; O'Donnell and

directly observable starting in 2006 and by identifying CEOs who, at least once during the period 2006–2013, hold an option until the year of expiration. For the sake of clarity, we would like to clarify that we do not require our executive data to have available information on outstanding stock options which could explain the discrepancy of findings between our and their study.

Johnson, 2001), sales people (Dawson, 1997), and accountants (Pierce and Sweeney, 2010).[7] If females are indeed generally more ethical than males, then we expect the top female executives to be more aligned with the shareholders' interests and to be able to positively affect the market value of cash holdings.

Based on the above discussion related to superior firm outcomes of female led firms and greater ethical propensities of females in various situations documented in prior studies, we propose *Hypothesis 1B*:

Hypothesis 1B: *To the extent that superior female ethical proclivities and other gender-based traits permeate all corporate decisions leading to well-established superior firm outcomes, these expected cumulative beneficial effects, along a myriad of dimensions, manifest in greater market value of corporate cash holdings.*

2.3 Executive gender, corporate culture, and the value of cash holdings

A recent growing literature investigates the link between firm gender diversity, corporate culture, and firm value. For example, Jain-Link, Kennedy, and Bourgeois (2020) state that inclusive workplaces based on gender and race tend to be more innovative towards their customers' needs and create a positive learning culture. Following the idea of Camerer and Vepsalainen (1988), Billings, Klein, and Shi (2022) look at a *visible* measure of corporate culture based on firm gender diversity. They conjecture that the board gender diversity is indicative of an inclusive corporate culture that significantly and positively affects firm value. Along with these studies, a new stream of the literature is emerging that focuses on the relationship between culture and cash holdings. For instance, Deng (2022) finds that the regional Confucian culture density is an important determinant of the corporate cash policy in China. By extending the above arguments to female top executives, we expect female managers to play a more positive role in improving corporate culture, given their documented behavioral characteristics. Hence, female top executives are expected to positively

[7] There are other related works investigating the ethical attitude of male versus female students (Albaum and Peterson, 2006).

affect the market value of corporate cash holdings via the corporate culture channel.

Based on the above reasoning, we propose *Hypothesis 2*:

Hypothesis 2: *Female top executives have a positive effect on the market value of corporate cash holdings, directly and indirectly, as they are expected to have a more beneficial effect on corporate culture.*

2.4 Executive gender, agency conflicts, and the value of cash holdings

Prior studies document the role of females in mitigating firms' agency conflicts. For example, Adams and Ferreira (2009) find that female directors reduce agency conflicts in U.S. firms. Similarly, Carter, Simkins, and Simpson (2003) find a significant negative relationship between the fraction of women on corporate boards and agency costs for a sample of Fortune 100 firms. Focusing on female CEOs, Ullah, Fang, and Jebran (2019) show that female executives reduce agency conflicts resulting in increased firm value. Invoking Jensen's (1986) agency cost of free cash flow, some studies argue that more mature companies with few investment opportunities may have excessive free cash flows triggering managerial perquisite consumption (Oswald and Young, 2008; Zhang, 2009; D'Mello and Miranda, 2010).

We conjecture that the role of female top executives on the value of corporate cash holdings will be more pronounced in firms that are more exposed to free cash flow related agency costs. To test this hypothesis, we classify firms based on their financial constraints and cash regimes. We reason that financially unconstrained firms are those with easier access to capital markets and, consequently, with more exposure to managerial perquisite consumption. As for the cash regimes, prior literature has distinguished between raising (i.e., less available cash) and distributing (i.e., more available cash) cash regimes and, based on this categorization, we expect free cash flow agency costs to be greater in firms in a distributing (cash) regime. Based on the above discussion, we propose *Hypotheses 3A* and *3B*:

Hypothesis 3A: *The effect of female top executives on the value of corporate cash holdings*

will be more pronounced for financially unconstrained firms.

Hypothesis 3B: *The effect of female top executives on the value of corporate cash holdings will be more pronounced for firms with a distributing cash regime.*

2.5 Executive gender, corporate governance policies, audit quality, and the value of cash holdings

Corporate governance can be viewed as a nexus of mechanisms to ameliorate various agency problems associated with the firm. Margaritis and Psillaki (2010) show that nominating outside directors that represent large or institutional shareholders increases the monitoring effectiveness over managers. Linn and Park (2005) find that to mitigate agency problems and attract reputable and capable directors, companies offer stock-based incentive compensation plans to directors. Chi and Lee (2010) conclude that corporate governance is effective when agency risk is high, i.e., the company has surplus free cash flow.

Given this backdrop, we contend that female executives and corporate governance will accomplish the same task, i.e., aligning managers' and shareholders' interests. Therefore, we expect a substitution effect between the disciplining role of female top executives and the firm's corporate governance mechanisms in place. Based on the above reasoning, we propose *Hypothesis 4*:

Hypothesis 4: *The effect of female top executives on the value of corporate cash holdings will be inversely related to the strength of corporate governance mechanisms associated with the firm, due to the substitution effect of the two sources of monitoring.*

Further, there is large evidence showing that audit mechanisms help discipline the agency conflicts, enhance the firm integrity, and the overall ethics of corporations. Following the same reasoning explained above, we expect a substitution effect between the role of female top executives and the quality of the audit mechanism in place. We then propose *Hypothesis 5*:

Hypothesis 5: *The effect of female top executives on the value of corporate cash holdings will be inversely related to the audit quality to which the firm is subject to, due to the substitution effect*

of the two sources of monitoring.

3 Data sources, sample selection process, and summary statistics

In this paper, we define a firm as run by a female executive if either the CEO and/or the CFO is a woman.We include both CEOs and CFOs in our analysis because there are relatively fewer female CEOs compared to female CFOs in the U.S. and therefore, including female CEOs and CFOs helps in terms of statistical inference. In addition, prior work has shown that CFOs play an important role in making corporate financial and accounting decisions (see, e.g., Mian, 2001; Graham, Harvey, and Rajgopal, 2005; Geiger and North, 2006; Chava and Purnanandam, 2010; Frank and Goyal, 2010; Jiang, Petroni, and Wang, 2010). Data on executives are collected from ExecuComp.

A manager is classified as a CEO if his/her title is composed of phrases such as "chief executive officer," "chief exec," "CEO", and other similar titles. Similarly, a manager is classified as a CFO if his/her title is composed of phrases such as "chief financial officer," "chief finance officer," "CFO", and other similar titles. All our observations have executive gender information. We find 1,973 unique firms for a sample period spanning from 1992 to 2018. We are able to identify 346 unique firms with female executives and 2,380 executive transitions with 175 male-to-female transitions.

Firm-level data and stock price information are extracted from the COMPUSTAT and Center for Research in Security Prices (CRSP) databases, respectively. Following the approach by Faulkeneder and Wang (2006), we eliminate firm-years for which net assets are negative, the market value of equity is negative, or dividends are negative. We delete utility firms (SICs 4900-4999) and financial firms (SICs 6000-6999). We winsorize all continuous variables at the 1st and 99th percentile to deal with possible outliers.[8] The final number of firm-year observations is 14,518.

We report summary statistics for salient variables in Table 1. We find that the average firm has a 4.48% 1-year excess (abnormal) stock return while the median is practically zero.[9] The mean and

[8] Aktas et al. (2019) also delete observations with negative capital expenditures. Applying this filter will not change our findings.

[9] Summary statistics on excess stock market returns are different than those reported in Falkender and Wang (2006). We argue that this difference could be driven by two factors. First, we construct our analysis on a different

median changes in cash holdings are close to zero (1% and .3%, respectively), suggesting that the distribution of the change in cash holdings is quite symmetric. The mean and median cash holdings levels are 12.9% and 7%, respectively, which are consistent with other prior works on corporate cash holdings (see, e.g., Opler et al., 1999). Similarly, the mean leverage ratio is 20.3% and the median is at 15.5%, comparable with other works in the area.

Comparing the sample of firms run by female and male executives, we note that male executives have significantly more market leverage than their female counterparts (20.7% vs. 17.4%). Also, male executives are associated with lower firm's market value ($7b vs. $10b) and common dividend amounts (1.2% vs. 1.4%) but also greater interest expenses (3% vs. 2.1%), investments in R&D (2.2% vs. 1.8%), and net assets (1.24% vs. 1.09%).[10]

4 Empirical findings

This section presents the main empirical tests of gender differences on the value of cash holdings. To check the validity of our results, we perform a wide series of robustness tests, such as controlling for executive-specific information, including firm fixed effects, and using alternative definitions of cash holdings.

4.1 Baseline empirical methodology and findings

To investigate the impact of top executive gender on the value of cash holdings, we follow Faulkender and Wang (2006) and augment their model with a dummy for whether the CEO and/or the CFO is a female (*Female*) and its interaction with the change in cash holdings. Specifically, we test the

sample period, 1992 through 2018 instead of 1972 through 2001 as in Faulkender and Wang (2006). Further, our sample size is smaller due to the inclusion of executive-specific control variables.

[10] As argued by Huang and Kisgen (2013), the difference in size is likely to be attributed to the greater market attention that larger firms attract. Specifically, larger firms are more careful in avoiding gender discrimination in hiring and promotion as they are more visible. Females are also more likely to be hired by bond-rated firms and in those with a lower proportion of collateralizable (fixed) assets.

model specified below.

$$(r_{i,t} - R^B_{i,t}) = \alpha + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2\ Female_{it} + \beta_3 Female_{it} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma' X + \varepsilon_{it}. \quad (1)$$

The dependent variable in model (1) is the firm i's excess return from year $(t-1)$ to year t. $r_{i,t}$ is defined as the annual stock return for firm i at time t (fiscal year-end) and $R^B_{i,t}$ is stock i's benchmark portfolio return for the same time period t. Following Daniel and Titman (1997), we use the 25 Fama and French portfolios formed on size and book-to-market as benchmark portfolios. For each firm-year observation, a firm is grouped into one of the 25 Fama and French portfolios based on the intersection between size and book-to-market. The return of the corresponding Fama and French portfolio is regarded as the benchmark return for the firm during that year. $\Delta C_{i,t}$ is the change in cash holdings from year $t-1$ to t.

As in Faulkender and Wang (2006), we deflate the change in cash holdings by the 1-year lagged market value of equity ($M_{i,t-1}$). Given this standardization, we can interpret the coefficient β_1 as the dollar change in shareholders' value for a one-dollar change in cash holdings. $Female_{it}$ is a dummy variable that takes the value equal to one if the firm has a female top executive (CEO and/or CFO). In equation (1), β_2 measures the direct effect of female executives on shareholders' value. Next, we construct the interaction term, $Female_{it} \times \frac{\Delta C_{i,t}}{M_{i,t-1}}$. The coefficient of this interaction term is our coefficient estimate of interest. It represents the difference in the marginal value of one dollar between firms managed by female executives and firms managed by men, thus indicating the impact of top executive gender on the value of cash holdings. A significantly positive (negative) β_3 coefficient indicates that an additional one dollar of cash holding is worth more (less) for firms managed by female CEOs and/or CFOs relative to firms managed by male ones. The vector X includes the set of firm-specific characteristics from the Faulkender and Wang's baseline model in order to control for changes in firms' profitability, financial policy, and investment policy. These firm-specific control variables are: (1) $\Delta E_{i,t}$, the change in earnings before extraordinary items; (2) $\Delta NA_{i,t}$, the change in net assets; (3) $\Delta R\&D_{i,t}$, the change in research and development expenses; (4) $\Delta I_{i,t}$, the change in interest expenses; (5) $\Delta D_{i,t}$, the change in common dividends; (6) $NF_{i,t}$, the firm's net financing; and (7) $C_{i,t-1}$, the firm's cash holdings at the end of the previous year.

All these variables are scaled by the lagged market value of equity ($M_{i,t-1}$). Consistent with Faulkender and Wang (2006), we include the market leverage of the firm ($L_{i,t}$), the interaction between $L_{i,t}$ and the change in cash holdings scaled by the lagged market value of equity ($\frac{\Delta C_{i,t}}{M_{i,t-1}}$), and the interaction between the lag of cash holdings ($C_{i,t}$) and $\frac{\Delta C_{i,t}}{M_{i,t-1}}$. Details about the variables' definitions are defined in Appendix A. Finally, we include year and industry fixed effects to control for time invariant industry characteristics that may affect the firm's excess returns. Statistical inference is drawn by clustering the standard errors at the firm level.

The results, presented in Table 2, show that having a female top executive (CEO and/or CFO) significantly increases the value of cash holdings both economically and statistically, as indicated by the positive and statistically significant coefficient on the interaction between change in cash holdings and female executives (columns 3 and 4).[11] The coefficient in column 3 shows that the value that the stock market assigns to a dollar of cash is \$0.49 greater for a firm managed by a top female executive relative to a firm run by a male (p-value $< 1\%$). We refine our analysis in columns (5) and (6) and columns (7) and (8) to distinguish between female CEOs and CFOs, respectively. We find that one dollar is worth \$0.62 more for a firm managed by a female CEO relative to one with a male CEO and \$0.56 more for a firm run by a female CFO relative to a firm with a male CFO.

Additionally, in Table 2, we report the marginal value of cash holdings for the entire sample and for firms run by female top executives. To do so, we use the mean value for the lag in cash holdings (12.9%) and the mean leverage ratio (20.3%). Therefore, the marginal value of one dollar to shareholders in the *average* firm is \$0.95 ($= 1.275 + (-0.057 \times 12.9\%) + (-1.573 \times 20.3\%)$). Following Tong's (2011) approach, we construct an F-test on the null hypothesis that the marginal value of \$1 is one and report the p-value in brackets. We find that an additional dollar is valued significantly different from one in the entire sample (p-value $< 0.01\%$).

Next, we report the marginal values for the impact of top executive gender on the value of corporate cash holdings. We find that the marginal value of one dollar to shareholders in firms run

[11] Observe that the number of observation is 14,518 in columns (1) through (6) and 12,499 in columns (7) and (8). The change in the number of observations occurs because some firms do not have a female CFO or it could not be identified.

by female executives is \$1.39 (= 1.223+0.491+(−0.063×12.9%)+(−1.558×20.3%)). Consequently, the marginal value of cash holdings for firms managed by men is \$0.90. We find similar results when we separate female CEOs from female CFOs. The marginal value of cash holdings to shareholders in firms run by female CEOs (CFOs) is \$1.56 (\$1.47) against the \$0.94 (\$0.91) of firms managed by men. The F-tests show that all the \$ amounts are significantly different from one (p-value <0.01%).[12]

In summary, consistent with our hypothesis H1B, our results show that having a female top executive is associated with a positive impact on the marginal value of corporate cash holdings.

4.2 Robustness tests to the baseline model

Having established that female top executives have a positive and statistically significant effect on the value of corporate cash holdings, we now proceed to assess the robustness of our results.

4.2.1 Controlling for executive-specific variables

In addition to controlling for variables that prior works have established to influence the value of cash holdings, we include a set of executive-specific information such as age (*Exec Age*), ownership (*Exec Ownership*), proxied by the number of shares (excluding options) owned by the top executive divided by common shares outstanding at the end of the fiscal year, and the executive equity-based compensation (*Exec EBC*), measured by the sum of the value of new stock options (using modified Black–Scholes method) granted to the firm's top executives as a percentage of total compensation paid to them. Further, we include the interactions of all these executive-based variables with the contemporaneous change in cash holdings.

Our results are presented in Table 3, Panel A, and show that our finding of a positive effect of female top executives on the value of corporate cash holdings is robust to the inclusion of executive-specific information. The coefficient estimate of the interaction term in columns 1 and 2 is positive, statistically significant at the 1% level, and equal to 0.543, suggesting that the cross-sectional

[12] As a robustness test, we also estimate our baseline regression model with the inclusion of executive overconfidence and our findings remain robust.

difference in the marginal value of cash between female and male top executives, CEOs and/or CFOs, is \$0.543. We get a similar result when we focus on firms with a female CFO. Finally, the interaction term is still positive but not statistically significant when we look at firms with female CEOs.[13]

4.2.2 Controlling for firm fixed effects

Our baseline results could be driven by unobserved time-invariant firm-specific characteristics. To address this issue, we re-run our baseline specification and substitute the industry fixed effects with firm fixed effects. Our results are presented in Table 3, Panel B. The interactions are all positive and statistically significant, ranging from 0.529, when we look at firms run by female CFO, to 0.749, when we focus on firms managed by female CEOs. All the coefficient are statistically significant either at the 1% level (for $Female$ and $Female\ CEO$) or at the 5% level (for $Female\ CFO$).

4.2.3 Using an alternative definition of change in cash holdings

We re-run our baseline specification by using a different definition of change in cash holdings. Following Faulkender and Wang (2006), we define the net change in cash holdings ($Net\Delta C_t$) as the realized change in cash holdings minus the average change in cash holdings in the corresponding benchmark portfolio over the same period. Using the net change in cash holdings helps mitigating the impact of the increasing time trend in the level of cash holdings, as discussed in Bates et al. (2009).[14] Our results, reported in Table 3, Panel C, show that the positive relationship between female top executives and value of corporate cash holdings still holds. Magnitude, statistical, and economic significance are preserved.[15]

[13] Note that the number of observations is only 11,967 in columns (1) and (2). Here, to calculate the executive ownership or age, we need to collect information for both the CEO *and* CFO.

[14] Bates, Kahle, and Stulz (2009) find that firms' cash holdings increased about 130 percent between 1980 and 2006.

[15] When we separate female CEOs from female CFOs, we find a statistically significant result for female CFOs but not for CEOs, in line with the weaker result found for female CEOs in the baseline regression table.

4.2.4 Excluding marketable securities

In our analysis, we construct cash holdings using cash plus marketable securities (COMPUSTAT Data item 1). However, as argued by Louis et al. (2012), the market value of marketable securities can be different from their book value and that difference might be correlated with omitted variable that affect the value of corporate cash holdings. To ensure that our results are not driven by this potential issue, we also conduct the analysis with pure cash balances (COMPUSTAT Data item 162). The untabulated results are qualitatively and quantitatively similar to those reported in Table 2.[16]

4.3 Comparing the effects of male-to-male and male-to-female executive transitions on the value of corporate cash holdings

Another way to examine the effect of gender on the value of cash holdings is to partition the effect of top executive transitions based on the gender and to compare the value of cash holdings to shareholders between these two groups. Specifically, we apply the difference-in-differences approach to compare the stock market value of cash holdings before and after transitions from a male to a female executive with a control sample of male-to-male transitions (Huang and Kisgen, 2013). We further restrict our sample to three years before and after the transition, with the exclusion of the transition year. Our regression model is described as follows:

$$\begin{aligned}(r_{i,t} - R^B_{i,t}) \;=\; & \alpha + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2\, FemaleTrans_{it} + \beta_3 Post_{it} + \\ & + \beta_4 \frac{\Delta C_{i,t}}{M_{i,t-1}} \times FemaleTrans_{it} \times Post_{it} + \beta_5 FemaleTrans_{it} \times Post_{it} + \\ & + \beta_6 \frac{\Delta C_{i,t}}{M_{i,t-1}} \times Post_{it} + \beta_7 \frac{\Delta C_{i,t}}{M_{i,t-1}} \times FemaleTrans_{it} + \gamma' X + \varepsilon_{it}. \end{aligned} \tag{2}$$

As in model (1), the dependent variable is the firm's excess return from year $(t-1)$ to year t. In equation (2), *Post* is a dummy variable taking a value equal to one if year t is after the appointment, and zero otherwise. *FemaleTrans* is a dummy variable that takes a value equal to

[16] The untabulated results are available upon request.

one for firms facing a male-to-female top executive transition. The triple interaction variable, $FemaleTrans \times \frac{\Delta C_{i,t}}{M_{i,t-1}} \times Post$, reflects the impact of female executives on the post-hiring stock market value of corporate cash holdings. X is the same set of control variables included in our base model (1) and described in Appendix A.

The results using difference-in-differences model are reported in Table 4. Our coefficient of interest is β_4, illustrating the value of cash holdings after firms face a transition from a male to a female top executive. As shown in the table, columns (1) and (2), the interaction term is positive, statistically significant at the 5% level, and equal to 1.083 suggesting that, in firms facing a transition from male to female top executives, the value of cash holdings to shareholders is \$1.083 greater than the one observed in firms facing a male-to-male transition. Similar to the approach taken in the baseline analysis, we distinguish between male-to-female CEO and CFO transitions (identified with the dummies $FemCEOTrans$ and $FemCFOTrans$, respectively). The effect of transitions from a male to a female CFO or CEO on the value of corporate cash holdings is positive, as shown in columns (3) through (6), but statistically significant only for male-to-female CFO executive transitions (columns (5) and (6)).

Our results from this analysis again confirm that female executives are associated with more cash holdings value to shareholders compared to their male counterparts.

5 Addressing endogeneity and self-selection with alternate empirical methods

We use a battery of robustness tests to address the potential endogeneity issue that may arise in the relation between executive gender and value of corporate cash holdings. First, following Faccio et al. (2016), we apply Heckman's (1979) two-stage model in combination with an instrumental variable to deal with the potential selection bias. Second, we report results for the propensity score matching approach to compare the value of cash holdings across pairs of female firm-years and matched male firm-years with almost identical observables. Finally, we conduct a placebo

analysis by randomly assigning the gender of the top executives and then examining the value of cash holdings to shareholders.

5.1 Heckman two-stage model

The baseline model that we test (in Table 2) has some limitations as it is likely to be affected by endogeneity issues that we need to address. One potential problem that may bias our results is the "self-selection" issue, which means that female executives may self-select into firms with specific characteristics which could drive the observed increased value of corporate cash holdings. To address this issue, we follow Heckman (1979) and use the treatment effects model. In the first-stage, we use a probit model to estimate the probability that firms will hire a female executive as a function of firm-specific characteristics (size, leverage, R&D, market to book, dividends, capital expenditures, and profitability), industry, and year fixed effects.[17] To facilitate identification, following Sugarman and Straus (1988), Di Noia (2002), and Huang and Kisgen (2013), we include a state's level of gender equality status, *Gender Equality*, as an instrument. It is argued that firms headquartered in a state that is friendlier to women's equality are more likely to hire female executives. The state's gender equality value for each firm is based on the firm's headquarters location. Higher values for *Gender Equality* indicate firms in states with greater attention toward gender equality.

In the second-stage, we test the relationship between executive gender and value of cash holdings including the inverse Mills ratio (derived from the first stage) and the same set of control variables used in equation (1). Specifically, the first- and second-stages can be described as follows:

First Stage:

$$Female\ Executives_{it} = \alpha + \beta_1 Gender\ Equality_i + \theta X_{it} + \varepsilon_{it}, \tag{3}$$

[17] Probit models with fixed effects are commonly associated with the incidental paramenter problem. To address this issue, we also run the first stage using a conditional logistic regression. This model controls for all stable characteristics of the individuals by using only within-individual variation to estimate the regression coefficients, implying that, when employing the conditional logistic approach, we cannot include the *Gender Equality* variable, which is constant across firms and only changes across states. Using a conditional logistic regression in place of a probit model does not change the results which are similar in magnitude and sign.

Second Stage:

$$(r_{i,t}-R^{B}_{i,t}) = \alpha+\beta_1\frac{\Delta C_{i,t}}{M_{i,t-1}}+\beta_2\ Female_{it}+\beta_3 Female_{it}\times\frac{\Delta C_{i,t}}{M_{i,t-1}}+\gamma' X+\delta\ Inverse\ Mills\ Ratio+\varepsilon_{it}. \tag{4}$$

The interaction variable between the *Female* dummy and the change in cash holdings is our variable of interest. X is the same set of control variables included in the baseline model and described in Appendix A. As in previous models, we include year and industry fixed effects and cluster standard errors at the firm level.

Our results for the second-stage of the treatment effects model are presented in Table 5. In each of the second-stage regression models, the coefficient for the interaction is positive and statistically significant at either the 1% level, when we look at female CEOs and CFOs (columns 1 and 2), or the 5% level, when we consider female CFOs (columns 5 and 6), or the 10% level, when we focus on female CEOs (columns 3 and 4). The magnitude is comparable to our baseline findings. These results confirm our previous intuition and further strenghten the idea that executive gender is an important trait affecting the value of cash holdings.

5.2 Propensity score matching

To further address the problem of non-random selection, we employ a propensity score matching approach (Rosenbaum and Rubin, 1983). We begin with a probit regression that estimates propensity scores, $p(Y = 1/X = x)$, based on the probability of receiving a binary treatment, Y, conditional on all the control variables, X. In our setting, we consider having a female top executive as treatment and we estimate the probability of having a female top executive using the independent variables of the baseline specification (Model (1)) employed in Table (2).[18] For each firm-year with a female CEO and/or CFO, we use the propensity score to find a comparable firm-year with a male CEO and/or CFO using the nearest neighborhood matching algorithm with replacement to minimize the propensity score distance between the matched comparison units and the treatment

[18] We replicate the first stage of the propensity score matching approach by using a conditional logistic regression and get similar results.

units (Hong, Hung, and Lobo, 2014).[19] To ensure that any combination of characteristics observed in the treatment group can also be observed among the control group (Bryson, Dorsett, and Purdon, 2002), we implement the common support condition (Minutti-Meza, 2013). Particularly, we discard all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group (Caliendo and Kopeinig, 2008). To ensure the matching approach is appropriate, we use a caliper width of 0.2 (Austin, 2011).[20] Using this approach, we find 1,392 unique pairs of matched firms-years. When we consider having a female CEO (CFO) as treatment, we find 407 (1,043) unique pairs of matched firms-years.

Our results for the propensity score matching approach are presented in Table 6. Panel A compares firm-characteristics for the treated and control samples and shows that the matching is closely performed (i.e., the differences between the mean values of all the matching variables for the treated and the control samples are not statistically significant). Panel B shows the regression results for the matched sample. Our results confirm our previous findings. The sign and magnitude of the interaction coefficients are positive and statistically significant in all the specifications, regardless of how the female top executive dummy is constructed. Overall, the evidence of this subsection shows that female executives are more likely to increase the value of corporate cash holdings consistent with the idea that female executives take decisions that align with shareholders' interests.

5.3 Placebo test

We further assess the robustness of our results using a placebo test that randomly assigns female executives to firms. This approach, which is widely used in psychology, ensures that each CEO or CFO has the same chance of being hired in any company and thus guarantees that any difference between and within firms is not systematic. If we believe that the effect on the value of corporate cash holdings can be attributed to the executive gender (and is causally related to it), then we should *not* observe a positive and significant relation between value of cash holdings and the randomly

[19] To circumvent a concern that replaced observations with extreme propensity scores are matched many times, and thus, are heavily weighted (Lawrence, Minutti-Meza, and Zhang, 2011), as a robustness check, we use a matching algorithm that does not allow for replacement. The results are unchanged.

[20] The results hold when we use a caliper width of 0.1.

(and artificially) assigned female executive.

The placebo test results are presented in Table 7. This table shows that randomly assigned female top executives play no role on the value of corporate cash holdings (columns 1 and 2). The result persists when we distinguish female CEOs (columns 3 and 4) from female CFOs (columns 5 and 6). This result confirms our earlier intuition that top executive gender is an important executive trait affecting the value of cash holdings.

6 The corporate culture channel

Culture influences a range of financial decisions such as investment and risk-taking (Graham et al., 2022). In this section, we test *Hypothesis 2* and investigate the corporate culture channel guiding the effect of female top executives on the market value of corporate cash holdings using a newly developed measure by Li, Mai, Shen, and Yan (2021).[21] Using a machine learning approach, Li et al. (2021) analyze 209,480 earnings call transcripts and obtain scores on the top five corporate values identified by Guiso, Sapienza, and Zingales (2015) - *innovation*, *integrity*, *quality*, *respect*, and *teamwork* - for 62,664 firm-year observations over the period 2001-2018. Earnings call transcript files are obatined from Thomson Reuters' StreetEvents (SE). Each file contains the body of a call transcript along with the information that helps matching the company to the Compustat database such as the ticker symbol header, the company name, the title of the event, and the date of the call. We refer to Li et al. (2021) Section 1 of their Internet Appendix for a full description of the matching procedure to construct the firm-level measure of corporate culture.

We study the corporate culture channel using a two-step procedure. First, we employ a difference-in-differences approach to compare the corporate cultural values (*Culture*) before and after transitions from a male to a female executive with a control sample of male-to-male transitions. When estimating the difference-in-difference model, we include firm-specific characteritics that may affect the degree of cultural development, along with firm and year fixed effects.[22] After

[21] We are grateful to Professor Kai Li for providing the corporate culture variable.

[22] We also test the effect of top executive gender on corporate culture by including year and industry fixed effects and find similar results.

assessing the effect of male to female transitions on corporate culture, we test the baseline model specified in equation 1 with the inclusion of the interation variable between *Culture* and the change in corporate cash holdings.[23] Below we present the model specifications:

$$(Culture)_{it} = \alpha + \beta_1 Post_{it} + \beta_2 FemaleTrans_{it} \times Post_{it} + \gamma' X + \varepsilon_{it}. \tag{5}$$

$$\begin{aligned}(r_{i,t} - R^B_{i,t}) \;=\; & \alpha + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2\, Female_{it} + \beta_3 Female_{it} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_4\, Culture_{it} + \\ & + \beta_5 Culture_{it} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma' X + \varepsilon_{it}.\end{aligned} \tag{6}$$

Our goal is to show that female executives promote the corporate cultural environment and that the positive effect that female executives play on the market value of corporate cash holdings can be decomposed in two distinct effects; i.e., a *direct* effect, measured by the interaction coefficient β_3, and an *indirect* effect capturing the role of corporate culture, and measured by the interaction coefficient β_5.

Our results for the corporate culture channel are presented in Table 8, Panels A and B. Panel A shows the results for the difference-in-differences model and illustrates the idea that male to female transactions enhance the corporate cultural values in the post-transaction period; i.e., the coefficiente β_2 is positive, equal to (.272), and statistically significant at the 5 percent value.[24]

In panel B, we present our results for the baseline model augmented with the interaction term between *Culture* and the change in cash holdings. The table shows a few important results. First, our earlier finding of a positive effect of female top executives on the market value of corporate cash holdings still holds when we account for an augmented model. Second, the coefficient β_5 is positive, equal to (.068), and statistically significant at the 5 percent value, suggesting that corporate culture is an important factor affecting the value of cash holdings. Finally, we observe that the magnitude of β_3 is larger compared to that of β_5, which points to the idea that top executive gender explains more

[23] We also use a two-stage least squares approach to investigate our culture-based channel. In the first step, we regress the corporate cultural values against past lagged values of *Female*, the dummy variable identifying female top executives. Then, we use the predicted values from the first stage to estimate the baseline regression model with the addition of an interaction term between the predicted values for *Culture* and the change in cash holdings, while controlling for *Culture*. Our findings are robust to this alternative approach.

[24] Note that, in Panel A, we include firm fixed effects to account for firm-specific time-invariant factors that can affect the corporate culture (as, for example, firm reputation), and, for this reason, we do not include the dummy *FemaleTrans*.

of the variation in the market value of cash holdings compared to firm's culture. Taken together, our results suggest that top executive gender affects the value of accumulated cash directly and indirectly, through the role of firm culture, which we show is significantly affected by the gender of the management in place. This finding adds a new dimension to the value of corporate cash holdings literature.

7 Top executive gender and value of cash holdings under specific scenarios

In this section we analyze the effect of female executives on the value of cash holdings under (a) cash distributing and cash raising regimes, (b) degree of financial constraints, (c) weak and strong corporate governance, (d) high and low percentage of insitutional ownership, and (e) higher and lower audit quality. For brevity and following prior literature (see, e.g., Aktas et al., 2019), we present the results using female top executives, although our results remain qualititatively similar and statistically significant when we separate female CEOs from female CFOs.

7.1 The role of cash regimes and financial contraints

In this subsection, our goal is to test hypotheses *3A* and *3B*. In particular, we want to study the role that female top executives may have in settings where the probability of diverting firms' resources is higher and thus the free cash flow agency cost problem more predominant. In doing so, we rely on previous literature showing that females have an important role in mitigating firms' agency conflicts. For example, Adams and Ferreira (2009) find that women in the boardroom allocate more effort to monitoring activities thus reducing agency conflicts in U.S. firms. Similarly, Carter, Simkins, and Simpson (2003) find a significant negative relationship between the fraction of women on corporate boards and agency costs for a sample of Fortune 100 firms. Focusing on female CEOs, Ullah, Fang, and Jebran (2019) show that female executives reduce agency conflicts resulting in increased firm value. Following this line of reasoning, we conjecture that the role of female top executives on the value of corporate cash holdings will be more pronounced in firms that are more

exposed to free cash flow related agency costs. We test the validity of our hypotheses by classifying firms based on their financial constraints and cash regimes.

We first focus on the role of cash regimes and present the results in Table 9. We follow Halford et al. (2017), and Aktas et al. (2019) to identify cash regimes, that is, we rely on actual firm behaviors and classify a firm as in the raising cash regime if, in a given year, it issues equity for a value that is 3% greater than the market value of equity and does not make dividend payments. Otherwise, it is classified as being in the cash distributing regime. Our results show that the effect of female top executives on the value of cash holdings is more pronounced within firms with a distributing cash regime. The finding is consistent with our hypothesis *H3B*.

In economic terms, having a female top executive in the distributing cash regime increases the value of $1.00 cash holding by an additional amount of $0.512 relative to a firm run by a male executive in the same cash regime. We find no statistically significant relationship between top executive gender and value of cash within firms with a raising cash regime.[25] These results show that the fundamental relation between top executive gender and value of cash holdings still holds when we account for firms' cash regimes. The relation becomes stronger within firms with a distributing regime, where free cash flow agency conflicts are more likely to arise and females can better intervene to alleviate them and increase the value of cash holdings.[26]

In untabulated results, we validate the robustness of our findings using a different approach to distinguish firms between those with an excess of cash and those lacking cash. In particular, we follow Dittmar and Mahrt-Smith (2007) and look at the cash residuals, defined as the difference between the actual and the predicted cash. Firms with positive residuals are defined as having an excess of cash, while firms with nonpositive residuals are classified as lacking cash. Our results are robust to this alternative methodology to categorize firms and confirm the idea that the positive

[25] Other papers have also looked at the role of cash regimes, see, e.g., Faulkender and Wang (2006), and Halford, McConnell, Sibilkov, and Zaiats (2017).

[26] This finding is confirmed when we look a bit closer at firm-year observations within the distributing cash regime. In our sample, we have 13,876 firm-year observations that fall into the distributing cash regime. About 50.2% of them are classified as financially unconstrained, when using the Kaplan-Zingales (1997) index. This further strengthens the idea that firms more exposed to opportunistic behaviors from managers are also those that will benefit the most from female top executives in terms of cash holdings value. We find similar results when we use other measures of financial constraints such as the Whited-Wu (2006) and the Hadlock and Pierce (2010) indices.

effect of female top executives on the value of cash holdings is magnified in firms more exposed to free cash flow problems.[27]

We now turn to analyze the role of financial constraints.[28] We distinguish between financially constrained and unconstrained firms using several proxies. First, we use long-term issuer-paid credit ratings in conjunction with debt information and classify firms with positive debt outstanding in a given year into the high financially constrained group if the firm has either no credit rating information or its long-term debt is associated with a speculative grade rating (i.e., $BBB-$ and below) for that year. Firms with no debt outstanding and firms with investment grade ratings (i.e., above $BBB-$) are classified as low financially constrained (UC). Further, we use the Kaplan and Zingales (1997) index (K-Z), the Whited-Wu (2006) index (W-W), and the Hadlock-Pierce (2010) index (H-P) to split firms into the two categories, financially constrained (C) and unconstrained (UC).[29] When we use the financial constraint indices, we classify firms as financially constrained in year t if the indices are above the sample median in that year. Otherwise, we define firms as being financially unconstrained.

The results analyzing the role of financial constraints are presented in Table 10. Here, we report the results using the credit rating information, the W-W, and the K-Z indices.[30] The results show that the effect of female executives on the value of corporate cash holdings is more pronounced within firms classified as financially unconstrained, regardless of the proxy used to capture financial constraints. For example, when we categorize firms based on corporate credit ratings, we find that having a female top executive in financially unconstrained firms increases the value of \$1.00 cash holding by an additional amount of \$0.778 relative to a firm run by a male executive in the same category. Such a relationship is not found in the financially constrained group. These results are in support of our hypothesis *H3A*. Together with the results investigating the role of cash regimes, the findings of this subsection reinforce the idea that the effect of females on the value of cash holdings

[27] Untabulated results are available upon request.

[28] Other papers have also looked at the role of financial constraints, e.g., Denis and Sibilkov (2010), Chi and Su (2016), and Bates, Chang, and Chi (2018).

[29] The description of variables is provided in Appendix A.

[30] The results using the Hadlock-Pierce (2010) index are similar in magnitude and statistical significance and they are available to readers upon request.

is magnified within firms with an excess of resources that can potentially be diverted to alternative, value-destroying investments. Finally, these tests strengthen our conjecture that females help to mitigate firms' agency conflicts thus resulting in the market assigning a greater value for its cash holdings.

7.2 The role of corporate governance and institutional investors' monitoring

Prior literature has extensively studied the effects of corporate governance policies on the value of cash holdings. For example, Dittmar and Mahrt-Smith (2007) show that in poorly managed firms cash is valued less and managed in a way that significantly reduce firm's operating profits. Tong (2011) shows that the effect of diversification on the value of cash holdings is negative in firms with lower governance. We investigate the role of corporate governance by separating firms with a good corporate governance from firms with a bad corporate governance. We use the corporate governance index developed by Gompers, Ishii, and Metrick (2003) and construct this index using data on corporate charters of takeover defenses from the Investor Responsibility Research Center (IRRC) database. A higher Gompers et al. (2003) index indicates more restrictions on shareholder rights, thus corresponding to a lower level of corporate governance. Firms are classified as having a good (bad) system of corporate governance if the firm's Gompers et al. (2003) index is below (above) the yearly median. The IRRC database only provides data for a subset of firms (mostly larger firms) in the sample which brings the total number of firm-year observations down to 5,900.

Our results are presented in Table 11, Panel A. We find that the relation between female top executives and value of cash holdings only exist within the group of firms that have poor performance. In particular, we find that having a female top executive in firms with poor corporate governance increases the value of $1.00 cash holding by an additional amount of $0.858 relative to a firm run by a male executive in the same category. The relation between female top executive and value of cash holdings is negative but not statistically significant in the group of firms with better corporate governance.

In Panel B, we use an alternative corporate governance index based on Bebchuk, Cohen, and

Ferrell (2009). Bebchuk et al. (2009) argue that 6 out of 24 provisions in the IRRC database are the most important ones leading to managerial entrenchment. Their corporate governance index is constructed on these six provisions. Similar to the Gompers et al. (2003) index, a higher index indicates more restrictions on shareholder rights, thus corresponding to a lower level of corporate governance. We follow the same approach of Panel A and split firms between firms with good corporate governance and firms with bad corporate governance depending on whether the Bebchuk et al. (2009) index is below or above the yearly sample median, respectively.[31] Consistent with our prior findings, our results suggest that females increase the value of cash holdings in firms that are poorly governed. Interestingly, we find that the effect of female top executives on the value of cash holdings is lower in firms with good corporate governance, although the coefficient is not statistically significant.[32]

We further corroborate our results in Table 12**.** Here, we split the sample based on the institutional investors' ownership, which prior literature has found to play a key role in firms' corporate governance mainly due to the monitoring role that institutional investors may exercise (see, e.g., Demiralp, D'Mello, Schlingemann, and Subramanian, 2011). Institutional ownership is defined as the sum of shares held by institutions from 13F filings divided by shares outstanding. We classify firms as having high (low) institutional ownership if the fraction of shares held by institutional investors is above (below) the yearly sample median. Our results confirm our earlier findings that the effect of female top executives on the market value of corporate cash holdings is greater in firms with a reduced monitoring activity.[33]

Taken together, our results suggest that female top executives substitute for corporate governance and monitoring policies and the role of females on corporate outcomes is weaker when other mechanisms of shareholders' protection are in place. Overall, these findings support our hypothesis *H4*.

[31] Due to data availability, the number of observations for Panel B is further reduced.

[32] The difference in the effect of female top executives on the value of cash holdings between high and low governance firms is statistically different from zero regardless of the measure employed to proxy for corporate governance policies (p-value $< 5\%$).

[33] We thank an anonymous referee for suggesting the alternative test on the monitoring role of institutional investors.

7.3 The role of audit quality

In prior sections, we have shown that female executives have a disciplinary role that increases the value of corporate cash holdings. However, apart from the presence of female executives, there are other mechanisms that can reduce the shareholder-manager conflict of interest issue and trigger better firm integrity and ethics, such as the monitoring role exercised by the auditors.[34] In this section, we investigate the role of female executives on cash holdings controlling for firms' audit quality. We follow the approach by DeFond and Zhang (2014) and define the auditor quality by using the auditor size, as captured by Big N membership. It is often argued, in fact, that auditor size captures stronger auditor incentives, because reputation costs increase with size, and because larger auditors' "deep pockets" make them a target for litigation. To identify audit quality, we construct the dummy variable *Big N* that takes a value equal to one if the auditor is one of the Big N audit firms (i.e., better audit quality), and zero otherwise (i.e., worse audit quality).[35] We split our sample using the *Big N* dummy variable and estimate the baseline model within each group.

These results are presented in Table 13. We observe that the coefficients on the interaction terms between change in cash holdings and $Female$ are positive and statistically significant in both groups (i.e., *Big N* and *Non-Big N*). However, the magnitude is quite different. Examining firms audited by Big-N audit firms, we find that having a female top executive increases the value of $1.00 cash holding by an additional amount of $0.524 relative to a firm run by a male executive in the same category. The corresponding dollar increase for the group of Non-Big firms is three times larger and equal to $1.651, suggesting that the effect of females on the value of corporate cash holdings is magnified within firms that are subject to a weaker audit quality. Finally, we test the difference in the effect of female executives on the value of cash between firms covered by Big-N audit firms and those that are not and find that it is significant at the 5 percent value. We conclude by noting that there is a substitution effect between the disciplining role of female top executives and the firms' audit mechanisms. These findings support hypothesis *H5*.

[34] For example, Kornish and Levine (2004) show that audit mechanisms act on behalf of shareholders and can ensure truth-telling in financial reports.

[35] In our sample, it is Big 5 during 1992–2001 and Big 4 during 2002–2018.

8 Conclusions

With the backdrop of growing corporate cash holdings in the U.S. and increasing focus on gender-based decision-making, we document that top executives' (CEO's and CFO's) gender has a significant effect on the value of cash holdings. We find that the marginal value of one dollar of cash holdings for firms managed by female top executives is \$1.39, while that of their male counterparts is \$0.90. When we separate the effects of CEOs and CFOs, we find that the marginal value of a dollar for firms run by female CEOs (CFOs) is \$1.56 (\$1.47) as compared to \$0.94 (\$0.91) for their corresponding male counterparts.

Our study reveals the substantial difference in the market's assessment of the value of corporate cash holdings based on the gender of the top executive(s). We reason that this difference can be rationalized by the gender-based traits of female executives that permeate all aspects of corporate decision making with their associated beneficial effects being cumulatively reflected in the value of cash holdings. This is also the first study to relate corporate culture to value of corporate cash holdings. We show that female top executives significantly promote corporate culture and that the more salubrious cultural environment is a possible indirect channel for the greater market value of cash holdings that we observe in female managed firms.

Further, we find that the positive effect of female executives on corporate cash holdings is more pronounced for financially unconstrained firms as they are more susceptible to value destroying uses of cash. Similarly, cash distributing firms, which are also prone to misuse of cash, benefit more in terms of value of cash holding when managed by female executives as opposed to their male counterparts.

We also document that the female executives play a substitution role in the presence of weak corporate governance and low institutional investor ownership and hence, the positive effect of female executives on the value of cash holdings is more pronounced in such firms. Examining the audit quality of firms reveals that the effect of female executives on the value of cash holdings is magnified in firms associated with lower ranked auditors.

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Appendix A

Definitions of Variables:

This section provides the variable definitions used in the analysis. Compustat item codes, when available, are provided in parentheses.

Big N: Equals to one if the auditor is one of the Big N audit firms, otherwise it assumes a value of zero.

C: Cash (data item 1) scaled by market value of equity in year $(t-1)$.

Cash regime: A firm is classified in the *raising* cash regime, if it issues equity for a value that is greater than 3% of the market value of equity (MV) and does not make dividend payment, otherwise it is classified as *distributing* cash.

Corporate Governance: A firm is classified as having a good (bad) corporate governance if the G-index, or the E-index, are below (above) the yearly sample median.

Culture: Composite culture measure developed by Li, Mai, Shen, and Yan (2021) summarizing corporate values on *innovation*, *integrity*, *quality*, *respect*, and *teamwork.*

D: Common dividends (data item 21) scaled by market value of equity in year $(t-1)$.

E: Earnings before interest and extraordinary items (data item 18 + data item 15 + data item 50 + data item 51) scaled by market value of equity in year $(t-1)$.

Exec Age: Natural logarithm of the continous executive age.

Exec EBC: Sum of the value of new stock options (using modified Black–Scholes method) granted to the firm's top executives (CEO and/or CFO) as a percentage of total compensation paid to them.

Exec Ownership: Number of shares (excluding options) owned by the top executive divided by common shares outstanding at the end of the fiscal year.

Female: Equals to one if the firm has a female CEO and/or a female CFO, and zero otherwise.

Female CEO: Equals to one if the firm has a female CEO, and zero otherwise.

Female CFO: Equals to one if the firm has a female CFO, and zero otherwise.

FemaleTrans: Dummy variable that takes a value equal to one for firms facing a male-to-female top executive transition.

FemCEOTrans: Dummy variable that takes a value equal to one for firms facing a male-to-female CEO transition.

FemCFOTrans: Dummy variable that takes a value equal to one for firms facing a male-to-female CFO transition.

Hadlock-Pierce (H-P) index: Financial constraint index constructed following Hadlock and Pierce (2010). It is defined as: –0.737*Size + 0.043*Size2 – 0.040*Age, where Size equals the log of inflation-adjusted Compustat item at (in 2004 dollars), and Age is the number of years the firm is listed on Compustat. In calculating the index, we follow Hadlock and Pierce and cap Size at (the log of) $4.5 billion and Age at 37 years. Firms are defined as financially constrained if the H-P index is greater than the yearly sample median.

High (Low) IO: Institutional ownership (IO) is the sum of shares held by institutions from 13F filings divided by shares outstanding. Firms are classified as having High (Low) institutional ownership if the fraction of shares held by institutional investors is above (below) the yearly sample median.

I: Interest expenses (data item 15) scaled by market value of equity in year $(t-1)$.

Kaplan-Zingales (K-Z) index: Financial constraint index constructed following Kaplan and Zingales (1997). It is defined as: -1.002 * [(ib + dp)/lagged PPENT] - 39.368 * [(dvc + dvp)/lagged PPENT] -1.315 * (che/lagged PPENT) + 3.139 * [(dltt + dlc)/(dltt + dlc + seq)] + 0.283 * MTB. Firms are defined as financially constrained if the K-Z index is greater than the yearly sample median.

L: Market leverage, defined as total debt (data item 9 + data item 34) divided by (total debt + market value of equity).

MV: Market value of equity (data item 54 * data item 199).

NA: Net assets, defined as total assets (data item 6) minus cash holdings (data item 1) scaled by market value of equity in year $(t-1)$.

NetΔC$_t$: Alternative definition of change in cash holdings, also called "unexpected change in cash holdings". It is defined as the difference between the realized change and the average change in cash holdings of a benchmark portfolio based on Fama and French (1993) 25 size and BE/ME portfolios.

NF: Net financing, calculated as total equity issuance (data item 108) minus repurchases (data item 115) plus debt issuance (data item111) minus debt redemption (data item 114) scaled by market value of equity in year (**t–1**).

$\mathbf{r}_{i,t}-\mathbf{R}^{B}_{i,t}$ = Excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios.

Ratings: Firms with positive debt outstanding in a given year are classified as being financially constrained (**C**) group in that year if the firm has either no credit rating information or its long-term debt is associated with a speculative grade rating in Compustat for that year. Firms with no debt outstanding and firms with investment grade ratings are classified as financially unconstrained (**UC**).

R&D: Research and development expenses (data item 46) scaled by market value of equity in year $(t-1)$.

Whited-Wu (W-W) index: Financial constraint index constructed following Whited and Wu (2006). It is defined as: –0.091*[(ib +dp)/at] – 0.062*[indicator set to one if (dvc + dvp) is positive, and zero otherwise] + 0.021*[dltt/at] – 0.044*[ln(at)] +0.102*[average 3-digit yearly SIC salegrowth] – 0.035*[sale growth]. Firms are defined as financially constrained if the W-W index is greater than the yearly sample median.

ΔC: The change in cash in year (t) relative to the prior year (t-1) scaled by market value of equity in year (t–1).

ΔD: The change in dvidends in year (t) relative to the prior year (t-1) scaled by market value

of equity in year (t–1).

ΔE: The change in earnings in year (t) relative to the prior year (t-1) scaled by market value of equity in year (t–1).

ΔI: The change in interest expenses in year (t) relative to the prior year (t-1) scaled by market value of equity in year (t–1).

ΔNA: The change in net assets in year (t) relative to the prior year (t-1) scaled by market value of equity in year (t–1).

ΔR&D: The change in research and development expenses in year (t) relative to the prior year (t-1) scaled by market value of equity in year (t–1).

Table 1: **Summary statistics for the full sample, and for subsamples of firms with female and male top executives.**

This table reports the summary statistics for variables constructed based on the sample of U.S. public firms from 1992 until 2018. Definitions of variables are listed in Appendix A.

	N	**Full sample**			**Female**	**Male**	**P-value**
		Mean	**Median**	**SD**	**(Mean)**	**(Mean)**	**of diff.**
No. obs. Female Exec		1,402					
No. obs. Female CEO		419					
No. obs. Female CFO		1,043					
$r_{i,t} - R^B_{i,t}$	14,518	0.0448	0.0002	0.5006	0.0645	0.0427	0.11
MV_t ($millions)	14,518	7,352.92	1,433.53	20,163.86	10,295.63	7,038.36	<.0001
C_{t-1}	14,518	0.129	0.070	0.247	0.138	0.128	0.05
L_t	14,518	0.203	0.155	0.196	0.174	0.207	<.0001
E_t	14,518	0.054	0.064	0.227	0.055	0.054	0.84
NA_t	14,518	1.221	0.842	1.564	1.085	1.236	<.0001
$R\&D_t$	14,518	0.021	0.000	0.049	0.018	0.022	0.02
I_t	14,518	0.029	0.011	0.073	0.021	0.030	<.0001
D_t	14,518	0.012	0.004	0.023	0.014	0.012	0.01
NF_t	14,518	0.008	-0.006	0.138	-0.001	0.009	0.00
ΔC_t	14,518	0.010	0.003	0.091	0.007	0.011	0.19
ΔE_t	14,518	0.008	0.006	0.138	0.011	0.008	0.45
ΔNA_t	14,518	0.056	0.034	0.307	0.049	0.056	0.40
$\Delta R\&D_t$ (%)	14,518	0.095	0.000	0.709	0.090	0.096	0.73
ΔI_t (%)	14,518	0.128	0.002	1.089	0.090	0.132	0.12
ΔD_t (%)	14,518	0.033	0.000	0.860	0.042	0.033	0.72

Table 2: **Relation between top executive gender and the value of cash holdings**

This table reports the results of OLS regressions to estimate the impact of top executive gender on the marginal value of cash holdings as specified in equation (1). The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios for firm i at time t, $r_{i,t} - R^B_{i,t}$. Our variable of interest is the interaction term between a dummy identifying the top executive gender (*Female*, for female CEOs and CFOs, *Female CEO*, for female CEOs, and *Female CFO*, for female CFOs, and the change in corporate cash holdings $\Delta C_{i,t}$. Following Faulkender and Wang (2006), we control for (1) $\Delta E_{i,t}$, the change in earnings before extraordinary items; (2) $\Delta NA_{i,t}$, the change in net assets; (3) $\Delta R\&D_{i,t}$, the change in research and development expenses; (4) $\Delta I_{i,t}$, the change in interest expenses; (5) $\Delta D_{i,t}$, the change in common dividends; (6) $NF_{i,t}$, the firm's net financing; and (7) $C_{i,t-1}$, the firm's cash holdings at the end of the previous year. All these variables are scaled by the lagged market value of equity ($M_{i,t-1}$). Also, we include the market leverage of the firm ($L_{i,t}$), the lag of cash holdings ($C_{i,t}$) and their interactions with the change in cash holdings scaled by the lagged market value of equity ($\frac{\Delta C_{i,t}}{M_{i,t-1}}$). The construction of variables is detailed in Appendix A. In all models, we include year and industry fixed effects. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Full Sample		***Female Executive***		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.275***	(<.0001)	1.223***	(<.0001)	1.267***	(<.0001)	1.207***	(<.0001)
Female			0.001	(0.89)				
ΔC_t *Female			**0.491*** **	**(0.01)**				
Female CEO					-0.014	(0.49)		
ΔC_t *Female CEO					**0.623***	**(0.06)**		
Female CFO							-0.003	(0.79)
ΔC_t *Female CFO							**0.559*** **	**(0.01)**
ΔE_t	0.380***	(<.0001)	0.382***	(<.0001)	0.380***	(<.0001)	0.344***	(<.0001)
ΔNA_t	0.292***	(<.0001)	0.294***	(<.0001)	0.293***	(<.0001)	0.301***	(<.0001)
$\Delta R\&D_t$	4.492***	(<.0001)	4.471***	(<.0001)	4.492***	(<.0001)	3.952***	(<.0001)
ΔI_t	-4.718***	(<.0001)	-4.730***	(<.0001)	-4.712***	(<.0001)	-4.529***	(<.0001)
ΔD_t	1.795***	(<.0001)	1.778***	(<.0001)	1.788***	(<.0001)	1.451***	(0.00)
NF_t	0.018	(0.67)	0.022	(0.61)	0.013	(0.75)	-0.003	(0.94)
C_{t-1}	0.047*	(0.10)	0.048*	(0.09)	0.048*	(0.09)	0.038	(0.21)
L_t	-0.430***	(<.0001)	-0.429***	(<.0001)	-0.430***	(<.0001)	-0.423***	(<.0001)
C_{t-1} *ΔC_t	-0.057	(0.71)	-0.063	(0.68)	-0.051	(0.74)	-0.026	(0.87)
L_t *ΔC_t	-1.573***	(<.0001)	-1.558***	(<.0001)	-1.571***	(<.0001)	-1.459***	(<.0001)
Year F.E.	Yes		Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes		Yes	
Adjusted R^2	0.308		0.309		0.308		0.315	
N	14,518		14,518		14,518		12,499	

The following table shows the marginal value of \$1, calculated based on the estimates in the regressions.

Marginal value of \$1			
Base model	\$0.95 (<.0001)	With *Female Exec*	\$1.39 (<.0001)
		With *Male Exec*	\$0.90 (<.0001)
		With *Female CEO*	\$1.56 (<.0001)
		With *Male CEO*	\$0.94 (<.0001)
		With *Female CFO*	\$1.47 (<.0001)
		With *Male CFO*	\$0.91 (<.0001)

Table 3: **Robustness tests to the baseline model**

This table reports robustness tests of OLS regressions to estimate the impact of top executive gender on the marginal value of cash holdings as specified in equation (1). The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. Consistently with Faulkender and Wang (2006) model, we include controls that are likely to affect the value of corporate cash holdings. In Panel A, we control for executive-specific information such as age, ownership, equity-based compensation, and their interaction with the change in cash holdings. In Panel B, we test the baseline regressions with the inclusion of firm fixed effects. In Panel C, we use an alternative definition of change in cash holdings. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A: Controlling for executive-specific information

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	2.281***	(0.00)	2.398***	(<.0001)	1.363***	(0.01)
Female	0.003	(0.81)				
ΔC_t *Female	**0.543*** **	**(0.00)**				
Female CEO			-0.007	(0.72)		
ΔC_t *Female CEO			**0.259**	**(0.39)**		
Female CFO					-0.001	(0.93)
ΔC_t *Female CFO					**0.636*** **	**(0.00)**
Exec Age	0.000	(0.67)				
ΔC_t *Exec Age*	-0.024**	(0.03)				
Exec Ownership	0.000	(0.73)				
ΔC_t *Exec Ownership*	0.012	(0.35)				
Exec EBC	0.001**	(0.02)				
ΔC_t *Exec EBC*	0.008***	(0.01)				
CEO Age			0.000	(0.74)		
ΔC_t *CEO Age*			-0.024***	(0.00)		
CEO Ownership			0.000	(0.53)		
ΔC_t *CEO Ownership*			0.013	(0.25)		
CEO EBC			0.000	(0.08)		
ΔC_t *CEO EBC*			0.007**	(0.02)		
CFO Age					-0.001	(0.13)
ΔC_t *CFO Age*					-0.006	(0.57)
CFO Ownership					-0.006**	(0.03)
ΔC_t *CFO Ownership*					0.290**	(0.03)
CFO EBC					0.001**	(0.04)
ΔC_t *CFO EBC*					0.007**	(0.04)
Controls	Yes		Yes		Yes	
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.322		0.310		0.321	
N	11,967		14,376		12,010	

Panel B: Inclusion of firm fixed effects

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.041***	(<.0001)	1.018***	(<.0001)	1.080***	(<.0001)
Female	-0.008	(0.68)				
ΔC_t *Female	**0.534*** **	**(0.01)**				
Female CEO			-0.042	(0.18)		
ΔC_t *Female CEO			**0.749*** **	**(0.00)**		
Female CFO					-0.007	(0.73)
ΔC_t *Female CFO					**0.529** **	**(0.03)**
Controls	Yes		Yes		Yes	
Year F.E.	Yes		Yes		Yes	
Firm F.E.	Yes		Yes		Yes	
Adjusted R^2	0.327		0.327		0.333	
N	14,518		14,518		12,499	

Panel C: Unexpected change in cash holdings

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
NetΔC_t	1.125***	(<.0001)	1.159***	(<.0001)	1.118***	(<.0001)
Female	0.001	(0.93)				
***Net*ΔC_t *Female**	**0.437** **	**(0.02)**				
Female CEO			-0.005	(0.79)		
***Net*ΔC_t *Female CEO**			**0.253**	**(0.43)**		
Female CFO					-0.004	(0.78)
***Net*ΔC_t *Female CFO**					**0.518*** **	**(0.01)**
Controls	Yes		Yes		Yes	
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.303		0.303		0.310	
N	14,518		14,518		12,499	

Table 4: **Difference-in-differences model**

This table reports results for the difference-in-differences approach. The variable of interest is the interaction between the change in cash holdings, (ΔC_t), *Post*, and *FemaleTrans*. *FemaleTrans* is a dummy variable that takes a value equal to one for firms facing a male-to-female transition. *Post* is a dummy variable for the after male-to-female transition period. As before, we control for variables that prior works have shown to be relevant for the value of corporate cash holdings. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	0.946***	(<.0001)	0.948***	(<.0001)	0.671***	(0.00)
Post	0.007	(0.34)	0.010	(0.25)	0.022**	(0.03)
ΔC_t *Post*	-0.215*	(0.06)	-0.111	(0.45)	-0.094	(0.51)
FemaleTrans	-0.013	(0.46)				
*FemaleTrans*Post*	0.006	(0.84)				
ΔC_t *FemaleTrans*	0.169	(0.54)				
ΔC_t *FemaleTrans*Post*	**1.083****	**(0.04)**				
FemCEOTrans			-0.027	(0.36)		
*FemCEOTrans*Post*			0.045	(0.24)		
ΔC_t *FemCEOTrans*			-0.044	(0.92)		
ΔC_t *FemCEOTrans*Post*			**0.125**	**(0.84)**		
FemCFOTrans					-0.014	(0.51)
*FemCFOTrans*Post*					-0.027	(0.44)
ΔC_t *FemCFOTrans*					0.113	(0.73)
ΔC_t *FemCFOTrans*Post*					**0.834***	**(0.09)**
ΔE_t	0.369***	(<.0001)	0.371***	(<.0001)	0.359***	(<.0001)
ΔNA_t	0.295***	(<.0001)	0.291***	(<.0001)	0.262***	(<.0001)
$\Delta R\&D_t$	3.528***	(<.0001)	3.994***	(0.00)	3.410***	(0.00)
ΔI_t	-5.446***	(<.0001)	-5.104***	(<.0001)	-5.475***	(<.0001)
ΔD_t	1.911***	(0.00)	1.514**	(0.03)	2.111***	(0.00)
NF_t	-0.064	(0.34)	-0.069	(0.37)	-0.020	(0.82)
C_{t-1}	0.070	(0.16)	0.071	(0.24)	0.049	(0.39)
L_t	-0.367***	(<.0001)	-0.402***	(<.0001)	-0.373***	(<.0001)
C_{t-1} *ΔC_t	0.191	(0.40)	0.364	(0.14)	0.491*	(0.08)
L_t *ΔC_t	-1.222***	(<.0001)	-1.397***	(<.0001)	-1.191***	(0.00)
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.352		0.349		0.363	
N	10,043		6,219		5,546	

Table 5: **Treatment effects model**

This table shows results for the second stage treatment effects model. In the first-stage, we use a probit model to estimate the probability that the firm will hire a female executive as a function of firm-specific characteristics, year, and industry fixed effects. In the second-stage, we estimate the impact of top executive gender on the marginal value of cash holdings as specified in equation (1) with the inclusion of the Inverse Mills ratio derived from the first stage. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.209***	(<.0001)	1.300***	(<.0001)	1.104***	(<.0001)
Female	0.002	(0.87)				
ΔC_t *Female	**0.491*** **	**(0.01)**				
Female CEO			-0.011	(0.56)		
ΔC_t *Female CEO			**0.629***	**(0.06)**		
Female CFO					-0.006	(0.63)
ΔC_t *Female CFO					**0.532****	**(0.02)**
ΔE_t	0.373***	(<.0001)	0.392***	(<.0001)	0.317***	(<.0001)
ΔNA_t	0.284***	(<.0001)	0.312***	(<.0001)	0.266***	(<.0001)
$\Delta R\&D_t$	4.621***	(<.0001)	3.945***	(<.0001)	4.317***	(<.0001)
ΔI_t	-4.709***	(<.0001)	-4.816***	(<.0001)	-4.446***	(<.0001)
ΔD_t	1.762***	(<.0001)	2.036***	(<.0001)	1.427***	(0.00)
NF_t	0.041	(0.33)	-0.026	(0.54)	0.088**	(0.05)
C_{t-1}	0.053*	(0.07)	0.032	(0.28)	0.087***	(0.00)
L_t	-0.376***	(<.0001)	-0.507***	(<.0001)	-0.055	(0.18)
C_{t-1} *ΔC_t	-0.071	(0.64)	-0.014	(0.93)	-0.066	(0.68)
L_t *ΔC_t	-1.565***	(<.0001)	-1.656***	(<.0001)	-1.376***	(<.0001)
Inverse Mills Ratio	-0.141***	(0.01)	0.238***	(<.0001)	-0.847***	(<.0001)
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.308		0.313		0.325	
N	14,451		14,451		12,438	

Table 6: **Propensity Score Matching**

This table shows results for the propensity score matching approach. We run a probit regression to pair female-year with male-year observations based on the controls employed in model (1), year, and industry dummies. Panel A shows the comparison of the independent variables between the treated (i.e., firms with a female top executive, CEO and/or CFO, a female CEO, or a female CFO) and the controls (i.e., firms with a male top executive, CEO and/or CFO, a male CEO, or a male CFO). Then, we run a regression of the decision variable of interest, the excess stock return over the benchmark portfolio, $r_{i,t} - R^B_{i,t}$, on the dummies for females, the change in cash holdings, their interaction, and the controls used in model (1). See appendix A for variable definitions. Results for the propensity score matching are presented in Panel B. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A

Firm characteristics	**Female Exec** (N = 1,392)	**Male Exec** (N = 1,392)	**P-value of diff.**
ΔC_t (%)	0.737	0.763	0.94
ΔE_t (%)	1.11	0.885	0.66
ΔNA_t	0.050	0.046	0.72
$\Delta R\&D_t$ (%)	0.090	0.118	0.24
ΔI_t (%)	0.090	0.103	0.71
ΔD_t (%)	0.043	0.047	0.91
NF_t (%)	-0.101	-0.134	0.94
C_{t-1}	0.138	0.136	0.76
L_t	0.173	0.170	0.65
Firm characteristics	**Female CEO** (N = 407)	**Male CEO** (N = 407)	**P-value of diff.**
ΔC_t (%)	0.218	0.671	0.49
ΔE_t (%)	0.816	-0.207	0.28
ΔNA_t	0.035	0.022	0.53
$\Delta R\&D_t$ (%)	0.041	0.044	0.94
ΔI_t (%)	0.029	0.133	0.18
ΔD_t (%)	0.033	-0.070	0.19
NF_t (%)	-1.320	-0.507	0.40
C_{t-1}	0.169	0.177	0.62
L_t	0.177	0.196	0.17
Firm characteristics	**Female CFO** (N = 1,043)	**Male CFO** (N = 1,043)	**P-value of diff.**
ΔC_t (%)	1.010	0.892	0.77
ΔE_t (%)	1.300	1.720	0.47
ΔNA_t	0.056	0.052	0.74
$\Delta R\&D_t$ (%)	0.105	0.115	0.71
ΔI_t (%)	0.112	0.095	0.67
ΔD_t (%)	0.053	0.018	0.44
NF_t (%)	0.392	0.120	0.62
C_{t-1}	0.126	0.136	0.17
L_t	0.169	0.166	0.70

Panel B

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	0.914***	(0.00)	1.307***	(0.01)	1.107***	(0.00)
Female	0.002	(0.89)				
ΔC_t *Female	**0.713*** **	**(0.01)**				
Female CEO			-0.011	(0.72)		
ΔC_t *Female CEO			**1.047****	**(0.03)**		
Female CFO					0.003	(0.87)
ΔC_t *Female CFO					**0.552***	**(0.06)**
ΔE_t	0.282***	(0.00)	0.161	(0.21)	0.322***	(0.00)
ΔNA_t	0.296***	(<.0001)	0.360***	(<.0001)	0.402***	(<.0001)
$\Delta R\&D_t$	5.874***	(0.00)	1.568	(0.52)	5.138***	(0.00)
ΔI_t	-2.827**	(0.03)	-3.347*	(0.10)	-4.811***	(0.00)
ΔD_t	2.087**	(0.02)	1.383	(0.28)	2.434***	(0.01)
NF_t	0.007	(0.96)	-0.400*	(0.05)	0.076	(0.57)
C_{t-1}	0.046	(0.51)	-0.030	(0.75)	0.080	(0.31)
L_t	-0.469***	(<.0001)	-0.334***	(0.01)	-0.430***	(<.0001)
C_{t-1} *ΔC_t	-0.078	(0.85)	-0.465	(0.34)	0.404	(0.27)
L_t *ΔC_t	-1.011*	(0.06)	-2.131***	(0.01)	-1.597***	(0.01)
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.316		0.269		0.327	
N	2,784		814		2,086	

Table 7: **Placebo test**

This table shows results for the placebo test where female executives are randomly assigned to firms. The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. In each of the regressions, we include controls that prior works have found to play a role on the value of corporate cash holdings, in addition to year, and industry fixed effects. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Female Executives		***Female CEOs***		***Female CFOs***	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.288***	(<.0001)	1.275	(<.0001)	1.303***	(<.0001)
Female	-0.010	(0.37)				
ΔC_t *Female	**-0.141**	**(0.45)**				
Female CEO			0.016	(0.45)		
ΔC_t *Female CEO			**-0.024**	**(0.93)**		
Female CFO					-0.015	(0.25)
ΔC_t *Female CFO					**-0.130**	**(0.55)**
Controls	Yes		Yes		Yes	
Year F.E.	Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes	
Adjusted R^2	0.308		0.308		0.309	
N	14,518		14,518		12,499	

Table 8: **The role of corporate culture**

This table shows results for the role of corporate culture in the relationship between top executive gender and market value of corporate cash holdings. In Panel A, we use a DID model to show the effect that a male-to-female top executive transition has on corporate culture, *Culture*. *Culture* is a measure from Li, Mai, Shen, and Yan (2021), who employ a machine learning approach to construct a composite measure of corporate culture that accounts for five different cultural values; i.e., *innovation*,*integrity*, *quality*, *respect*, and *teamwork*. In Panel A, our variable of interest is the interaction between *Post* and *FemaleTrans*. *FemaleTrans* is a dummy variable that takes a value equal to one for firms facing a male-to-female transition. *Post* is a dummy variable for the after-transition period. In panel B, the dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. Here, we estimate the baseline regression model with the addition of the interaction variable between *Culture* and the change in corporate cash holdings. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A

	Corporate Culture	
	Coeff.	*P Value*
*Post*FemaleTrans*	0.272**	(0.04)
Post	-0.029	(0.46)
Log Assets	-0.279***	(<.0001)
MTB	0.131***	(0.00)
Leverage	-0.091	(0.65)
ROA	-0.807***	(0.00)
Year F.E.	Yes	
Firm F.E.	Yes	
Adjusted R^2	0.352	
N	7,050	

Panel B

	$r_{i,t} - R^B_{i,t}$	
	Coeff.	*P Value*
ΔC_t	0.743***	(0.00)
Female	-0.003	(0.81)
ΔC_t *Female	**0.526*** **	**(0.01)**
Culture	0.001	(0.62)
ΔC_t *Culture	**0.068****	**(0.03)**
ΔE_t	0.377***	(<.0001)
ΔNA_t	0.265***	(<.0001)
$\Delta R\&D_t$	3.908***	(<.0001)
ΔI_t	-4.744***	(<.0001)
ΔD_t	1.305***	(0.01)
NF_t	-0.004	(0.95)
C_{t-1}	0.038	(0.24)
L_t	-0.373***	(<.0001)
C_{t-1} *ΔC_t	0.263	(0.19)
L_t *ΔC_t	-1.481***	(<.0001)
Year F.E.	Yes	
Industry F.E.	Yes	
Adjusted R^2	0.369	
N	9,019	

Table 9: **The role of cash regimes**

This table shows results for the impact of top executive gender on the value of corporate cash holdings within specific cash regimes. The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. We distinguish between the raising and the distributing cash regime. A firm is classified in the raising cash regime if it issues equity for a value that is greater than 3% of the market value of equity and does not make dividend payment. Otherwise, the firm is classified as distributing cash. In each of the regressions, we include controls that prior works have found to play a role on the value of corporate cash holdings, in addition to year, and industry fixed effects. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Raising cash regime		**Distributing cash regime**	
	(1)	(2)	(3)	(4)
	Coeff.	*P Value*	*Coeff.*	*P Value*
ΔC_t	0.936***	(0.00)	1.057***	(<.0001)
Female	0.010	(0.94)	0.001	(0.93)
ΔC_t *Female	**0.690**	**(0.13)**	**0.512*****	**(0.01)**
Controls	Yes		Yes	
Year F.E.	Yes		Yes	
Industry F.E.	Yes		Yes	
Adjusted R^2	0.387		0.304	
N	642		13,876	

Table 10: **The role of financial constraints**

This table reports results testing the impact of top executive gender on the marginal value of cash holdings between financially constrained and unconstrained firms. We use three different proxies for financial constraints. First, we use credit rating information. We classify firms with positive debt outstanding in a given year into the high financially constrained group in that year if the firm has either no credit rating information or its long-term debt is associated with a speculative grade rating in Compustat for that year. Firms with no debt outstanding and firms with investment grade ratings are classified as low financially constrained. Second, we use the Whited-Wu (2006) index. Finally, we employ the Kaplan-Zingales (1997) index. A firm is classified as financially constrained in year t when the Whited-Wu index, or the Kaplan-Zingales, are above the sample median in that year, and unconstrained otherwise. Variables' definitons are detailed in Appendix A. In each of the regression models, we include year and industry fixed effects. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Ratings (C)		**Ratings (UC)**		**High W-W (C)**		**Low W-W (UC)**		**High K-Z (C)**		**Low K-Z (UC)**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Coeff.	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.259***	(<.0001)	1.161***	(<.0001)	1.320***	(<.0001)	0.918***	(<.0001)	1.798***	(<.0001)	0.838***	(<.0001)
Female	0.003	(0.85)	-0.007	(0.66)	0.003	(0.89)	0.005	(0.70)	0.022	(0.16)	-0.018	(0.22)
ΔC_t *Female	**0.305**	**(0.14)**	**0.778****	**(0.04)**	**0.318**	**(0.18)**	**0.871*****	**(0.00)**	**0.440**	**(0.18)**	**0.500****	**(0.02)**
Controls	Yes		Yes		Yes		Yes		Yes		Yes	
Year F.E.	Yes		Yes		Yes		Yes		Yes		Yes	
Industry F.E.	Yes		Yes		Yes		Yes		Yes		Yes	
Adjusted R^2	0.314		0.301		0.304		0.334		0.292		0.363	
N	7,865		5,693		7,224		7,294		7,248		7,270	

Table 11: **The role of corporate governance**

This table shows results for the impact of top executive gender on the value of corporate cash holdings within specific cash regimes. The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. We distinguish between firms with good and bad corporate governance policies using the G-index (Panel A) or the E-index (Panel B). We classify firms as having a good (bad) corporate governance if the G-index, or the E-index, is below (above) the yearly sample median. Variables' definitions are detailed in Appendix A. In each of the regression models, we include year and industry fixed effects. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A: G-index

	Good governance		**Bad governance**	
	(1)	(2)	(3)	(4)
	Coeff.	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.067***	(<.0001)	0.949***	(0.00)
Female Exec	0.008	(0.84)	-0.033	(0.21)
ΔC_t *Female Exec	**-0.668**	**(0.28)**	**0.858****	**(0.02)**
Controls	Yes		Yes	
Year F.E.	Yes		Yes	
Industry F.E.	Yes		Yes	
Adjusted R^2	0.233		0.294	
N	2,509		3,391	

Panel B: E-index

	Good governance		**Bad governance**	
	(1)	(2)	(3)	(4)
	Coeff.	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.445***	(0.00)	1.116***	(0.00)
Female Exec	-0.009	(0.85)	-0.001	(0.99)
ΔC_t *Female Exec	**-0.936**	**(0.40)**	**1.047****	**(0.04)**
Controls	Yes		Yes	
Year F.E.	Yes		Yes	
Industry F.E.	Yes		Yes	
Adjusted R^2	0.189		0.257	
N	1,064		1,972	

Table 12: **The role of institutional ownership**

This table shows results for the impact of top executive gender on the value of corporate cash holdings for firms classified based on the institutional investors' monitoring activity. The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. Institutional ownership (IO) is the sum of shares held by institutions from 13F filings divided by shares outstanding. Firms are classified as having High (Low) institutional ownership if the fraction of shares held by institutional investors is above (below) the yearly sample median. In each of the regressions, we include controls that prior works have found to play a role on the value of corporate cash holdings, in addition to year, and industry fixed effects. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	High IO		**Low IO**	
	(1)	(2)	(3)	(4)
	Coeff.	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.181***	(<.0001)	1.368***	(<.0001)
Female Exec	0.002	(0.92)	-0.015	(0.43)
ΔC_t *Female Exec	**0.198**	**(0.53)**	**0.699****	**(0.02)**
Controls	Yes		Yes	
Year F.E.	Yes		Yes	
Industry F.E.	Yes		Yes	
Adjusted R^2	0.320		0.300	
N	5,927		5,941	

Table 13: **The role of audit quality**

This table shows results for the impact of top executive gender on the value of corporate cash holdings for firms classified based on audit quality. The dependent variable is the excess stock return over the fiscal year relative to the Fama and French (1993) 25 size and BE/ME portfolios, $r_{i,t} - R^B_{i,t}$. To identify audit quality, we construct the dummy variable *Big N*, which takes a value equal to one if the auditor is one of the Big N audit firms, otherwise it assumes a value of zero. In each of the regressions, we include controls that prior works have found to play a role on the value of corporate cash holdings, in addition to year, and industry fixed effects. Definitions of variables are listed in Appendix A. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Big N		**Non-Big N**	
	(1)	(2)	(3)	(4)
	Coeff.	*P Value*	*Coeff.*	*P Value*
ΔC_t	1.049***	(<.0001)	0.804***	(0.01)
Female Exec	-0.006	(0.58)	0.013	(0.80)
ΔC_t *Female Exec	**0.524****	**(0.02)**	**1.651****	**(0.02)**
Controls	Yes		Yes	
Year F.E.	Yes		Yes	
Industry F.E.	Yes		Yes	
Adjusted R^2	0.365		0.298	
N	9,057		1,023	