

Not Just a Boys' Club: Gender and Private Information Channels for Insider Trading

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Abstract

We investigate gender differences in insiders' trading profitability under female top executives (CEO/CFO) using a large sample of US firms between 1995 and 2016. We argue that top executive gender influences both insiders' access to and use of firm private information. Using a number of empirical specifications, including difference-in-differences on a propensity score matched sample and an instrumental variable approach, our results suggest a significant decrease in firm-wide insider trading profitability following switches from male-to-female CEOs and CFOs. We also show that male insiders trade more profitably under male top executives than they do after the appointment of a female top executive, and *vice versa* for females. These findings suggest that flows of private information between same-gender insider-executive dyads allow for profitable insider trading.

Keywords: *Insider Trading, Gender, Common Identity Bias, Information Asymmetry, Information Sharing.*

JEL Classification: *G14, G34, J16, M41*

1. Introduction

Does the gender of top executives matter for insider trading behavior? In this paper, we argue that it does *via* two non-exclusive channels. In particular, we predict that there are gender-driven differences in (i) firm-wide information asymmetry under male *versus* female top executives (i.e., gender affects the *existence* of private information), and in (ii) within-firm information sharing and information flows between same-gender dyads of top executives and other insiders (i.e., gender influences the *access* to private information). We explore how these differences impact insider trading profitability, which is directly affected by the degree of insiders' informational advantage (e.g., Aboody and Lev 2000).

To develop our predictions, we build on the prior work that indicates that male and female top executives have a differential effect on the firm information environment by producing different levels of financial reporting quality (Barua et al. 2010; Francis et al. 2015; Ge et al. 2011; Peni and Vähämaa 2010), and public disclosure (Gul et al. 2011). Additionally, building on the findings of the common identity bias literature, we predict greater information sharing between insiders and top executives of the same gender. The seminal work of Akerlof and Kranton (2000) argues that identity, and in particular gender identity, is an important driver of economic behavior. Moreover, prior research shows that individuals behave differently depending on whether they perceive others to be similar to themselves and share a common identity (Alesina and La Ferrara 2002, Amore et al. 2014, Matsa and Miller 2011). For example, McNeilly and Russ (2000) shows managers' perceptions of their sales representative employees' performance is higher when they both have the same gender relative to mixed-gender dyads. Similarly, loan officers are more likely to lend to same-gender borrowers (Campbell et al. 2018). These studies are part of a growing body of evidence that shows belonging to the same gender affects the way individuals share information and make decisions.

There is no conclusive evidence on how perceptions of common identity influence managerial behavior, but anecdotal evidence suggests that it may be a significant driver. For example, Kim C. Goodman, CEO of Worldpay US, stated that executives “*have a tendency to take chances on people that*

are most like themselves” (Dizik 2017), referring to managers’ preference in promoting people similar to themselves in terms of gender, ethnicity or personality.

If same-gender individuals trust each other more, build stronger ties, and ultimately, share private information among each other, this has important economic consequences, as shown by a growing literature that provides evidence of same-gender effects in network building, performance evaluation or job advancement (Bagues et al. 2017, Fang and Huang 2017, Mengel et al. 2018). Against this backdrop, we expect that top executives may be more willing to build formal and informal ties and share private information about their firms with insiders of the same gender. To understand whether information flows within the firm depend on having the same gender, we focus on insider trading behavior, as its profitability depends directly on insiders’ access to private information (Rozeff and Zaman 1988; Seyhun 1988). To the extent that same-gender insiders benefit from a privileged access to private information, we should observe higher profitability when insiders have the same gender as top executives.

To test our predictions on the influence of top executive gender on insider trading profitability, we run two analyses. First, we examine whether trading by *all* insiders differs depending on top executives’ gender. The evidence on the impact of gender on information asymmetry is mixed, but if firms with female CEOs and CFOs produce higher quality accounting and disclosure, this would reduce information asymmetry between insiders and outsiders (Bhattacharya et al. 2013, Brown and Hillegeist 2007, Diamond 1985, Diamond and Verrecchia 1991, Leuz and Verrecchia 2000). Insider trading opportunities may therefore depend on the gender of the CEO/CFO. Second, we study whether information flows and insiders’ behavior differ depending on top executives and insiders having the same gender. If insiders differentially trust and share information depending on whether they have the same gender, we expect to observe different insider trading behavior and profitability of male insiders under a male CEO/CFO than under a female CEO/CFO, and *vice versa* for female insiders.

Our tests yield the following key findings. First, we find that firm-wide insider trading profitability decreases when the CEO or CFO is a female. As firms that appoint a female top executive might be

significantly different from those that elect a male, we employ an instrumental variable approach. For our instrument we use the gender equality index developed by Sugarman and Straus (1988) that measures the extent to which a U.S. state has high levels of gender equality. We expect that the higher the gender equality in a state, the higher the likelihood for firms in that state to hire female executives (Huang and Kisgen 2013). The results obtained support our main finding of lower profitability under female top executives. Second, to ensure that unobservable changes in corporate governance that coincide with the presence of a female top executive do not drive our results, we examine the trading of insiders in firms that, after having appointed a female top executive, subsequently switch back to a male top executive. We find that in this situation, male insiders' profits increase again following the appointment of a male top executive. Female top executives may also not be randomly assigned to firms, and so our results may be driven by firm characteristics that are associated with gender biases in the appointment of CEOs. To correct for this potential endogeneity issue, we use a difference-in-differences framework on a propensity score matched sample, which allows us to compare trading profitability in firms that appoint a female CEO or CFO (treatment firms) and firms that are similar across a wide set of dimensions, but opt for a male CEO or CFO instead (control firms). After controlling for potential endogeneity, our results still show that insider trading profitability decreases in the period following a male-to-female CEO/CFO turnover. Our inferences also remain unchanged when we focus exclusively on the profitability of non-routine trades, as well as when examining volume of insider trading instead of profitability.

In our second set of analyses, we test whether same-gender insider-top executive dyads are more likely to share private information that facilitates profitable insider trading. By identifying the gender of insiders, we document that male insiders generate higher profits from insider trading than female insiders when both the CEO and CFO are male. Using a difference-in-differences approach on the matched sample, we also find that the profitability of male insiders decreases after the firm appoints a female top executive. Moreover, we show that the profitability of male insiders increases with every additional year that the insider spends in the same firm with a male top executive, compared to the same number of years

spent in a firm with a female top executive. Finally, we document that in R&D intense firms and in highly illiquid firms, where information asymmetry is likely to remain high regardless of the efforts of top executives to improve disclosure, gains from insider trading increase (decrease) for men (women) when both the CEO and CFO are male. Taken together, these findings support the idea that appointing a female top executive disrupts the information channel that had allowed for private information sharing when both top executives and the insider were male.

Given the body of research on gender differences in decision-making, we conduct additional tests to understand whether our results are driven by other actions that female CEOs or CFOs might undertake. Specifically, we test whether female top executives improve financial reporting quality, change the tone-at-the-top, or adopt insider trading rules that limit insider trading. Even when we control for these actions, the appointment of a female top executive still has a significant and negative effect on trading profitability of male insiders, supporting the common identity bias as a basis for information transfers within the firm that facilitate profitable insider trading. These results are robust when purchases and sales are analyzed separately, as well as for employing measures of buy-and-hold profits instead of profitability.

Our study makes two contributions. First, we contribute to the growing literature on gender and corporate governance by showing that same-gender insider-top executive dyads are more likely to share private information leading to profitable trading, and this is particularly true for male insiders. Second, we advance the insider trading literature by identifying a novel channel that facilitates information transfers and allows for informed insider trading; namely, having the same gender as the top executives of the firm. Our work complements the findings in Inci et al. (2017), that shows that female top executives trade less profitably than their male counterparts, and those in Mobbs et al. (2018), that finds female outside directors generate lower returns from insider trading relative to male outside directors. Both studies infer that the discrepancy may stem from differential access to information between females relative to males. In contrast to these studies, we analyze the profitability of insiders depending on the gender of the top executives, and show that the higher profitability of male insiders decreases after the appointment of a

female CEO or CFO. We therefore demonstrate real economic consequences for investors resulting from the differential access to information that occurs based on having the same gender in the form of greater insider trading profitability. Last, our study comes at a time of increased global interest on the question of gender quotas on corporate boards.¹ With these discussions underway and some countries already legislating for this, it is important to investigate what impact such requirements may have on firms and consequently, investors. Our examination is based in a non-quota environment where changes from male to female top executives happens voluntarily. This reduces any potential bias introduced by situations where there are quotas and the selection of women and men may be based on different criteria other than merit and performance, and as such, increases the generalizability of our findings.

The rest of the paper is organized as follows. Section 2 summarizes the related literature and sets out our hypotheses. Section 3 describes the sample and measures. Section 4 presents our models and results. Section 5 describes our robustness analyses, and section 6 concludes.

2. Background and predictions

Corporate insiders, such as directors, officers or employees, often legally trade in the shares of their own companies, earning consistent risk-adjusted abnormal returns (e.g., Seyhun 1986; Lakonishok and Lee 2001; Jagolinzer et al. 2011; Arif et al. 2018). Systematically beating the market in this way suggests insiders use private information (Rozeff and Zaman, 1988; Seyhun, 1988), which may crowd out outside investors, and raises two concerns. First, insider trading limits the gains from stock research and makes this research less valuable to outside investors (Fernandes and Ferreira 2009). Second, the ability to generate personal gains from insider trading opportunities may motivate insiders to disclose low-quality information, despite the higher cost of capital and lower stock prices associated with such trading (Zhang and Zhang 2018). In response to these concerns, regulators have increased oversight of insider trading

¹ Legal quotas for female directors are already being enforced in Norway, Belgium, Iceland, Italy, the Netherlands, Spain France and Germany.

through time. For example, the Sarbanes-Oxley (SOX) Act of 2002 requires insider trades to be publicly disclosed via the filing of Form 4 to the SEC within two business days of the trade occurring. In addition, many firms have adopted self-imposed insider trading restrictions (Bettis et al. 2000, Jagolinzer et al. 2011).² However, both of these efforts have had limited success and have not eliminated profitable insider trading (Jagolinzer et al. 2011).³

[INSERT FIGURE 1 HERE]

We examine whether the gender of top executives (CEO and/or CFO) influences insider trading profitability. As noted, profitability of insider trading ultimately hinges on the existence of private information that can be traded on. We argue that insiders' access to, and use of private information is dependent on two non-exclusive channels: (1) the quality of the firm information environment (i.e., the *existence* of private information); and (2) the information flows within the firm (i.e., *access* to private information). Figure 1 summarizes these two channels. In essence, information may be equally shared among all insiders irrespective of the gender of insiders or top executives, such that all insiders benefit in settings where information asymmetry between insiders and outsiders is present. Alternatively, some insiders, by developing close ties and trust with top executives, may become better informed and have better access to private information. It seems plausible that the gender of top executives may influence both channels. Next, we review the related literatures and present our predictions.

2.1. CEO and CFO gender and information asymmetry

Prior studies showing gender-driven differences in financial reporting quality and business and finance decision-making develop their predictions on the basis of a significant body of research that documents gender differences in overconfidence and risk-aversion (Barber and Odean 2001, Brenner 2015, Croson

² Self-imposed insider trading restrictions are justified by the costs it carries: increasing asymmetries of information, which leads to higher bid-ask spreads, lower liquidity, and a higher discount rate (Bettis et al. 2000).

³ Insiders are under the Act defined as directors, officers, and principal stock- holders with a stake of 10 percent or more. Prior to SOX, the requirement was to disclose the trade by the end of the month (Brochet 2010).

and Gneezy 2009, Niederle and Vesterlund 2007, Sapienza et al. 2009). Building on these findings, a growing literature suggests female top executives are more likely to comply with rules and regulations and be more careful in financial decision-making. For example, Huang and Kisgen (2013) finds that female CFOs issue less debt, while Levi et al. (2010) shows that female CEOs engage in less aggressive acquisitions, and Faccio et al. (2016) provides evidence that firms managed by female CEOs have less volatile earnings, lower leverage, and engage in lower overall corporate risk-taking. Moreover, female CEOs and CFOs produce higher quality accounting information (Barua et al. 2010, Francis et al. 2015) and the stock prices of firms with gender-diverse boards reflect more firm specific information (Gul et al. 2011). In addition, there is a substantial literature showing that higher financial reporting quality and disclosure is associated with lower information asymmetry (e.g., LaFond and Watts, 2008; Wittenberg-Moerman, 2008). Top executive gender may therefore influence information asymmetry between insiders and outsiders, and by extension, impact insider trading profitability.

Against this backdrop, a female CEO/CFO would be expected to engage less in earnings management, provide more transparent disclosures, take more careful financial decisions, and generally provide better financial reporting quality, thereby lowering information asymmetry between insiders and outsiders, and thus, insider trading opportunities. Consequently, insider trading profitability for *all* insiders would differ depending on the gender of top executives.

Formally stated, our first hypothesis is as follows:

H1: *Insider trading profitability is reduced by the presence of female top executives.*

In contrast to the above arguments, another strand of literature suggests that gender differences do not apply in leadership positions. Adams et al. (2007), Croson and Gneezy (2009), Deaves et al. (2009), Eagly and Johnson (1990) argue that gender-based differences in preferences, including risk taking and overconfidence, do not apply to female executives. A number of studies provide compelling evidence supporting this alternative, and suggest that after controlling for endogeneity and biases in the appointment of female CEOs/CFOs, no gender-driven differences remain (García Lara et al., 2017; Sila et

al., 2016). For example, the work of Bugeja et al. (2012) fails to find differences in CEO compensation across genders, which they interpret as women and men not being differently risk-averse, while Adams and Rangunathan (2017) shows that conditional on being in the finance industry, women are not more risk-averse than men. The findings of these studies are also consistent with the results from a controlled experiment by Gneezy et al. (2009) that explores gender differences in competitive environments between a typical patriarchal society (the Maasai in Tanzania) and a matrilineal society (the Khasi in India). They find that men in a patriarchal society compete twice as much as women, while women in a matrilineal society compete twice as much as men. Similarly, the controlled experiment by Pondorfer et al. (2017) documents no significant differences in risk preferences between men in a patrilineal society and women in a matrilineal society. These findings imply that if gender differences are influenced by nurture, rather than, or as well as, by nature, then target socialization reduces the asymmetric behavior between men and women (Gneezy et al. 2009).

Potential gender differences in overconfidence and risk-aversion, if they exist, would not explain differences in behavior within same-gender insider-executive dyads, i.e., male insiders would behave in a manner consistent with being overconfident and more risk-taking, independent of the gender of top executives. The work of Inci et al. (2017) shows that male insiders obtain greater insider profits from purchases than female insiders, suggesting that female insiders may have a disadvantage in accessing private information relative to their male counterparts. This indicates the plausible existence of a second non-exclusive channel that may explain how gender influences insider trading behavior, and this links to the literature on common identity bias.

2.2. CEO and CFO gender and information flows within the firm

Starting from Akerlof and Kranton (2000), identity (a person's sense of self) has been recognized as an important driver of economic outcomes. The sense of belonging to abstract social categories, such as "male" and "female," can significantly affect individual interactions. Numerous studies in organizational

psychology have shown that individuals' perception of common identity with others leads to greater trust (Farmer et al. 2014, Glaeser et al. 2000) and influences decision-making. Individuals are more likely to recommend for a job those candidates more similar to them (Baskett 1973) and evaluate more favorably their managers and subordinates whom they perceive as being similar to themselves (Pulakos and Wexley 1983). This perception of commonalities applies to gender identity as argued in Akerlof and Kranton (2000), as well as to religions or ethnicities as shown in Guiso et al. (2009). For example, managers' perceptions of their sales representative employees' performance is higher when they both have the same gender relative to mixed-gender dyads (McNeilly and Russ 2000). Further, in a field experiment, Delfgaauw et al. (2013) finds that sales competitions boost sales growth only for stores where the manager and a majority of workers are of the same gender. While loan officers are more likely to lend to same-gender borrowers (Campbell et al. 2018), as well as to those borrowers with the same language, ethnicity or religion (Fisman et al. 2017; Ravina 2018). Matsa and Miller (2011) finds that female directors help other women reach management positions, and finds that firms led by female CEOs perform better when the fraction of female directors increases. These authors explain that one potential reason for their result is that a female-friendly corporate environment "*can encourage cooperation and information exchange at the top*" (Amore et al. 2014, p. 1084).

Additionally, as noted in Akerlof and Kranton (2000), common gender identity may explain negative behaviour too, where those who do not share the common identity are mistrusted and excluded from decision-making and information sharing. Therefore, insiders and top executives having the same gender may influence perceptions of trustworthiness, facilitate information transfers, and influence network building. Networks are an important source of private information in economic settings. For example, Cohen et al. (2008) shows that personal connections improve flows of information for investment professionals, and Fracassi (2017) shows that social ties between executives and board members affect the investment policy of the firm.

Therefore, we expect that information sharing between top executives and other insiders depends on gender, where those insiders that have a different gender to top executives may struggle to develop informal ties and gain the same level of trust as insiders of the same gender,⁴ leading to gender differences in insiders' access to private information, and therefore, in insider trading profitability.

Formally stated, our second hypothesis is as follows:

H2: *Same-gender insider-top executive dyads yield higher insider trading profitability.*

Finally, prior work provides evidence that males benefit more from their professional networks than females (Fang and Huang 2017, Forret and Dougherty 2004, Ibarra 1992). Males also evaluate other males less harshly in settings such as promotion committees or performance evaluations (Grunspan et al. 2016; Bagues et al. 2017; Mengel et al. 2018). Overall, this could suggest that male dyads (male insider-male top executives) may differently share information and develop trust relative to female dyads (female insider-female top executives) in the firm. This may be particularly true in business practice, as most of the leaders in firms are male, and “*the ‘likes attract’ principle means that women often have to work harder to build relationships with decision makers and influential stakeholders.*”⁵ Also, gender might be a stronger identification factor for men than for women. For example, Campbell et al. (2018) shows that male lenders are more likely to give loans to male borrowers than to female borrowers based on soft information. If this holds in our setting, *H2* may only hold for male dyads of top executives and insiders.

3. Sample and measurement choice

We measure insider trading profitability as follows. We obtain insider trading information from Thomson Financial Insider Filings between 1995-2016, and consistent with prior research, we retain only open–

⁴ Personal ties and trust may be developed both through formal and informal networking. This may include on-the-job performance and assignment to relevant tasks within the top management team, but also, informal channels, such as playing golf or training for and running marathons with the CEO.

⁵ “How Women Can Build Their Professional Network”, *Wall Street Journal*, May 20th, 2018, available at: <https://www.wsj.com/articles/how-women-can-build-their-professional-networks-1526868480>.

market transactions, excluding stock based compensation. First, for each company, if more than one insider trades on a given day, we sum these trades and, in the case of opposite trades on the same day (both buying and selling), we subtract the total daily sales from the total daily purchases to identify a net purchase or sale. Next, we compute the trader-firm-day one-year buy-and-hold abnormal returns (adjusted for the same period buy-and-hold return of the CRSP firm size decile). We eliminate firms that could not be matched with the Compustat database, and cases where no data on CEO and CFO gender is available in either Execucomp or RiskMetrics. When missing, we search Bloomberg.com to identify the gender of top executives. The gender of insiders is identified by matching the insiders' first name or middle name to the Social Security Administration's records of names.⁶ If available, we use the middle name in cases where the first name is gender neutral. As the gender of the insider is crucial to our analysis, we drop trades that are carried out by an entity rather than an individual, and by those individuals whose names are not available in the Social Security Administration's data. We remove any observations where the transaction volume exceeds the CRSP daily trading volume. Finally, we require companies to have daily share prices available on CRSP including for the day of the transaction and one year either side of the trade. This generates our full sample for empirical analysis which consists of 73,697 purchases and 403,051 sales by 41,461 insiders (4,270 women and 37,191 men) in 3,344 U.S. firms.

3.1. Descriptive statistics

Table 1, Panel A presents summary statistics of the main variables employed. Firms that have a female CEO or CFO are, on average, larger, have smaller book-to-market ratios, and higher return on assets. The higher values of Altman's *Z-Score* for female firms might indicate a higher likelihood of firms appointing female top executives in times of crisis, a phenomenon known as the "glass cliff" (Ryan and Haslam 2005, 2007). However, the evidence for this is not conclusive, as firms with female top executives also

⁶We use Social Security Administration's records of names that occurred at least 5 times on annual Social Security card applications for births that occurred in the United States after 1879 and which are separated by gender. See, for reference: <https://www.ssa.gov/oact/babynames/limits.html>

appear to be larger and more stable. Firms with at least one female top executive have a higher entrenchment index (*InvEIndex*), tend to have younger CFOs, and the top executives in these firms have shorter tenure but higher total compensation than in firms with only male top executives.

[INSERT TABLE 1 HERE]

Given these differences between firms with male/female top executives, we control for these factors in all of our main model specifications. Additionally, to address the fact that firms that appoint a female top executive are intrinsically different from those that appoint a male, we also use a number of alternative specifications to our main model, that are explained below.

Table 1, Panel B shows descriptive statistics of trading by male and female insiders. The median trade value of purchases by males is greater than that of females, \$25,028 and \$17,500, respectively. The same is true for sales, \$193,408 to \$172,074. This is consistent with prior work suggesting that female insiders, such as COOs or Deputy CEOs, face a pay gap⁷ and may have lower funds available to engage in insider trading. This also supports our focus on insider trading profitability rather than on the volume of trading. Volume would be systematically affected by gender differences in pay, whilst profitability is not. Also consistent with prior research, we find that purchases earn positive abnormal returns while sales do not (Jagolinzer et al. 2011; Lakoniskok and Lee 2001), and that profitability is greater for males than females (Hillier et al. 2015, Inci et al. 2017). When we look for evidence on common identity effects, we find that mean and median profitability of sales is significantly greater for female insiders than male insiders when the CEO or CFO is also a woman. The same is true for median profitability of purchases. This is initial evidence that female insiders may use private information in a similar manner to male insiders in their trading, and that risk aversion and/or ethical behavior is not driving the overall lower average profitability of female insider trading.

⁷ Geiler and Renneboog (2015) estimate that females earn 23% less than males. In our setting, the median trade is 21% smaller for females than for males.

Table 1, Panel C shows the annual average number of insiders trading in firms where both CEO and CFO are male and where at least one top executive is female. It also shows the average number of female insiders and the ratio of female to male insiders. The number of insiders trading is significantly lower in firms where at least one top executive is female compared to where both top executives are male, which is indicative of female top executives reducing opportunities to trade. This is consistent with our first hypothesis. We also find that both the number and proportion of female insiders that trade is greater where at least one top executive is female. This is consistent with *H2*, in that opportunities for insider trading, as driven by access to private information, increase with same-gender insider-executive dyads. Given that insiders' access to information might differ depending on their role in the firm, we split insiders into insiders with high, medium, and low access to private information.⁸ We find that the difference in the number and proportion of female insiders is greatest in the subsample of insiders with lower access to information, suggesting that female insiders with low access to information benefit the most when the CEO or CFO is female.

4. Research design and empirical results

To study the impact of female top executives on insider trading profitability we undertake a two-step analysis. First, we study the effect of top executive gender on the profitability of insider trading. Second, we employ a difference-in-differences methodology on a propensity score matched (PSM) sample. While the gender of an executive is random, boards seeking to appoint new CEOs or CFOs could discriminate based on gender, or women may self-select into certain types of firms (Huang and Kisgen 2013). If firms discriminate based on gender, then our results could be driven the firm characteristics that are associated with such behavior. The difference-in-differences methodology helps correct for this potential

⁸ We use ROLECODE1 to classify insiders. Insiders with ROLECODE1 *CO*, *CB*, *P*, *OD* or *H* are classified as having high access to information, based on the findings in Seyhun (1986) that chairmen of boards and officer-directors trade on more valuable information than other insiders; those with ROLECODE1 *OB*, *O*, *OX*, *OT*, *D*, *DO*, *OD* or *H* are officers classified as having medium access to information; and all other insiders are classified as having low access to information.

endogeneity issue by identifying a control group of firms similar to our treatment firms that appoint a male top executive instead of a female top executive.

4.1. Full sample analysis

To test *HI*, we first examine whether insider trading profitability depends on the gender of top executives by using the following model on the full sample of firms and insiders:

$$Profitability_{i,j,t} = \mu + \beta_1 Female_exec_{j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t} \quad (1)$$

where *Profitability* is the one year size-adjusted buy and hold return of the net trade by insider *i*, in firm *j*, on day *t*. *Female_exec* is an indicator variable taking the value of 1 when at least one of the top executives (either the CEO or the CFO, or both) is a female on the day of the trade. *Controls* are observable time-varying, firm and insider characteristics that we describe in detail below (see the Appendix for full details on the calculation of all variables). Our coefficient of interest is β_1 , and under *HI* we predict that it is negative and significant.

Regarding *Controls*, model (1) includes *Size_day*, which is the natural logarithm of market equity of the firm on the day of the trade, to control for the different buying and selling patterns in small and large firms (Seyhun 1986) and for the greater profitability of trading in smaller firms (Lakonishok and Lee 2001). As insider trades have been found to be related to both the book-to-market ratio and recent stock returns (Piotroski and Roulstone 2005), we include *BTM_day* which is the book value of equity at the end of the fiscal year divided by the market value of equity on the day, and *BHARPRE* which is the buy-and-hold abnormal returns over the one-year period ending one day before the first insider transaction of the calendar year, calculated as the CRSP raw buy-and-hold return minus the average buy-and-hold return for equally sized firms using the NYSE/AMEX/NASDAQ size deciles. To control for firm performance and the likelihood that the “glass cliff” phenomenon (Ryan and Haslam 2005, 2007) affects our results, we include *ROA*, income before extraordinary items scaled by total assets, as well as Altman’s *Z-Score*, computed as the sum of 3.3 times earnings before interest and taxes, sales, 1.4 times

retained earnings, 1.2 times working capital, scaled by total assets (Leary and Roberts 2005). Given that corporate governance reduces the profitability of insider sales (Dai et al. 2016), we include *InstOwner*, the percentage of common shares outstanding owned by institutional shareholders, and *BdIndep*, the ratio of independent directors to total directors. We also include the inverse of the entrenchment index developed in Bebchuk et al. (2009) that includes staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes and supermajority requirements for mergers and charter amendments. Frankel and Li (2004) finds a positive association between return volatility and insider trading volume and to control for its potential impact on insider trading activity, we include, *StdRet*, the standard deviation of returns in the calendar year of the trade. Finally, we include a number of CEO and CFO characteristics to control for these characteristics potentially driving the different levels of profitability of insiders' trades. Specifically, we include the age of the CEO and CFO, their tenure within the firm, as well as their total compensation as reported by *Execucomp*. γ_j are industry fixed effects and τ_t are year fixed effects.

[INSERT TABLE 2 HERE]

The results for the estimation of model (1) are presented in Table 2, Panel A. Consistent with *HI*, the results show that insider trades are significantly less profitable when a top executive is female (coeff.= -0.019, t -stat = -6.316).⁹ This corresponds to a reduction in the one-year (unrealized), size-adjusted buy-and-hold abnormal returns of \$16,348 for a trade at the mean value of \$860,434, *ceteris paribus*. When replacing industry fixed effects by firm fixed effects, we get similar inferences (coeff.= -0.008, t -stat = -1.94). Our results are not sensitive to excluding non-routine trades.¹⁰

⁹ We also examine effects on the annual volume of trading and use annual control variables. In untabulated results, we observe that annual number of insider trades is significantly lower in firm-years where there is a female top executive. This is consistent with *HI* and suggests lower insider trading, either because of reduced access to information or greater monitoring and restrictions to trading practices with the presence of a female CEO or CFO.

¹⁰ Cohen et al. (2012) finds that abnormal insider profitability is concentrated in trades made by non-routine traders, suggesting that one can isolate trades that are more likely to be timed and using private information by removing trades that happen on an annual basis. We therefore repeat our main analysis on a sub-sample that excludes all same-direction trades that an insider makes in the same month, for at least three consecutive years. The (untabulated) results are qualitatively the same as those presented in Table 2, Panel A (coeff.= -0.011, t -stat = -3.455), suggesting that our results are due to a change in informed trading as opposed to routine trading.

A natural extension is to examine whether the effect is more pronounced for female CEOs or CFOs. However, even when using both CEO and CFO gender as the basis for our analysis, less than 9 percent of our observations have a female in either role. This is made up of just over 2 percent of CEOs being female and just under 7 percent CFOs being female. It is therefore extremely rare for both CEO and CFO to be female (around 0.3 percent of our observations). When replacing *Female_exec* with separate variables for CEO and CFO gender in the same regression, the coefficients for both are negative, but only CFO gender is significant. (Female CEO coeff.= -0.006, *t*-stat = -1.04, Female CFO coeff.= -0.0220, *t*-stat = -6.79). For meaningful analysis of subsamples and additional tests, we therefore use *Female_exec* which takes one when either the CEO or CFO are female, or when both of these roles are held by a female.

Next, we take a series of steps to alleviate endogeneity concerns. First, to rule out potential alternative explanations of other unobserved changes in a firm's preference for male/female top executives, we employ an instrumental variable approach. We look for an instrument that is correlated with the appointment of women to top positions, but not with profitability of insider trading except from through the *Female_exec* variable. Following Huang and Kisgen (2013), we use the gender equality index developed by Sugarman and Straus (1988) that measures the extent to which a U.S. state has greater gender equality as our instrument. We use the more recent values of the index calculated in a subsequent study by Di Noia (2002). Since there is no obvious reason why this index would explain insider trading, especially as insider trading regulation is set nationally and not at state level, it is a good candidate for an instrument. We expect that the higher the gender equality is in a state, the higher the likelihood for a firm headquartered in that state to hire female top executive (Huang and Kisgen 2013).

Based on the location of a firm's headquarters, we identify the corresponding value of the gender equality index for each firm for our sample of top executive switches (i.e., male-to-male, male-to-female, female-to-female and female-to-male). We estimate the following two-stage least squares (2SLS) model:

$$Female_exec_{j,t} = \varphi + \rho Gender\ Equality\ Index_j + \theta Controls_{j,t} + \gamma_j + \tau_t + \varepsilon_{j,t} \quad (2a)$$

$$Profitability_{i,j,t} = \mu + \beta FemaleIV_{j,t} + \theta Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t} \quad (2b)$$

where *Profitability* is our measure for insider trading for insider *i*, in firm *j*, on day *t*, *Female_exec* is an indicator variable that equals 1 if firm *j* has a female CEO or CFO in year *t*, and 0 otherwise, *Controls* are observable time-varying, firm and insider characteristics as described in Appendix A, γ_j are industry fixed effects, and τ_t are year fixed effects. *FemaleIV* is the fitted value of the female indicator from the first-stage regression. The coefficient of interest is β in model (2b), and we predict that it is negative and significant.

Table 2, Panel B, columns 1 and 2 present the results from the first-stage OLS regressions of the instrumental variable estimation. The coefficient of the gender equality index in this first-stage is highly significant, suggesting, as expected, a strong positive association between the likelihood of a firm appointing a female top executive and the extent to which a state is friendly towards gender equality. The *F-statistic* from the first-stage estimation is 132.22, indicating a strong instrument (Stock and Yogo 2005). Columns 3 and 4 report the results of the second-stage OLS estimation where *Profitability* is the dependent variable. The negative and significant coefficient of *FemaleIV* (coeff.= -1.248, *t-stat*= -7.532) supports our main prediction that firms with female top executives have lower levels of insider trading profitability. One plausible way that the instrument may be affecting the profitability of trading is through its potential correlation with the gender of insiders other than the CEO and CFO, as prior work shows that female insiders generally trade less profitably than men (Hillier et al. 2015, Inci et al. 2017). Therefore we re-estimate the 2SLS regressions controlling for the gender of the insider in both stages. The inferences are similar with a negative and significant coefficient at the second stage (coeff.= -1.353, *t-stat*= -6.85). However, because of the large magnitude of these coefficients, the reliability of the *FemaleIV* estimates should be interpreted with caution and we take further steps to alleviate endogeneity concerns around our main OLS regression in the following tests.

To ensure that our results are not a consequence of unobservable shifts in corporate governance or corporate culture that spuriously coincide with the presence of a female top executive, we design the

following test. We begin by identifying those firms that, after having appointed a female top executive, switch back to a male top executive over the sample period. We identify 39 such firms. Next, we examine whether insider trading profitability increases following a switch *back* to a male CEO or CFO. If our results are driven by changes in governance or culture that might have coincided with the appointment of a female CEO or CFO and were not captured by our main model, the effects should not reverse after a switch back to a male top executive. A reversal would support the idea that top executives' gender is associated with insider trading profitability. We estimate the following regression on this subsample of firms:

$$Profitability_{i,j,t} = \mu + \beta_1 Post_{i,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \quad (3)$$

Our coefficient of interest is β_1 . We predict and find in Table 2, Panel C that it is positive and significant (coeff.= 0.084, t -stat= 4.242), suggesting that after a male is appointed as top executive following the tenure of a female top executive, insider trading profitability increases again.

4.2. Propensity score matched sample analysis

In addition to gender discrimination in the access to top executive positions, the management psychology literature documents a preference for women executives in times of company crises; the “glass cliff” phenomenon (Ryan and Haslam 2005, 2007). This view is supported by a belief that women are good people managers and better able to take the blame for company failure (Ryan and Haslam, 2007). If firms discriminate in this way, then our results could be driven by the firm characteristics that are associated with the “glass cliff” effect. To correct for this potential endogeneity issue, we use a difference-in-differences and a propensity score matching (PSM) framework.

The PSM approach matches a treatment firm with a control firm that is similar across a series of relevant variables. This allows us to compare changes in insider trading behavior between firms that experience a male-to-female CEO/CFO turnover event (treated firms) and firms that are similar across a set of relevant observable characteristics, but appoint a male CEO/CFO instead (control firms). We begin

with a full sample consisting of 2,686 CEO and CFO changes between 1996 and 2014; 171 of them are male-to-female changes and 2,515 are male-to-male changes. For firms that change their top executives more than once we keep only the first event. We also remove male-to-male top executive switches in industries with no male-to-female top executive changes, and keep only those observations that correspond to the tenure of the preceding male top executive and to the tenure of the newly appointed male or female top executive. Given that we match the two samples based on lagged variables, our final sample is reduced to 9,989 observations corresponding to 150 male-to-female top executive changes and 1,031 male-to-male top executive changes.

Using this sample, we estimate a logistic regression based on observables from extant literature that predict the appointment of a female top executive (Hillman et al., 2007; Huang and Kisgen, 2013). Specifically, we include in the model: a) firm characteristics, including firm size (*Size*), book-to-market (*BTM*), return on assets (*ROA*), firm age (*FirmAge*), sales concentration ratio (*Concentration*) and Altman's Z-Score (*ZScore*); b) corporate governance proxies, such as board independence (*BoardIndep*) and the E-Index (*InvEIndex*); c) proxies for the likelihood of having females on the board of directors, including board size (*BoardSize*) and whether the firm operates in an industry where women employees are prevalent (*FemEmpl*); and d) a control for stock market performance (*Return*). We control for year fixed effects. To ensure that the gender of the newly appointed top executive does not affect the contemporaneous firm characteristics that we match on, all the determinants are measured in the previous fiscal year. The likelihood ratio chi-square of 257.9 (p -value = 0.0325) and suggests that the model is statistically significant.

The results reported in Table 3, Panel A indicate that firms that appoint a female CEO or CFO are larger (coeff. = 0.15, z -stat = 5.982), older (coeff. = 0.010, z -stat = 4.207), have higher board independence (coeff = 1.309, z -stat = 3.594) and lower entrenchment as measured by *InvEIndex* (coeff. = 0.098, z -stat = 3.383), and are more financially healthy (coeff. = 0.058, z -stat = 2.140). This last result is especially interesting, since it does not suggest a "glass cliff" effect is present in our setting. In line with

the findings of Hillman et al. (2007) and García Lara et al. (2017), firms operating in industries having more female employees are more likely to appoint a female top executive (coeff. = 0.010, z -stat = 4.317).

Next, we match firms with male-to-female top executive switches to firms with male-to-male top executive switches in the same year and based on the type of executive change (i.e., CEO or CFO) based on the propensity scores obtained in the previous step. To do so we use a nearest neighbor procedure with no replacement and a caliper of 25% of the standard deviation of the logit transformation (Rosenbaum and Rubin 1985, Stuart and Rubin 2008). Our final matched sample consists of 138 pairs of firms. Table 3, Panel B shows that the matching procedure successfully eliminates differences between the treatment and control groups in the year of the executive change.¹¹

[INSERT TABLE 3 HERE]

To remove the effect of other potential time series changes within the firm, contemporaneous to the CEO or CFO turnovers, and similar to Francis et al. (2015) and Huang and Kisgen (2013), we employ a difference-in-differences approach. This framework allows us to compare insider trading behavior in firms before and after male-to-female CEO/CFO turnover to a control sample of firms with male-to-male CEO/CFO turnover. Compared to simple panel data with fixed effects, the difference-in-differences approach has a number of benefits (Huang and Kisgen, 2013). First, to ensure that the executive has sufficient time to make an impact, he or she is required to be in the position for a minimum period of two years. Second, we condition all tests on the occurrence of any type of CEO or CFO turnover. Specifically, the controls for our male-to-female CEO/CFO turnover firms are a sample of male-to-male CEO/CFO turnover firms. Third, the difference-in-differences approach allows us to control for time-invariant unobservable firm effects by comparing the insider trading behavior after a male-to-female CEO/CFO turnover with insider trading behavior before the switch. Our main regression is as follows:

¹¹ Following Sianesi (2004) and Caliendo and Kopeinig (2008), we re-estimate the logistic model using the matched pairs to check the success of the procedure. Pseudo- R^2 is 0.0178 post-matching compared to 0.0325 before matching, suggesting that after matching there are fewer differences between the treatment and control groups.

$$\begin{aligned}
Profitability_{i,j,t} = & \mu + \beta_1 Post_{i,t} + \beta_2 Treat_i + \beta_3 PostTreat_{i,t} + \\
& + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t},
\end{aligned} \tag{4}$$

where $Profitability_{i,t}$ is our trader-firm-specific measure, γ_j are industry fixed effects, τ_t are time fixed effects and the rest of the variables are as described in Appendix A. Our coefficient of interest is β_3 and we predict it is negative and significant. Table 3, Panel C presents the results on the effect of male-to-female CEO/CFO turnover on insider trading. The coefficient of $PostTreat$ is negative (coeff. = -0.103, t -stat = -7.600), indicating the profitability of insider trades decreases in the period following a male-to-female CEO/CFO turnover. When replacing industry fixed effects with firm fixed effects, we get similar inferences (coeff. = -0.110, t -stat = -1.94).

4.3. Common identity bias and insider trading

To the extent that males and female insiders have different access to private information under male and female top executives, we expect that male-male and female-female insider-top executive dyads may have different trading profitability than mixed female-male and male-female insider-top executive dyads. If only $H1$ holds, and what differs is the level of information asymmetry under male and female top executives, then, all dyads should be affected in a similar manner. Figure 1 visually summarizes the channels identified under $H1$ and $H2$. To test $H2$ and examine whether the common identity bias explains our results, we split the full sample in two ways: (1) based on the gender of top executives, and (2) based on the gender of insiders, and re-estimate the following model for each of these subsamples:

$$Profitability_{i,j,t} = \mu + \beta_1 Female_insider_{i,j,t} (Male_execs_{j,t}) + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \tag{5}$$

Where $Female_insider_{i,j,t}$ is an indicator variable that takes the value of 1 when the insider is a female and 0 otherwise, and $Male_execs_{j,t}$ is an indicator variable that takes the value of 1 when both the CEO and the CFO are males and 0 otherwise; the rest of the variables are as previously described. The results are presented in Table 4, for the full sample split by the gender of top executives in Panel A, and by the

gender of insiders in Panel B. In Table 4, Panel C we present comparable results for our PSM sample, using the difference-in-differences approach.

[INSERT TABLE 4 HERE]

The first two columns of Table 4, Panel A suggest that female insiders generate significantly lower insider trading profitability relative to male insiders when both the CEO and the CFO are male (coeff. = -0.007, t -stat = -3.213), while they obtain significantly higher profitability relative to male insiders when at least one top executive is female (coeff. = 0.010, t -stat = 2.040).¹² In Table 4, Panel B we present insider's profitability on the full sample split by the gender of insiders. Our results support the idea that when both the insider and the top executive are male, profitability is higher for insiders (coeff. = 0.021, t -stat = 7.265), suggesting that having the same gender builds a channel of private information that allows for profitable insider trading. Interestingly, we find support for *H2* only for the male-to-male insider-top executive dyads, but not for the female-to-female insider-top executive dyads. Taken together, this evidence supports *H2*, although the results are stronger for male-to-male insider-top executive dyads than for female-to-female insider-top executive dyads.^{13,14}

As we observed a reduction on the number of trades per year in firms with female top executives, we also examine the effect of the volume of trading by male and female insiders. In untabulated results, we observe that the number of trades by male (female) insiders is positive and significantly (negative, but not significantly) associated with both top executives being male. We also examine more closely trades

¹² We also check the results after removing those trades performed by the CEO and CFO themselves, and our inferences remain the same for the male CEO and CFO subsample (coeff. = -0.007, t -stat = -3.165), while the female CEO or CFO evidence remains positive but not significant at conventional levels (coeff. = 0.008, t -stat = 1.112).

¹³ Female insiders might hold lower positions within the firms, leading to lower wages and access to private information to trade on; in untabulated tests, we re-estimate the test reported in Table 4, Panel B by additionally controlling for the role held by insiders (ROLECODE1 fixed effects). The results are qualitatively the same.

¹⁴ We repeat the test using those trades that are more likely to depend on access to information. These are non-routine trades which represent all the abnormal profitability of aggregate insider trading (Cohen et al. 2012). We remove insiders sales or purchases that occur in the same month in at least three consecutive years. The results are qualitatively the same to those reported in Table 4, Panel B for male insiders (coeff. = 0.016, t -stat = 5.018) and negative, but not significant for female insiders (coeff. = -0.007, t -stat = -1.186) suggesting that the timing and use of private information is indeed driving our results.

around stock splits as these events represent new information to outsiders. We obtain dates of stock splits from CRSP and calculate the number of trades by an insider that occur in the 45 days preceding the stock split divided by that insider's total number of trades in the year. We regress this measure on the presence of a female CEO or CFO and observe that male insiders exploit these events less under female top executives (coeff. = -0.681, t -stat = -3.120) and that female insiders trade more around these events if the CEO or CFO is female but that this difference is not significant (coeff. = 9.064, t -stat = 0.605). However, the sample of female trading in this sample is low (89 trades) and therefore unlikely to yield significant results. On balance, these tests are consistent with *H2* and our main tests, showing that volume and informed trading is more prevalent in same-gender insider-top executive dyads.

The differential effect for the male-to-male and the female-to-female dyads could be driven either by the relatively smaller sample of female-to-female dyads, or by a differential effect of the common identity bias. It is important to note that both CEO and CFO are male when *Male_execs* takes 1, but only one of them is female when *Male_execs* takes 0. Prior studies have also documented differential results of the common identity bias for male and female individuals, suggesting that gender might be a stronger identification factor for men than for women. For example, Grunspan et al. (2016) finds a strong male bias in favor of nominating other males when assessing their class performance, while females chose their nominations equitably based on performance rather than gender. Similarly, Campbell et al. (2018) shows that male lenders are more likely to give loans to male borrowers than to female borrowers based on soft information, while female loan officers process the loan application similarly for all applicants, regardless of the gender of the applicant.

To further understand whether the common identity bias underpins our findings, we build on the literature that suggests people may trust individuals more when they have had a longer interaction with them (Alesina and La Ferrara 2002, Coleman 1994). Therefore, we also test whether insiders' profitability is higher when they have a longer overlap with the tenure of the firm's top executives. In particular, we study whether profits for male insiders increase with every year that they spend in the company where the

top executives are male. To do so, we calculate the number of years of overlap between each insider and the CEO and CFO of the firm. Next, we compute a trader-firm-year level overlap measure as the average of the number of years of overlap that an insider has with the tenure of a male CEO and CFO (for example, if an insider has an overlap with the CEO of three years and the CFO of one year, the composite overlap measure is two years.) Table 5, Panel A shows that the coefficient for *Male_execs* is not significant in the first year of overlap; in the second year of overlap, insider trading profitability of male insiders is 4.9 percentage points greater if both top executives are male and in the third year, by 8 percentage points, supporting *H2*.¹⁵

[INSERT TABLE 5 HERE]

We next study whether male insiders obtain higher profits in male-dominated industries. To the extent that information flows differ because of networks among same gender-dyads, our results should be stronger in settings that are dominated by one gender. Results in Table 5, Panel B suggest that male insiders obtain higher profitability from insider trading in industries where the majority of employees are men (as measured by the variable *male_ind_50*, taking the value of 1 for industry-years where male employees make up for 50% or more of total employees).

5. Additional analyses

5.1. Insider trading and the monitoring role of female top executives

Our results so far support both *H1* and *H2* and suggest that insider trading profitability is lower in firms led by a female top executive, and this is driven by a decrease in the profitability of trades by male insiders. In this section, we explore alternative explanations for these findings. In particular, we build on the prior literature and examine three channels that are consistent with female top executives providing

¹⁵ We repeat the analysis for the profitability of female insiders, and the results are insignificant irrespective of the number of years of overlap with a female top executive. More details about what could trigger this asymmetric behavior between male-to-male and female-to-female insiders-executives dyads in section 5.2.2.

differential monitoring relative to male top executives. Specifically, we examine whether our results are explained by: (1) improved financial reporting quality, (2) greater use of firm-level insider trading restrictions, and/or (3) an improved tone-at-the-top in the presence of a female top executive.

5.1.1. Financial reporting quality and insider trading restrictions

We first examine whether female CEOs and CFOs directly improve financial reporting quality, thereby limiting information asymmetry and decreasing insider trading profitability. Previous studies have found that insider trading yields higher returns in firms with higher levels of information asymmetry and lower reporting quality (Aboody and Lev 2000, Frankel and Li 2004, Huddart and Ke 2007). In addition, Barua et al. (2010) and Francis et al. (2015) find that firms with female CFOs have higher accounting quality. Therefore, the differential trading of insiders under male and female top executives may be a consequence of a change in financial reporting quality of the firm following a male-to-female top executive switch.

A second channel that may influence our results is the adoption of “blackout periods.” The adoption of insider trading restrictions (ITR) prevents insiders from trading before important events for the firm e.g. earnings announcements. Bettis et al. (2000) finds that most ITR policies involve blackout periods in the last two thirds of the period between two consecutive quarters. We therefore examine whether female top executives are more likely to implement ITRs after being hired, and whether this explains the change in profitability of insiders’ trades.

To examine whether our results are explained by financial reporting quality or ITRs channels, and similar to Gul et al. (2011), we first analyze the effect of female top executives on each of these constructs. Next, we examine whether the inclusion of an additional control for each of these channels removes the documented effect of *Female_exec* on insider trading profitability. Specifically, we estimate the following regressions on the full sample:

$$X_{j,t} = \mu + \beta_1 \text{Female_exec}_{j,t} + \delta \sum \text{Controls}_{j,t} + \gamma_j + \tau_t + \varepsilon_{j,t} \quad (6a)$$

$$\text{Profitability}_{i,j,t} = \mu + \beta_1 \text{Female_exec}_{j,t} + \beta_2 X_{i,j,t} + \delta \sum \text{Controls}_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \quad (6b)$$

where $X_{j,t}$ is either the measure of financial reporting quality or ITRs, and the other controls are as previously described. In particular, we examine the absolute value of abnormal discretionary accruals as estimated using the modified Jones model (*AbsDA_MJ*). To measure the adoption of insider trading restrictions, and since the extent to which firms restrict insider trading internally is not directly observable, we follow Roulstone (2003) in using the observable effect of timing policies to build a measure for ITRs. The higher the percentage of trades executed in the short period of the allowed trading window (i.e., on average during the 30 days following the earnings announcement), the more restricted insider trading is considered to be within the firm.

[INSERT TABLE 6 HERE]

Table 6, Column 1, presents the results of estimating the effect of female top executives on discretionary accruals (model 6a). Column 2 presents the results of model (6b) estimating the change in insider trading profitability following a male-to-female top executive switch where we include an additional control for the identified channel, in this case, financial reporting quality, and columns 3 and 4 present the results obtained for the adoption of ITRs.

Consistent with Barua et al. (2010), and as can be seen in column 1, the presence of a female top executive has a significant and negative impact on discretionary accruals, suggesting that reporting quality increases in the presence of female top executives (coeff.= -0.035, t -stat= -5.924). We find that greater absolute discretionary accruals increases trading profitability (coeff.= 0.009, t -stat= 8.134), consistent with previously documented findings that earnings management facilitate/incentivize opportunistic trading and *vice versa* (Aboody and Lev 2000, Frankel and Li 2004, Huddart and Ke 2007). This suggests that the presence of female top executives tends to improve the information environment as well as curb opportunistic trading. However, this channel does not fully explain our results, as even when controlling for discretionary accruals, we find that the presence of a female CEO or CFO has a significant incremental negative effect on insider trading profitability (coeff.= -0.020, t -stat= -6.460).

Female top executives are also not found to be more likely to impose (or enforce) ITRs than male top executives, as there is no effect in column 3 for the presence of a female top executive on the extent to which insider trading occurs in the thirty-day window after the earnings announcement (coeff.= 0.001, t -stat= -0.269). Perhaps contrary to the intention of such restrictions, we find that insider profitability increases for trades in firm-quarters where most trades occur in the “allowed” trading window, possibly as a result of a reduction in litigation risk on account of the timing of the trade, making insiders less worried about trading opportunistically in this time-period. Controlling for the effect of ITRs does not remove the significant decrease in profitability of insiders’ trades in the presence of female top executives.

5.1.2. Tone at the top and insider trading profitability

Next, we test whether our results are explained by female CEOs and CFOs setting a different tone-at-the-top. Top management behavior exerts a significant influence on their employees’ behavior (Jong and Hartog 2007, Starke 2012). For example, Bushman et al. (2018) finds that CEOs drive the corporate culture in banks and shows that employees in banks with materialistic CEOs (as evidenced by managers’ ownership of luxury goods) are more likely to exploit insider trading opportunities relative to executives at banks with more frugal CEOs. More materialistic executives have also been found to promote a looser control environment thereby increasing the probability of other insiders perpetrating fraud during their tenure (Davidson et al. 2015). Further, and most relevant to our setting, Skaife et al. (2013) finds a link between material weaknesses due to a weak tone-at-the-top and insider trading profitability. As Abbott et al. (2012) finds that the presence of at least one female board member is associated with a decline in the number of financial restatements, facilitated by an improvement in the tone-at-the-top, there is reason to believe that this may extend to female CEOs and CFOs. Taken together, it is plausible that female top executives set a stronger tone at the top that permeates throughout the organization and constrains insiders’ opportunistic trading.

To test whether our results are due to a different tone-at-the-top set by male and female top executives, we obtain auditors’ SOX 404 opinions from Audit Analytics. Following Skaife et al. (2013),

we collect data on material weakness in internal controls (*MWIC*) and set our *Tone* variable to 1 if the weakness is due to key 13, “*Senior management competency, tone, reliability issues*” or due to key 21, “*Ethical or compliance issues with personnel*”, and 0 otherwise. This data is available from 2004 and for 2,288 firms in our sample, corresponding to 16,798 firm-year observations. 3,479 (20.71%) of our firm-year observations relate to firms that have at least one material weakness opinion. 246 (1.46%) of these observations relate to firms where at least one of the material weakness opinions were due to weakness in the tone at the top.

[INSERT TABLE 7 HERE]

Using these data, first, we first estimate a *probit* model regressing whether the firm has had a material weakness in internal control opinion due to tone-at-the-top weakness during our sample period on the presence of a female top executive. We include in the model a set of controls for the appointment of a female top executive as described in previous tests. Additionally, and in line with Skaife et al. (2013), we control for determinants of material weakness including a firm’s recent losses (*PctLoss*), operating characteristics that increase accounting measurement application risk (*Inv_ratio*), whether a firm experienced recent changes in organizational structure (*M&A*), and whether a firm uses a big four auditing firm (*Big4*). The results from this test are presented in Table 7, column 1. We do the same for firm’s material weakness in internal control opinions due to any reason, presented in column 2. We find that the likelihood of a firm having one or more material weakness opinions is only weakly related to the presence of a female top executive. In particular, *Female_exec* is not significant in the *Tone* regression in column 1 (coeff.= -0.008, *z*-stat= -0.086), and negative in the *MWIC* regression in column 2 (coeff.= -0.095, *z*-stat= -2.318).

We repeat our main test from equation (6b) and include *Tone* and *MWIC* as well as controls for known predictors of female top executive appointments, material weaknesses in internal control, and market reactions, reported in columns 3 and 4. Unlike Skaife et al. (2013), we find that a weak tone-at-the-top is not associated with higher profits of insider trades over and above explanations offered by

material weaknesses due to other reasons. We find that *Female_exec* is still negative and significant in all settings, confirming that neither a material weaknesses in internal controls, nor a weak tone-at-the-top removes the negative effect of female top executives on insider profitability, which is indicative that changes to the tone-at-the-top is not responsible for our results in support of *H1*. In untabulated tests, we include in our full sample model proxies for these three channels simultaneously and retain our inferences. Taken together, the finding that these channels do not subsume our main results support the common identity bias as being at least partly responsible for our findings.

5.2. Insider trading and the common identity bias

In the previous sections, we have provided evidence of a lower insider trading profitability of male insiders under female top executives than under male top executives. In section 5.1, we have explored a number of channels that would lead to a decrease in information asymmetry under female top executives. Next, we explore the role of common identity bias in explaining our results.

5.2.1. Monitoring and common identity bias

We first repeat our main analysis on the subsamples of female and male insiders and include controls for the three potential monitoring channels explored in section 5.1, as well as (unrealized) profits. Skaife et al. (2013) point to the fact that examining only returns as the main measure of profitability may ignore the materiality of the trade. Therefore, we build an additional measure that takes account of the size of insiders' trades: we multiply the one-year buy-and-hold abnormal (size-adjusted) return, i.e. our profitability measure, by the dollar value of each trade. As per Skaife et al. (2013), we take the negative of this product for sales to represent the loss avoided when selling shares. The results are reported in Table 8 and show that the impact of female top executives on both profitability and profits (unrealized gains) is limited to the subsample of male insiders and that this holds when controlling for abnormal discretionary accruals, percentage of trades in the 30 days following the earnings announcement, and our tone-at-the-top measure. This finding supports a private flow of information allowing for profitable

insider trading when both insiders and top executives are male, and reinforces the fact that this result is not (solely) explained by the monitoring role of female top executives.

[INSERT TABLE 8 HERE]

Several insider trading studies also differentiate between purchases or sales, as it can be argued that purchases are more representative of informed trades as sales are potentially triggered by liquidity and diversification needs as opposed to private information (e.g., Inci et al. 2017, Mobbs et al. 2018). When splitting our sample on purchases and sales, our results are qualitatively unaffected.

5.2.2. Information asymmetry and common identity bias

While the evidence that female top executives reduce the availability of private information through the reduction of discretionary accruals supports *H1*, the negative effect of a female CEO or CFO on profitability remains. This suggests that the argument for a firm-wide reduction in information asymmetry does not explain the full effect of female top executives on insiders' profitability. To distinguish the effect of female top executives on the differential access to information (our second channel) from that of a reduction in information asymmetry (our first channel), we construct two subsamples of firms where (i) top executives have less scope to reduce information asymmetries between insiders and outside investors; and (ii) insiders are less likely to exert effort to acquire private information, increasing the likelihood that profitability is driven by privileged access to private information.

First, Aboody and Lev (2000) shows that research and development (R&D) intensity drives gains from insider trading. The lack of motivation for transparent disclosure of R&D, even by the most conscientious managers, is driven by its proprietary nature and the need not to release too much information to competitors. Therefore, in firms with high R&D expenses, even those CEOs and CFOs that would seek to increase transparency will not remove information asymmetries to the same extent as in firms with lower R&D intensity. We can therefore use the subsample of firms with high R&D expenditures to isolate the effect of the second channel, *H2*, and test whether same-gender insider-top

executive dyads enjoy higher insider trading profitability. We follow Cohen et al. (2008) and replace R&D by zero when missing, as long as selling, general, and administrative costs (SG&A) is not missing. We construct our first subsample as the observations with R&D expenses in the top quartile of our sample throughout the sample period. The results from this test are presented in Table 9, Panel A. We find a positive and significant effect of *Male_execs* (coeff.= 0.016, *t*-stat= 3.069) for male insiders and a negative and significant coefficient for *Male_execs* (coeff. -0.028, *t*-stat =2.562) for female insiders. This suggests that in firms where greater private information is available, regardless of efforts to reduce information asymmetries, insiders' access to this information depends on having the same gender as the CEO and/or CFO. Within this setting, male insiders earn significantly higher returns from insider trades where the CEO and CFO are both men. Similarly, female insiders earn significantly higher returns from insider trading in firms when at least one of the top executives is female, and significantly lower returns when both top executives are male.

Second, we examine settings characterized by low stock liquidity. In illiquid firms, insiders would be compelled to hold shares for longer, as the opportunities for profitable trading are reduced. This in turn decreases the incentives to exert effort in search of private information (Dou et al., 2018). To the extent that insiders still make profitable trades in this setting, it is likely that this is due to privileged access to information, which 'falls into their laps' due to their differential access to top executives. We measure stock illiquidity as per Amihud (2002) and take the annual average of the daily ratio of a stock's absolute return divided by its dollar trading volume. Table 9, Panel B reports the findings for illiquid firms. The results are fully comparable to those obtained in Panel A and again suggest the common identity bias is an important factor explaining insider profitability and information flows within the firm.

Third, to better understand whether the asymmetric results for female insider-top executive dyads relative to the male insider-top executive dyads (Table 4, Panel B) are a consequence of the limited representation of females in companies, we study a subsample of firms headquartered in states in the top-quartile of the gender equality index developed by Sugarman and Straus (1988). We expect that there

will be more female insiders in states with higher gender equality. Indeed, in untabulated results, we find that there are more female insiders trading in the firms headquartered in states in the top-quartile of this index (average of 0.58 distinct female traders per firm-year, or 9.5% of all insiders that trade in a year) compared to firms from states in the low-quartile (average of 0.52 distinct female traders per firm-year, or 8% of all insiders that trade in a year), and the difference is significant. The results are presented in Table 9, Panel C. Similar to the main results in Table 4, Panel B, we find that male insiders still trade profitably when top executives are male. Crucially, we find that female insiders also trade more profitably when at least one top executive is female relative to the situation when both top executives are male (coeff.= 0.029, t -stat= 2.158). This result has intuitive appeal. For gender to affect information flows within the firm, a minimum number of same-gender insiders and top executives need to be present. When we focus on firms where a higher number of female insiders are present and trading, we find comparable results for the common identity bias female insiders-top executive dyads.¹⁶

Taken together, these results support *H2* that the common identity bias explains the way insiders share information within the company.

6. Summary and conclusion

We explore the existence of gender-driven differences in the profitability of insider trading. In particular, we argue that insider trading profitability is systematically affected by two distinct and non-exclusive channels. First, we argue and find a different level of information asymmetry under female *versus* male top executives, which suggests that top executives' gender affects the *extent* of information asymmetry and thus, of profitable insider trading opportunities. Second, we find evidence consistent with greater information flows and information sharing across same-gender dyads of insiders-top executives,

¹⁶ Female insiders may hold lower positions within the firms, which could lead to lower wages and less access to private information to trade on. In untabulated tests, we re-estimate the test reported in Table 9, Panel C by additionally controlling for the role held by insiders within the firm (ROLECODE1 fixed effects). The results are qualitatively similar.

suggesting that gender affects the *access* to private information by insiders. We find compelling evidence of lower firm-wide insider trading profitability under female top executives, and this result is due to changes in trading by male insiders, who generate higher profits under male top executives than under female top executives. This result is consistent with a flow of private information facilitating profitable trading when both the insider and top executives are male. Together with the finding that only when both CEO and CFO are male do male insiders trade more profitably than female insiders, this suggests that there is something of a boys' club facilitating the spread of private information amongst male insiders. However, this relationship is reversed in the presence of a female CEO or CFO, i.e. in these firms, female insiders trade more profitably than male insiders. This suggests that there are similar private information privileges for female insiders when there is a female top executive.

We perform a series of additional tests to rule out alternative explanations. We find that our main result is not explained by female top executives improving financial reporting quality, adopting internal restrictions to insider trading, or changing the tone-at-the-top. Instead, we find that in settings where insiders access to information is more difficult to limit to reduce information asymmetries, such as in R&D intense firms and firms with highly illiquid stock, female (male) insiders trade more (less) profitably when there is a female top executive to when both top executives are male. Finally, we find that female (male) insiders trade more (less) profitably when at least one of the top executives are female in firms located in states with greater gender equality. Taken together, this suggests that same gender insider-top executive dyads yield greater access to information for both male and female insiders in settings where information asymmetry is present or where there is a sufficient number of female insiders in the firm engaged in insider trading.

These results are relevant for regulators in the context of the discussions of mandatory quotas for gender representation on corporate boards, as well for empirical research, given that by explaining firms' heterogeneity solely by firm characteristics, one may miss individual attributes such as like gender, which are clearly important determinants of the observed differences insider trading profitability

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Appendix A. Variables definition

Variable	Definition	Source
AbsDA_MJ	Discretionary accruals as measured by the Modified Jones model developed by Dechow et al. (2003) adjusted for performance and firm growth as in Collins et al. (2017). The proxy for discretionary accruals is given by the residuals from the following regression estimated for each industry-year combination with at least 10 observations: $\frac{TA_{i,t}}{Assets_{i,t-1}} = \alpha + \beta_0 \frac{1}{Assets_{i,t-1}} + \beta_1 \frac{\Delta Sales_{i,t} - \Delta Rec_{i,t}}{Assets_{i,t-1}} + \beta_2 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \beta_3 ROA_{i,t-1} + \beta_4 SG_{i,t-1} + \varepsilon_{i,t}$	Compustat
AgeCEO	The age of the CEO in a given year, set to 0 if missing.	ExecuComp
AgeCEO_d	An indicator variable that takes 1 when missing value for AgeCEO has been replaced by 0.	
AgeCFO	The age of the CFO in a given year, set to 0 if missing.	ExecuComp
AgeCFO_d	An indicator variable that takes 1 when missing value for AgeCFO has been replaced by 0	
BdIndep	The number of independent directors divided by total directors per firms with missing values being set to 0.	RiskMetrics
bdingep_d	An indicator variable that takes 1 when missing value for BdIndep has been replaced by 0.	
BHARPRE	Buy-and-hold abnormal returns over the one-year period ending one day before the first insider transaction of the calendar year, calculated as the CRSP raw buy-and-hold return minus the average buy-and-hold return for equally sized firms using the NYSE/AMEX/NASDAQ size deciles.	CRSP & Thomson Financial Insider Filings
Big4	An indicator variable that takes 1 if the firm is audited by a Big 4 auditor and 0 otherwise.	Compustat
BoardSize	Log of the number of directors at the beginning of the fiscal year.	RiskMetrics
BTM_day	Firm book value of equity at the end of the fiscal year divided by the market value of equity on the day of the trade	Compustat
Concentration	The sale of the firm divided by the total sales of the industry (2 digit SIC) in which the firm operates.	
Eindex_d	Indicator variable that takes 1 when missing values for InvEindex has been set to 0, and 0 otherwise.	
Female_exec	Indicator variable that takes 1 if a firm has a female CEO or a female CFO and 0 otherwise.	ExecuComp or RiskMetrics
Female_insider	Indicator variable that takes 1 for a female insider and 0 otherwise.	
FemaleIV	The fitted value of the female indicator from the regression: $Female_i = \varphi + \rho Gender Eq Index_i + \theta Controls_{i,t} + \tau_t + \epsilon_{1,i,t}$	
FemEmpl	Annual percentage of women to total employees for an industry in a given year as reported by the US bureau of labour statistics.	Manually collected from the bureau of labour statistics:

		https://www.bls.gov/opub/ee/archive.htm
FirmAge	The number of years since the firm's IPO.	Compustat
Gender Equality Index	U.S. state gender equality index (Sugarman and Straus, 1988). We use the more recent values of the index from Di Noia (2002).	Di Noia (2002)
Insider Gender	Takes one if the insider is female, based on the first name of the insider, 0 if male.	Social Security Administration, https://www.ssa.gov/oact/baby_names/limits.html
InstOwner	The percentage of common shares outstanding owned by institutional shareholders.	Thomson Reuters
InstOwner_d	Indicator variable that takes 1 in years for which InstOwner is missing, and 0 otherwise.	
Inv_ratio	Inventories divided by assets	Compustat
InvEindex	The inverse of the entrenchment index, based on the six provisions proposed by Bebchuk et al. (2009): staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes and supermajority requirements for mergers and charter amendments.	RiskMetrics
M&A	An indicator variable that takes 1 if the firm reports sales from mergers and acquisitions, 0 otherwise.	Compustat
Market Equity	Share price at the end of the fiscal year multiplied by the number of shares outstanding	Compustat
male_ind_50	Indicator variable that takes 1 for industry-years where male employees make up for 50% or more of total employees, and 0 otherwise.	
Male_execs	Indicator variable that takes 1 when both CEO and CFO are male, and 0 otherwise	
MWIC	Indicator variable that takes 1 if auditors' SOX 404 opinion is that there is a material weakness in internal controls, and 0 otherwise.	Audit Analytics
Overlap	Trader-firm-year level measure of the average number of years since and insider first traded the company's shares during the tenure of a particular CEO and CFO, computed as $0.5 * (\text{year} - \text{the first year the insider traded during the tenure of the CEO} + 1 + \text{year} - \text{the first year the insider traded during the tenure of the CFO} + 1)$. For example, if an insider has been overlapping with the CEO for 3 years and with the CFO for one year, the composite overlap measure becomes two years.	Thomson Financial Insider Filings and ExecuComp
PctLoss	Percentage of the most recent three years that the firm reported a loss (IB<0)	Compustat
PctSafe	The percentage of shares traded during the allowed trading window over the total number of shares traded during the period between two consecutive earnings announcements. For our annual measure, we use only the fourth quarter.	Thomson Financial Insider Filings
Post	Indicator variable that takes 1 in the years after a firm has had a transition in the CEO or CFO, 0 in the years before and missing in the year of the transition.	ExecuComp
PostTreat	Indicator variable that takes 1 for treatment firms after the transition from a male to a female CEO/CFO, 0 in the years prior to the transition and missing in the year of the transition.	
Profitability	One-year buy-and-hold return starting one day after transaction date minus the average buy-and-hold return for equally sized firms using the NYSE/AMEX/NASDAQ size deciles.	CRSP

Profit	Profitability multiplied by the dollar value of the trade	
Return	End-of-fiscal year return of \$1 invested in a firm's stock on the first day of the fiscal year (%)	CRSP
ROA	Income before extraordinary items scaled by total assets.	Compustat
Size	Log of annual market equity.	Compustat
Size_day	Log of daily market equity.	Compustat
StdRet	Standard deviation of returns during the calendar year.	CRSP
TDC1CEO	Total CEO compensation as reported by ExecuComp, multiplied by 1000 for consistency with Compustat, set to 0 when missing.	ExecuComp
TDC1CEO_d	An indicator variable that takes 1 when missing value for TDC1CEO has been replaced by 0	
TDC1CFO	Total CEO compensation as reported by ExecuComp, multiplied by 1000 multiplied by 1000 for consistency with Compustat, set to 0 when missing.	ExecuComp
TDC1CFO_d	An indicator variable that takes 1 when missing value for TDC1CFO has been replaced by 0.	
TenureCEO	Number of years since the person was appointed as a CEO, computed as the difference between the calendar year of the observation and the year when they became CEO, plus one. If the same person has been appointed CEO several times, Execucomp only records the date of the last appointment; in this case we compute tenure as the number of years since the first time the person appears as CEO in our sample.	ExecuComp
TenureCFO	Number of years since the first time the person appears as CFO in our sample, plus 1, set to 0 when missing.	ExecuComp
tenurecfo_d	An indicator variable that takes 1 when missing value for TenureCFO has been replaced by 0.	
Tone	Indicator variable that takes 1 if auditors' SOX 404 opinion is that there is a material weakness in internal controls due to key 13, i.e. "Senior management competency, tone, reliability issues" or due to key 21, i.e. "Ethical or compliance issues with personnel", and 0 otherwise.	Audit Analytics
Treat	Indicator variable that takes 1 if the firm switches from a male to female CEO or CFO during our sample period.	ExecuComp
Z-Score	Altman's Z-Score as modified by Leary and Roberts (2005) and defined as 3.3 times earnings before interest and taxes and sales plus 1.4 times retained earnings and 1.2 times working capital, scaled by total assets.	Compustat

Figure 1. Top Executive Gender and Insider Trading Behavior

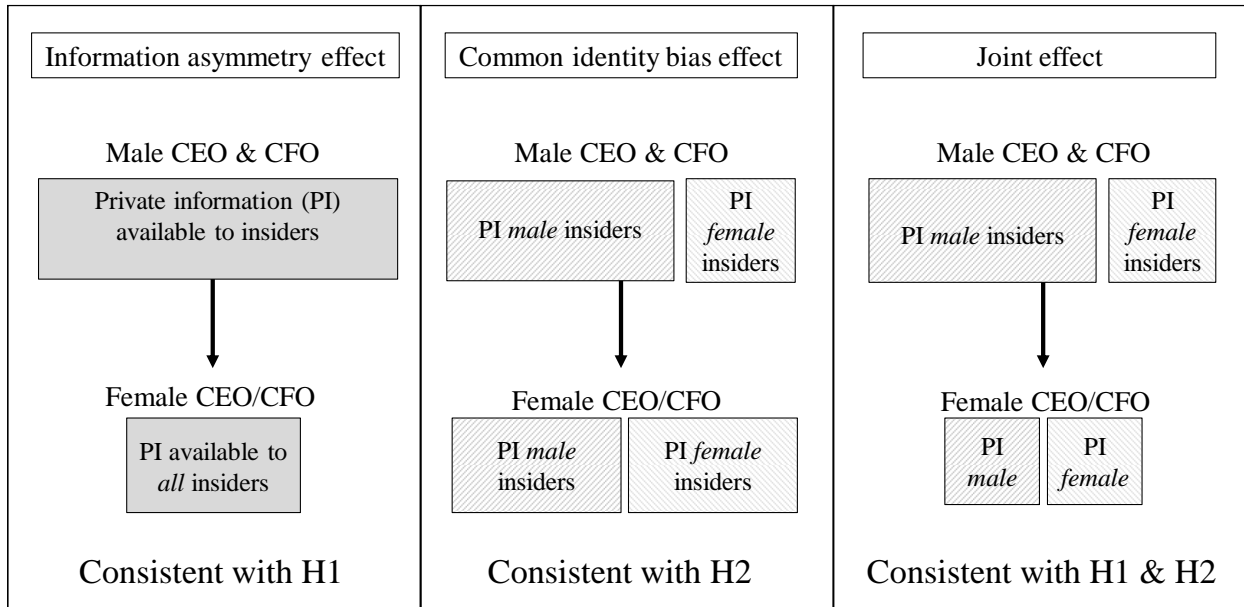


Table 1.
Summary Descriptive Statistics.

(A) Full Sample Descriptive Statistics of Profitability and Independent Variables

<i>Variable</i>	<i>Full sample - All firms</i>				<i>Full sample - Female firms</i>				<i>Full sample - Male firms</i>			
	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>
Profitability	381,912	-0.005	0.397	0.013	33,691	-0.022	0.382	-0.003	348,221	-0.003	0.399	0.015
Size_day	381,912	14.763	1.641	14.595	33,691	14.846	1.655	14.679	348,221	14.755	1.639	14.588
BTM_day	381,912	0.403	0.444	0.305	33,691	0.402	0.509	0.288	348,221	0.403	0.438	0.306
ROA	381,912	0.054	0.127	0.062	33,691	0.067	0.126	0.069	348,221	0.052	0.127	0.061
ZScore	381,912	1.763	1.719	1.87	33,691	1.937	1.467	2.036	348,221	1.746	1.741	1.856
InvEindex	381,912	-1.818	1.76	-2	33,691	-2.027	1.764	-2	348,221	-1.798	1.758	-2
InstOwner	381,912	0.576	0.323	0.68	33,691	0.574	0.34	0.687	348,221	0.576	0.321	0.68
BdIndep	381,912	0.206	0.332	0	33,691	0.215	0.341	0	348,221	0.205	0.331	0
BHARPRE	381,912	0.194	0.586	0.088	33,691	0.193	0.526	0.112	348,221	0.194	0.592	0.086
StdRet	381,912	0.027	0.014	0.023	33,691	0.026	0.014	0.022	348,221	0.027	0.014	0.023
AgeCEO	324,739	53.577	7.579	54	30,168	53.215	7.624	53	294,571	53.614	7.574	54
AgeCFO	212,669	50.632	6.654	51	21,819	49.771	6.19	50	190,850	50.731	6.697	51
TenureCEO	381,912	6.519	6.214	5	33,691	6.196	6.014	4	348,221	6.55	6.232	5
TenureCFO	304,946	3.922	3.057	3	28,191	3.756	3.115	3	276,755	3.939	3.051	3
TDC1CEO	372,901	4.255	1.000	2.098	33,099	4.925	7.858	2.357	339,802	4.189	10.200	2.080
TDC1CFO	301,563	2.065	2.900	1.297	27,848	2.110	3.021	1.394	273,715	2.060	2.888	1.285

(B) Trade Value and Profitability

	<i>Male Insiders</i>			<i>Female Insiders</i>			<i>Diff. Female vs. Male Insiders</i>	
	<i>N</i>	<i>Mean</i>	<i>Median</i>	<i>N</i>	<i>Mean</i>	<i>Median</i>	<i>t-test</i>	<i>Z-test</i>
<i>Purchases</i>								
<i>Trade Value</i>	47230	\$239,776	\$25,028	4229	\$162,225	\$17,500	0.090	<0.001
<i>Profitability</i>	47230	0.091	0.008	4229	0.074	0.016	0.041	0.547
Male CEO and CFO								
<i>Trade Value</i>	43551	\$225,335	\$25,000	3522	\$165,549	\$14,316	0.222	<0.001
<i>Profitability</i>	43551	0.091	0.009	3522	0.067	0.002	0.009	0.599
Female CEO or CFO								
<i>Trade Value</i>	3679	\$410,729	\$26,785	707	\$ 145,666	\$13,332	0.057	<0.001
<i>Profitability</i>	3679	0.089	-0.007	707	0.107	0.047	0.388	0.010
<hr/>								
	<i>Male Insiders</i>			<i>Female Insiders</i>			<i>Diff. Female vs. Male Insiders</i>	
<i>Sales</i>	<i>N</i>	<i>Mean</i>	<i>Median</i>	<i>N</i>	<i>Mean</i>	<i>Median</i>	<i>t-test</i>	<i>Z-test</i>
<i>Trade Value</i>	301393	\$986,101	\$193,408	29060	\$668,257	\$172,074	<0.001	<0.001
<i>Profitability</i>	301393	-0.019	0.015	29060	-0.027	0.002	0.001	<0.001
Male CEO and CFO								
<i>Trade Value</i>	277527	\$934,317	\$190,450	23621	\$651,462	\$163,354	<0.001	<0.001
<i>Profitability</i>	277527	-0.017	0.017	23621	-0.027	-0.001	<0.001	<0.001
Female CEO and CFO								
<i>Trade Value</i>	23866	\$1,588,263	\$230,150	5439	\$741,194	\$213,986	<0.001	<0.001
<i>Profitability</i>	23866	-0.042	-0.01	5439	-0.026	0.02	0.004	<0.001

(C) Average Annual Number of Trades by Insiders in Male and Female Led Firms

	All Insiders		High Access Insiders		Medium Access Insiders		Low Access Insiders	
	Male CEO&CFO	Female CEO/CFO	Male CEO&CFO	Female CEO/CFO	Male CEO&CFO	Female CEO/CFO	Male CEO&CFO	Female CEO/CFO
Number of insiders	7.012	6.601	8.034	7.625	6.464	6.058	7.186	6.849
T-test, p-value	0.009		0.009		<0.001		<0.001	
Number of Female insiders	0.603	1.162	0.046	0.098	0.466	0.58	0.116	0.615
T-test, p-value	<0.001		<0.001		<0.001		<0.001	
Female/Male insiders ratio	0.080	0.174	0.008	0.017	0.07	0.095	0.017	0.101
T-test, p-value	<0.001		<0.001		<0.001		<0.001	

This table presents summary descriptive statistics of the full sample. Panel A shows descriptive characteristics of the main variables for the full sample as well as separately for firms that have a female CEO or CFO and firms that have only male CEOs and CFOs. Panel B presents mean and median values of trade size in dollars and of the one year size-adjusted buy-and-hold-return of purchases and sales. These statistics are presented separately for male and female insiders trading in firms where both CEO and CFO are male and where at least one is female. Panel C presents the average of the annual number of insiders, the number of female insiders and the ratio of female to male insiders trading in firms where both CEO and CFO are male and where at least one is female. Columns (1) shows this for all insiders and columns (2-4) shows this separately for insiders with high, medium and low access to information as defined by ROLECODE1, see footnote 7. Variables defined in Appendix A. All continuous variables are winsorized at 0.5% by fiscal year.

Table 2

The effect of female top executives on insider trading profitability.

(A) Full sample

	Profitability	T-stat
Female_exec	-0.019***	(-6.316)
Size_day	0.013***	(13.505)
BTM_day	0.078***	(12.800)
ROA	-0.074***	(-6.544)
ZScore	0.002**	(2.216)
InvEindex	-0.009***	(-9.653)
InstOwner	-0.003	(-0.412)
BdIndep	-0.015	(-1.445)
BHARPRE	-.0119***	(-3.03)
StdRet	3.246***	(17.871)
AgeCEO	-0.000	(-0.781)
AgeCFO	0.001***	(2.786)
TenureCEO	-0.000	(-0.968)
TenureCFO	-0.002***	(-6.079)
TDC1CEO	0.000***	(7.607)
TDC1CFO	-0.002***	(-5.747)
Constant	-0.312***	(-10.275)
Observations	381,912	
R-squared	0.035	
<i>Dummy controls included</i>	<i>Yes</i>	
<i>Year and industry FE</i>	<i>Yes</i>	

(B) Full sample - Instrumental variable results

	First stage Female_exec	T-stat	Second stage Profitability	T-stat
Gender Equality Index	0.115***	(11.481)		
FemaleIV			-1.248***	(-7.532)
Constant	-0.003	(-0.237)	-0.240***	(-8.935)
Observations	374,278		374,278	
F-statistic	132.22			
p-value	0			
<i>Controls included</i>	<i>Yes</i>		<i>Yes</i>	
<i>Year and industry FE</i>	<i>Yes</i>		<i>Yes</i>	

(C) Male-to-Female-to-Male tests

	Profitability	T-stat
Post	0.084***	(4.242)
Constant	-0.286	(-1.213)
Observations	3,177	
R-squared	0.309	
<i>Controls included</i>	<i>Yes</i>	
<i>Year and industry FE</i>	<i>Yes</i>	

Panel A shows the main regression on the full sample where the dependent variable is the one year size-adjusted buy-and-hold-return on insiders trades. We denote by *Dummy controls* a vector of variables consisted of *Eindex_d*, *InstOwner_d*, *Bindep_d*, *AgeCEO_d*, *AgeCFO_d*, *Tenureceo_d*, *Tenurecfo_d*, *TDC1CFO_d*, *TDC1CEO_d*, *TDC1CFO_d*. Panel B shows the results of the two-stage least squares regression results based on the full sample. Column (1) shows the first-stage results, and column (2) shows second-stage profitability results. Panel C shows the effect of a female-to-male top executive change on insiders' profitability. The test is performed on the subsample of our treatment firms that have subsequently switched back to a male top executive. All continuous variables are winsorized at 0.5% by fiscal year.

Table 3

Propensity Score Matching

(A) Logit regression of likelihood to appoint a female top executive

	Treat	Z-stat
Size	0.150***	(5.982)
BTM	0.074	(0.918)
ROA	-0.249	(-0.646)
FirmAge	0.010***	(4.207)
BoardSize	-0.087	(-0.569)
Concentration	-14.557	(-0.702)
FemEmpl	0.010***	(4.317)
BoardIndep	1.309***	(3.594)
BoardIndep_d	1.001***	(3.618)
InvEIndex	0.098***	(3.383)
EIndex_d	-0.325***	(-3.148)
Return	0.003	(0.059)
Constant	-4.975***	(-10.675)
ZScore	0.058**	(2.140)
Observations	9,984	
Year FE	Yes	
LR-Chi squared	257.9	
p-value	0.0325	

(B) Difference in means between the treatment and control groups after matching

	Control	Treatment	Difference	p-value
Size	7.41	7.43	-0.02	0.91
BTM	0.44	0.51	-0.07	0.11
ROA	0.06	0.05	0.01	0.37
FirmAge	20.38	22.70	-2.33	0.18
BoardSize	1.81	1.83	-0.01	0.58
Concentration	0.00	0.00	0.00	0.75
FemEmpl	37.11	35.94	1.17	0.54
BoardIndep	0.24	0.29	-0.05	0.28
InvEIndex	-1.62	-1.82	0.20	0.34
Return	0.14	0.06	0.08	0.14
ZScore	2.05	1.91	0.14	0.40

(C) PSM DID - The effect of female top executives on insider trading profitability

	Profitability	T-stat
Post	0.085***	(10.743)
Treat	0.079***	(6.536)
PostTreat	-0.103***	(-7.600)
Constant	-0.058	(-0.450)
Observations	23,922	
R-squared	0.127	
Controls included	Yes	
Year and industry FE	Yes	

This table reports the results of our propensity score matching procedure (Panel A) and the outcome of the matched sample (Panel B). Panel C shows the effect of a female top executives on insiders' profitability on the PSM sample. z-statistics (t-statistics) indicated. Variables are measured at the end of the previous fiscal year. Errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 4

Male top executives and gender of insiders.

(A) Effect of insider gender on profitability: full sample split by gender of top executives

	<i>Male CEO and CFO</i>		<i>Female CEO/CFO</i>	
	Profitability	T-stat	Profitability	T-stat
Female_insider	-0.007***	(-3.213)	0.010**	(2.040)
Constant	-0.274***	(-8.610)	-0.301***	(-3.263)
Observations	348,221		33,691	
R-squared	0.036		0.094	
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

(B) Male top executives and gender of insiders: full sample split by gender of insiders

	<i>Male insiders</i>		<i>Female insiders</i>	
	Profitability	T-stat	Profitability	T-stat
Male_execs	0.021***	(7.265)	0.002	(0.299)
Constant	-0.311***	(-10.099)	-0.445***	(-5.554)
Observations	348,587		33,281	
R-squared	0.037		0.036	
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>		<i>Yes</i>	

(C) PSM sample - The effect of appointing a female top executive on male and female insiders' profitability

	<i>Male insiders</i>		<i>Female insiders</i>	
	Profitability	T-stat	Profitability	T-stat
Post	0.098***	(11.114)	0.053***	(2.845)
Treat	0.085***	(6.624)	0.041*	(1.913)
PostTreat	-0.120***	(-8.145)	-0.015	(-0.564)
Constant	-0.084	(-0.607)	-0.010	(-0.056)
Observations	20,871		3,051	
R-squared	0.133		0.226	
<i>Controls included</i>	<i>yes</i>		<i>yes</i>	
<i>Year and industry FE</i>	<i>yes</i>		<i>yes</i>	

Panel A shows the effect of a same-gender insider and top executive on insiders' profitability and profits. The first column uses the full sample of trades made by male insiders, and the second column shows the full sample of trades made by female insiders. T-stat are in parentheses and errors are robust and clustered at trading day level. Panel B shows the effect of female top executives on male insiders' profitability in columns (1), and of female insiders' profitability in columns (2) using the PSM sample. T-stat are in parentheses and errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 5

Executive-Insider overlap.

(A) The effect of male top executives on insiders' trading profitability split by the number of overlapping years between the insider and top executive.

	<i>Overlap = 1yr</i> Profitability	<i>Overlap = 2yrs</i> Profitability	<i>Overlap = 3yrs</i> Profitability
Male_execs	0.007 (1.062)	0.049*** (6.262)	0.080*** (8.065)
Constant	-0.287*** (-4.964)	-0.216* (-1.770)	-0.554*** (-3.680)
Observations	95,235	42,907	27,752
R-squared	0.041	0.091	0.101
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

(B) Full sample - Profitability of male insiders in male-dominated industries

	Profitability
male_ind_50	0.068*** (9.347)
Constant	-0.360*** (-11.014)
Observations	333,588
R-squared	0.038
<i>Controls included</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>

Panel A shows the effect of a same-gender insider and top executive on insiders' profitability and profits. Column 1 (2, 3) shows results when male insiders and the top executive overlap for one (two, three) year(s). The test uses all trades by male insiders. Panel B shows the effect of operating in male-dominated industries on male insiders' profitability and profits. The first column uses the main effect of the variable that captures male-dominated industries, and the second column shows the interaction effect between male top executives in male dominated industries. The test is performed on the full sample. T-stat are in parentheses and errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 6

Monitoring.

CEO/CFO effects on Financial Reporting Quality and Insider Trading Restrictions and Insiders' Profitability.

	Financial Reporting Quality		Insider Trading Restrictions	
	AbsDA_MJ	Profitability	PctSafe	Profitability
AbsDA_MJ		0.009*** (8.134)		
PctSafe				0.010*** (2.929)
Female_exec	-0.035*** (-5.924)	-0.020*** (-6.460)	-0.001 (-0.269)	-0.024*** (-6.339)
Constant	-0.059 (-0.994)	-0.300*** (-9.823)	0.421*** (12.680)	-0.275*** (-7.183)
Observations	380,897	380,512	238,960	238,825
R-squared	0.159	0.035	0.051	0.043
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

This table shows results of the analyses of two alternative monitoring mechanisms: financial reporting quality and insider trading restrictions. Column 1 (3) shows the effect of a female top executive on discretionary accruals (insider trading restrictions), and column 2 (4) shows whether profitability is influenced by including discretionary accruals (insider trading restrictions) as an additional control in the regression. The test uses the full sample. T-stat are in parentheses and errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 7

Tone at the top

Female top executive effects on Tone at the Top and Insiders' Profitability.

	(1)	(2)	(3)	(4)
	Tone_firm	MWIC_firm	Profitability	Profitability
Female_exec	-0.008	-0.095**	-0.020***	-0.020***
	(-0.086)	(-2.318)	(-6.513)	(-6.509)
Tone			-0.008	0.005
			(-0.412)	(0.247)
MWIC			0.012*	
			(1.896)	
PctLoss	0.334***	0.236***		
	(3.278)	(4.701)		
Inv_ratio	0.149	0.814***		
	(0.702)	(7.168)		
M&A	0.092	0.053*		
	(1.316)	(1.738)		
Big4	-0.514***	-0.092**		
	(-6.066)	(-2.018)		
Size	-0.022	-0.120***	0.014***	0.014***
	(-1.127)	(-10.420)	(13.089)	(12.969)
BTM	0.134***	0.161***	0.099***	0.099***
	(3.064)	(3.757)	(11.891)	(11.914)
ROA	-0.167	-0.044	-0.001	-0.001
	(-0.939)	(-0.339)	(-0.042)	(-0.043)
ZScore	0.015*	-0.005	0.001	0.000
	(1.959)	(-0.856)	(0.634)	(0.562)
InvEindex	-0.063**	-0.005	-0.001	-0.001
	(-2.247)	(-0.378)	(-0.942)	(-0.957)
InstOwner	0.319*	0.157*	0.019***	0.019***
	(1.703)	(1.919)	(2.641)	(2.627)
BdIndep	1.055	-0.129	-0.037**	-0.036**
	(1.637)	(-0.557)	(-2.192)	(-2.170)
AgeCEO	-0.006	0.003	-0.000	-0.000
	(-1.008)	(1.426)	(-0.783)	(-0.809)
AgeCFO	0.007	0.004*	0.000	0.000
	(1.105)	(1.757)	(1.496)	(1.569)
TenureCEO	-0.007	-0.003	0.000**	0.000**
	(-0.967)	(-1.298)	(2.377)	(2.410)
TenureCFO	-0.020	-0.014***	-0.002***	-0.002***
	(-1.637)	(-2.860)	(-5.850)	(-5.871)
TDC1CEO	0.004	-0.009**	-0.000**	-0.000**
	(0.698)	(-2.459)	(-2.312)	(-2.261)
TDC1CFO	0.012	-0.042**	-0.004***	-0.004***
	(1.305)	(-3.632)	(-9.510)	(-9.499)
BHARPRE			-0.011***	-0.011***
			(-2.726)	(-2.713)
StdRet			2.545***	2.547***
			(11.374)	(11.383)
Constant	-3.322***	-0.171	-0.356***	-0.354***
	(-4.824)	(-0.643)	(-6.472)	(-6.436)
Observations	13,386	13,461	217,269	217,269
Pseudo-R ²	0.045	0.050	0.049	0.049
Dummy controls included	Yes	Yes	Yes	Yes

<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
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Columns 1 and 2 show the effect of a female top executive on a firm having a reported material weaknesses of internal controls and those weakness being due to a weak tone at the top. Columns 3 and 4 show the effect of a female top executive on insider trading profitability when controlling for tone-at-the-top-weakness and material weakness in financial reports. We denote by *Dummy controls* a vector of variables consisted of *Eindex_d*, *InstOwner_d*, *Bdindp_d*, *AgeCEO_d*, *AgeCFO_d*, *Tenureceo_d*, *Tenurecfo_d*, *TDC1CFO_d*, *TDC1CEO_d*, *TDC1CFO_d*. The test uses the full sample. Robust z-statistics (t-statistics) in parentheses in columns 1 and 2 (3 and 4). Errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 8

Additional Robustness.

The effect of all male top executives on the trading profitability and profits for male and female insiders, controlling for alternative channels.

	<i>Male Insiders</i>		<i>Female Insiders</i>	
	Profitability	Profits	Profitability	Profits
Female_exec	-0.016*** (-3.713)	-0.005* (-1.856)	-0.012 (-1.582)	0.006 (1.627)
Tone	0.059*** (2.641)	0.052*** (3.606)	-0.150 (-1.015)	-0.076* (-1.704)
MWIC	-0.021** (-2.086)	-0.019*** (-2.939)	-0.011 (-0.423)	-0.002 (-0.107)
AbsDA_MJ	0.012*** (7.449)	0.006 (1.504)	0.013*** (5.117)	0.005*** (3.676)
PctSafe	0.016*** (3.845)	-0.009*** (-2.647)	0.035*** (3.867)	-0.004 (-0.873)
Constant	-0.572*** (-10.932)	-0.192*** (-6.491)	-0.811*** (-8.134)	-0.192*** (-3.784)
Observations	117,266	117,266	12,030	12,030
R-squared	0.076	0.031	0.067	0.039
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

This table shows the effect of a female top executive on insider trading profitability (columns 2 and 4) and profits (columns 3 and 5) in our subsamples of male and female insiders' trades after controlling for FRQ, TATT and ITRs measures. T-stat are in parentheses and errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.

Table 9.

Cross sectional tests.

(A) The effect of same-gender insider/top executives dyads on insider trading profitability for firms in the top quartile of R&D expenses

	<i>Male insiders</i> Profitability	<i>Female insiders</i> Profitability
Male_execs	0.016*** (3.069)	-0.028** (-2.562)
Constant	-0.489*** (-9.346)	-0.812*** (-5.821)
Observations	84,914	9,409
R-squared	0.101	0.123
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>

(B) The effect of same-gender insider/top executives dyads on insider trading profitability for illiquid firms

	<i>Top quartile Amihud Illiquidity</i>		<i>Top quintile Amihud Illiquidity</i>	
	<i>Male insiders</i> Profitability	<i>Female insiders</i> Profitability	<i>Male insiders</i> Profitability	<i>Female insiders</i> Profitability
Male_execs	0.024*** (3.508) (-1.597)	-0.032 (-1.603) (-3.096)	0.051*** (6.119) (2.049)	-0.044* (-1.755) (-2.614)
Constant	-0.346*** (-4.931)	-0.901*** (-4.487)	-0.410*** (-5.104)	-1.082*** (-4.294)
Observations	89,019	6,421	71,153	5,222
R-squared	0.047	0.120	0.057	0.142
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

(C) The effect of same-gender insider/top executives dyads on insider trading profitability for firms in the top-quartile most female-friendly states

	<i>Male insiders</i> Profitability	<i>Female insiders</i> Profitability
Male_execs	0.035*** (6.606)	
Female_exec		0.029** (2.158)
Constant	-0.784** (-2.282)	-0.364** (-2.536)
Observations	70,558	6,327
R-squared	0.064	0.115
<i>Controls included</i>	<i>Yes</i>	<i>Yes</i>
<i>Year and industry FE</i>	<i>Yes</i>	<i>Yes</i>

Panel A of this table shows the effect of both top executives being male on insiders' profitability for firms in the top quartile of R&D expenditures. Column (1) shows the full sample of trades made by male insiders, and column (2) those made by female insiders. Panel B shows the effect of both top executives being male on insiders' profitability for firms in the top quartile and quintile of illiquid stocks based on Amihud (2002), i.e. the daily ratio of absolute stock return to its dollar volume, averaged over the year. Panel C shows the effect of same-gender insiders and top executive dyads for a subsample of firms that have headquarters in states that are in the top-quartile for gender equality based on the index developed by Sugarman and Strauss (1988). T-stat are in parentheses and errors are robust and clustered at trading day level. All continuous variables are winsorized at 0.5% by fiscal year.