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Do Commonalities Facilitate Private Information Channels? Evidence from Common Gender and Insider Trading

Finance Working Paper N° 758/2021
May 2021

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ECGI Working Paper Series in Finance

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Abstract

We examine insider trading profitability and common identity between insiders and top executives. In particular, we argue that common gender and the resultant social connections it creates influence access to private information, where insiders benefit from greater information sharing with top executives of the same gender. Using a large sample of US firms between 1995 and 2016, we find higher (lower) insider trading profitability for female (male) insiders in the presence of a female CEO or CFO. We also study and find that, in isolation, other social and professional commonalities, such as common age, ethnicity, having attended the same university or having worked at the same firm also increase insider profitability, albeit to a lesser extent. Our evidence suggests that some of these commonalites, when cumulated, enhance the common gender effect. We examine formal interactions and find that attending meetings and serving on committees with top executives of the same gender enables private information sharing, consistent with common gender acting as an informational channel. We also document greater clustering of insiders' trades around the trades made by common gender top executives. Our findings are consistent with flows of private information from CEOs and CFOs to less informed common gender insiders.

Keywords: Gender, Information Asymmetry, Insider Trading, Social commonalities

JEL Classifications: G14, G34, J16, M41

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Do Commonalities Facilitate Private Information Channels?

Evidence from Common Gender and Insider Trading

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This draft: April 2021

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Abstract

We examine insider trading profitability and common identity between insiders and top executives. In particular, we argue that common gender and the resultant social connections it creates influence access to private information, where insiders benefit from greater information sharing with top executives of the same gender. Using a large sample of US firms between 1995 and 2016, we find higher (lower) insider trading profitability for female (male) insiders in the presence of a female CEO or CFO. We also study and find that, in isolation, other social and professional commonalities, such as common age, ethnicity, having attended the same university or having worked at the same firm also increase insider profitability, albeit to a lesser extent. Our evidence suggests that some of these commonalites, when cumulated, enhance the common gender effect. We examine formal interactions and find that attending meetings and serving on committees with top executives of the same gender enables private information sharing, consistent with common gender acting as an informational channel. We also document greater clustering of insiders' trades around the trades made by common gender top executives. Our findings are consistent with flows of private information from CEOs and CFOs to less informed common gender insiders.

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1. Introduction

Similarity fosters trust and connection.[1] In this paper, we study whether it matters for private information sharing. We propose and test a novel determinant of insiders' informational advantage: common identity with the CEO/CFO. We predict that commonalities between individuals influence *access* to private information and that greater information sharing occurs when insiders and top executives are similar. We examine whether differences in the information insiders receive through this commonality channel influence their informational advantage, as reflected in insider trading profitability (Aboody and Lev 2000).

Prior work does not examine whether commonalities play a role in insider trading. We shed light on this issue, adding to two strands of literature. First, we build on the common identity literature to advance our understanding on whether commonalities foster within-firm information sharing. The seminal work of Akerlof and Kranton (2000) argues that identity shapes economic behavior. This is confirmed by research showing that individuals behave differently depending on whether they perceive others to share a common identity (Alesina and La Ferrara 2002; Amore et al. 2014; Matsa and Miller 2011). Against this backdrop, we study the interplay between insider trading profitability and several commonalities, such as whether insiders have the same gender, same ethnicity, are of similar age, have attended the same university, or have worked at the same firm with top executives. This permits identifying which commonalities matter in insider-CEO/CFO information sharing.

In our main analyses, focusing on common gender provides several benefits. First, gender is a salient, largely ascribed, ex ante commonality that can be perceived without need to exchange information between the parties, nor is it related to the type of information being transmitted (i.e. company-related). Common gender is particularly salient within firms' upper echelons. This is because gender segregation in the workplace means few women populate these top management positions, making gender a more defining,

[1] McPherson et al. (2001, p. 416) define this as homophily: "the principle that a contact between similar people occurs at a higher rate than among dissimilar people." This principle can be colloquially summarized by the proverb "birds of a feather flock together." Similarities may refer to having the same gender, age or nationality/ethnicity, as well to having attended the same school or University, or having worked for the same firm (overlapping employment history). We denote such shared social and demographic charactistics as 'commonalities' and refer to them as 'common gender,' 'common age,' 'common ethnicity,' and 'common education,' respectively.

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prominent commonality. Second, gender allows us to identify common identity and to isolate it from other commonalities that may also proxy for additional social or professional background. For example, attending the same Ivy League University (common education) may also indicate a common socio-economic background. Third, while there is no conclusive evidence on how common gender influences information sharing, prior research indicates common gender influences other economic decision-making.[2] Therefore, gender is the commonality for which we expect stronger effects.

Our focus on common gender is motivated by, and allows us to add to a second strand of literature. Inci et al. (2017) document that women insiders obtain lower profitability in their trades relative to men, although this effect is attenuated when more women are present. We add to their work by proposing that common gender facilitates information sharing, fostering insider trading profitability *both* for women and men. Evidence on this information channel would explain why the presence of more women attenuates gender differences in profitability. Second, we study the role of female executives in improving corporate governance, to examine the finding of lower average insider trading profitability for women. Existing research tests the association between gender and corporate governance quality, finding mixed evidence (Faccio et al. 2016, Levi et al. 2010, Sila et al. 2016). Insider trading profitability may be a manifestation of opportunistic information usage (Skaife et al. 2013), that can be reduced by strengthening corporate governance (Ravina and Sapienza 2010; Cziraki et al. 2014). Then, if female top executives improve governance and constrain opportunism, this may explain average lower profitability.

We run four main analyses. First, we study whether common gender influences information flows and the information insiders are privy to, as proxied by their trading under common and opposite gender executives. If top executives are more willing to trust, build personal ties, and share private information with insiders of the same gender, we should observe higher profitability for trades by common gender insiders, as compared with the profitability of opposite gender insiders. Second, we look at the role of other

[2] McNeilly and Russ (2000) show that managers' perceptions of their sales representatives' performance is higher when they both have the same gender. Similarly, loan officers are more likely to lend to borrowers of the same gender (Campbell et al. 2019). Also, there is evidence on common gender effects in network building, performance evaluation, and job advancement (Bagues et al. 2017, Fang and Huang 2017, Mengel et al. 2019).

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commonalities in facilitating the information transfers that enhance insider profitability, both in isolation and in combination with common gender. Third, we explore potential channels that facilitate common gender effects by examining settings that foster insiders' interaction. Fourth, we assess whether female executives in our sample impose stronger corporate governance mechanisms.

Our tests yield the following key findings. When the CEO or CFO is a woman the profitability of male insiders' trades declines, while female insiders' trading profitability increases and tends to be higher than that of their male counterparts. Our analysis reveals a reduction in the one-year (unrealized), size-adjusted buy-and-hold abnormal returns of $15,045 for a trade at the mean value of $884,991 for male insiders, and an increase of $21,139 for female insiders on the mean value of female insider trades at $603,970, ceteris paribus. This is consistent with common gender effects in insider trading profitability for both men and women, and suggests vertical information flows exist from CEOs and CFOs to common-gender insiders with less access to information. We next study other social and contextual commonalities. In particular, we consider common education, age, ethnicity, and having worked in the same organization for several years. Consistent with evidence in Bradley et al. (2020), Cohen et al. (2010), or Hwang and Kim (2009) on the role of these ties in facilitating insider-outsider exchanges, these commonalities also foster insider trading profitability, albeit to a lesser extent than common gender. Importantly, some of them enhance common gender effects: women of the same ethnicity or with overlapping historical employment benefit more from their common identity. This is in line with the discussion in McPherson et al. (2001), that "similarity breeds connection" (p. 415), whereby connection patterns get stronger as more ties exist between two people, indicating that "homophily of each type of relation cumulates" (p. 418).

To identify the mechanisms underpinning our findings, we explore observable formal interactions. In particular, we focus on committee membership and board meeting attendance. We find that serving on the same committees as top executives of the same gender boosts insiders' profitability. Female insiders trade more profitably in years when they attend meetings with at least two other women on the committee.

Our finding of greater profitability for female insiders cannot be fully explained by female top executives disrupting the channels that facilitate trading with private information, since that would lead to

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reduced insider trading profitability for *all* insiders, both men and women. Yet, our setting permits conducting analyses to better understand if CEO or CFO gender affects corporate governance practices and/or whether this influences the gender-driven differences in the information insiders receive. We examine three governance mechanisms: financial reporting quality, insider trading restrictions, and tone-at-the-top. We find that insider trading restrictions are more likely in firms with female leadership. However, neither of these governance channels remove the effect of common gender on profitability.

Next, we analyze insiders' trading patterns. We find that male insiders' trades tend to be clustered in the days after a male CEO or CFO trades to a much greater extent than after a female CEO or CFO trades, and that the reverse is true for female insiders. This is consistent with insiders trading faster and more often after they receive private information from a common-gender top executive. When we analyze profitability from sales and purchases, we find that women's (men's) profitability stems mostly from sales (purchases). This suggests common-gender female insiders have an informational advantage when they trade on bad news, consistent with research that suggests that women are more likely to discuss tough issues (McInerney-Lacombe et al. 2008) and topics found "unpalatable by all-male boards" (Gul et al. 2011, p. 315).

Female top executives are unlikely to be randomly assigned to firms. We take two steps to alleviate endogeneity concerns. First, we use firm-fixed effects to control for unobservable firm-level characteristics that are relatively stable over time (like culture, corporate governance, and workplace practices) and may influence the selection of a female CEO or CFO. Second, we run our main tests on a subsample of insiders who trade both under male and female executives, and a subsample of individuals who are simultaneously insiders of multiple firms. Taken together, the results are consistent with our main findings. Our inferences are also robust to the use of alternative measures for insider trading that account for trade materiality.

Our study makes several contributions. First, we identify a novel channel—social commonalities, specifically common gender—that facilitates information transfers and allows for informed insider trading. Our results indicate private information flows from the top down: increased profitability and higher dollar-amount of returns mostly stem from trades of female insiders with *low* information access. We examine how and where information sharing occurs and identify practices, such as attending board meetings with

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other insiders, or belonging to the same board committees as common gender top executives, that foster information transfers. There is limited prior research informing our understanding of circumstances and channels that enable within-firm information flows.

Second, our study reveals the role of additional commonalities, and find that these commonalities positively influence profitability, albeit less than common gender. Interestingly, we find that some commonalities enhance the effect of common gender. This adds to prior work which typically focuses on school ties between executives and outsiders such as sell-side analysts, or auditors (e.g., Cohen et al. 2010; Guan et al. 2016). Our results suggest that different commonalities may matter in within-firm day-to-day interactions than in insider-outsider settings, and that context may be relevant to understand which commonalities are salient and likely to have economic consequences.

Third, we contribute to the corporate governance literature. Our results enrich the evidence in Inci et al. (2017) in that we examine the role of corporate governance. We document that while the appointment of a female executive increases the adoption of insider trading restrictions, it does not sever the common gender information channel. When we control for corporate governance improvements, we still find evidence of common gender effects. Second, our evidence sheds light on the findings in Inci et al. (2017) that, in firms with more female insiders and more trading by them, there is no statistical difference in profitability between female and male insiders. Crucially, we address what remains unknown: whether it is decreased profitability of male trades or increased profitability of female trades that underpins this result. Overall, our findings indicate that common gender benefits both men and women, and challenges the documented lower profitability of female insider trading. We expect this lower average profitability may be explained by the fact that female profitability has been measured in firms led by male executives.

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. Arif et al. 2018; Jagolinzer et al. 2011; Lakonishok and Lee 2001; Seyhun 1986). Systematically beating the market in this way suggests insiders

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use private information (Rozeff and Zaman 1988; Seyhun 1988). This raises two concerns. First, insider trading limits the gains from stock research, making it less valuable (Fernandes and Ferreira 2009). Second, the ability to generate gains from insider trading may motivate insiders to disclose low-quality information (Zhang and Zhang 2018). In response to these concerns, regulators have increased oversight of insider trading: the Sarbanes-Oxley (SOX) Act of 2002 requires insider trades to be publicly disclosed to the SEC within two business days of the trade.[3] However, these efforts have had limited success and, to date, they have not eliminated profitable insider trading (Jagolinzer et al. 2011).

We examine whether commonalities and the connections they breed, and particularly, common gender, influence the way information flows within firms. As noted, insider trading is a useful proxy for tracking information sharing, given that its profitability hinges on the existence of private information that can be traded on. Insiders' access to, and use of, private information depends on the information flows within the firm. Tracking insider trading patterns allows us to investigate whether some insiders, by developing close ties with top executives, gain better access to private information and, therefore, an informational advantage. We discuss this channel in detail next.

Social commonalities and information flows within the firm

A fundamental principle in network formation is that similarity fosters connection. Social networks can be homogenous with respect to sociodemographic characteristics such as ethnicity, age, gender, occupation, or education. In turn, connections are an important source of private information in economic settings. For example, Cohen et al. (2008) show 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. Studies in organizational psychology confirm that social ties are often built on commonalities (see, for a review, McPherson et al. 2001). Attending the same college or university, belonging to the same age group, race, ethnicity (nationality), or gender can be such ties. Prior studies have

[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).

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shown that individuals' perception of common identity with others leads to greater trust (Farmer et al. 2014; Glaeser et al. 2000) facilitating information transfers and network building.

In finance and economics, starting from Akerlof and Kranton (2000), identity (i.e. a person's sense of self) is recognized as an important driver of economic outcomes. The sense of belonging to abstract social categories, such as "male" and "female" can affect individual interactions. Consistent with this view, prior evidence indicates that individuals are more likely to favor those who are similar to themselves, for example, to recommend candidates for a job or to evaluate managers and subordinates more favorably (Baskett 1973; Pulakos and Wexley 1983). This perception of commonalities applies to gender (Akerlof and Kranton 2000), religious, language-, ethnicity-related identity (Fisman et al. 2015, Guiso et al. 2009, Ravina 2018), as well as to generational identity (Joshi et al. 2010).

Consistent with the view that commonalities may foster information sharing between firm insiders and outsiders, Cohen et al. (2010) provide evidence that sell-side analysts with a school tie to senior corporate officers outperform by up to 6.6% per year in their buy recommendations. Given that their evidence is concentrated in the period before Regulation Fair Disclosure forbade selective disclosure, Cohen et al. (2010) interpret their findings as common past attendance at the same educational institution fostering information access and thus, informational advantage. Also studying sell-side analysts, Bradley et al. (2020) find evidence that a prior common employment background between analysts and management gives analysts an advantage in acquiring and/or processing information. In contrast to this information-access explanation, Wintoki and Xi (2020) attribute to in-group favoritism their evidence that fund managers allocate more assets to firms managed by executives or directors with the same political partisan affiliation as the fund manager.

While not studied by this prior work in economics, common gender is the focus of the seminal work of Akerlof and Kranton (2000). Gender has been studied in homophily research in sociology, because it provides a number of advantages when compared with other commonalities: it is an ex ante, largely ascribed commonality that is observable. Individuals are easily aware of others' gender, without need to exchange information, making it a perfect candidate for testing how perceived identity affects economic decisions in

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the workplace. Unlike gender, traits like education, religion, or even age need an interaction primer to become aware of the commonality. Also, as noted in McPherson et al. (2001), similarity effects depend on the demography of the potential tie pool.[4] The workplace is highly segregated by gender, particularly among managers and directors (e.g. Goldin 2014). This means that, within the upper-echelons of a company, the strength of gender ties joining individuals is high, as individuals are likely aware of others of the same gender. This is expected to be particularly true for women.[5]

Albeit less studied than other commonalities, prior evidence suggests common gender effects may exist. Sales competitions boost sales growth only for stores where the manager and most workers are of the same gender (Delfgaauw et al. 2013). Loan officers are more likely to lend to same-gender borrowers (Campbell et al. 2019). Matsa and Miller (2011) find that female directors help other women reach management positions and that firms led by female CEOs perform better when the fraction of female directors increases. One potential reason for this result is that a female-friendly corporate environment "*can encourage cooperation and information exchange at the top*" (Amore et al. 2014, p. 1084). In Akerlof and Kranton (2000), common identity explains negative behavior, too, where those who do not share a common identity are mistrusted and excluded from information sharing and decision-making. This is relevant in our setting, since prior work studying managers and entrepreneurs indicates that men have more same-gender networks, especially where they are a strong majority (Ibarra 1992, 1995, 1997), as is the case in the upper echelons of firms everywhere. McPherson et al. (2001, p. 424) note same-gender patterns are particularly strong in "instrumental or status-loaded ties of advice, respect, and mentoring." Opposite-gender insiders may then not gain the same level of trust as insiders of the same gender as top executives. These personal

[4] As noted in Marsden (1987), the underlying pool of ties and its heteroegeneity, is likely to influence which commonalities are salient. Consider, as an example, a board of directors where an Italian young woman sits. If all other board members are also young women, but from diverse ethnic origins/nationalities, then, gender and age would not be salient commonalities. However, ethnicity may matter: connection with another Italian may be likely.

[5] For reference, in Cohen et al.'s (2010) study of common education and information sharing between sell-side analysts and managers and directors, around half of all analysts shared an Ivy League University connection with senior officers (43.72%) and directors (48.51%). Indeed, having attended Harvard University explained 18.53% of all connection between managers and sell-side analysts, and 18.22% of all connections between directors and sell-side analysts. In the upper-echelons of the workplace, being a woman is arguably a more salient, differentiating connection, than it is having attended Harvard University which was salient for sell-side analysts.

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ties and trust may develop through formal assignments to relevant positions and tasks, but also informal channels, such as socializing both at the office and outside, including, for example, smoking together during breaks (Cullen and Perez-Truglia 2020), playing golf, or training for marathons together. This can lead to gender differences in insiders' access to private information and therefore in insider trading profitability.

We test the generalizability of our argumentation by exploring whether other commonalities also affect information sharing, and whether sharing more than one commonality enhances the commonality effect. For instance, individuals who are both of the same gender and have graduated from the same university might build stronger ties than those who have only gender in common. To test this scenario, we collect data on ethnicity (nationality), social (education and age), and contextual (number of years spent at the same firm) commonalities. We then study how each of these commonalities influences insider trading, as well as whether they moderate the relation between common gender and insider trading profitability. These commonalities, and particularly, school ties, have been explored in some detail in prior work looking at whether common identity fosters insider-outsider information flows. The exent to which these ties matter for insider-insider information sharing, where firm selection processes may make these commonalities less salient (if most insiders share them) is an empirical question of interest.

The role of corporate governance in insider trading

Research has examined if female leadership is associated with higher corporate governance quality through the predominantly female traits of ethical sensitivity and/or risk aversion (Barber and Odean 2001; Brazel et al. 2015; Brenner 2015; Croson and Gneezy 2009; Niederle and Vesterlund 2007; Sapienza et al. 2009). The findings of this literature are inconclusive. One strand finds that female top executives are more likely to comply with rules and regulations and be prudent in financial decision-making,[6] while other studies provide compelling evidence that, after controlling for endogeneity and biases in female appointments, no

[6] Huang and Kisgen (2013) find that female CFOs issue less debt; Levi et al. (2010) show that female CEOs acquire less aggressively; Faccio et al. (2016) provide evidence that firms managed by female CEOs have less volatile earnings, lower leverage, and take less overall corporate risk.

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gender-driven differences remain (García Lara et al. 2017, Sila et al. 2016).[7] These later findings are consistent with Adams et al. (2007), Croson and Gneezy (2009), Deaves et al. (2009), and Eagly and Johnson (1990), who argue that population gender-based gaps in preferences, including risk taking and overconfidence, are not necessarily similar to gender gaps among executives.

Arguably, however, because stronger corporate governance reduces the profitability of insider trading (Ravina and Sapienza 2010; Cziraki et al. 2014), an alternative prediction to the common gender effect would be that female top executives provide better quality corporate governance relative to male top executives. Then, female executives would lower information asymmetry and reduce insider trading opportunities (and profitability) for all insiders. We also examine this channel in our tests below.

3. Sample and measurement choice

We obtain insider trading information from Thomson Financial Insider Filings from 1995–2016, and, following prior research, retain only open-market transactions, excluding stock based compensation. First, for each insider, we identify whether the trade is a purchase or a 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). For sales, we multiply this by (-1) so that, similar to purchases, higher values mean greater profitability, but in terms of avoiding losses in the year following a sale, as opposed to increased capital gains in terms of a purchase. We eliminate firms that could not be matched with the Compustat database. In cases where no data on the CEO and CFO gender is available in either Execucomp or ISS (formerly RiskMetrics), we search Bloomberg.com and retain observations for which we can identify the gender of the CEO and CFO. The gender of insiders is identified by matching the insiders' first name or middle name to the Social Security Administration's (SSA) records of names.[8] If available, we use the middle name

[7] 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. Law and Mills (2017) find no difference in corporate tax avoidance across genders, while Adams and Ragunathan (2017) show that, in the finance industry, women are not more risk-averse than men.

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

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when the first name is gender neutral. As gender is crucial to our analysis, we drop trades that are carried out by an entity rather than an individual and by individuals whose names are not available in the SSA data.

We remove observations where the transaction volume exceeds the CRSP daily trading volume and we require companies to have daily share prices available in CRSP for the day of the transaction and one year either side of the trade. Our full sample comprises 381,865 transactions (51,328 purchases and 330,297 sales) by 41,252 insiders (4,099 women and 37,156 men) in 2,586 unique US firms.

Descriptive statistics

Table 1, panel A, presents summary statistics of the main variables employed. Firms with a female CEO or CFO, on average, have higher Altman's *Z-Score*, which 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).[9] However, the evidence is inconclusive, as firms with female top executives are also larger, have higher return on assets, and appear to be 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. The average value of trades by male insiders ($884,991) is greater than that of female insiders ($603,970). This is consistent with research suggesting that female insiders, such as COOs or deputy CEOs, face a pay gap and may have lower funds available.[10] This also justifies our focus on trading profitability, rather than on the volume of trading: volume would be systematically affected by gender differences in pay, while profitability is not.

[INSERT TABLE 1 HERE]

[9] We use both the CEO and CFO gender, given that less than 9 percent of our observations have a female in either role (over 2 percent of CEOs and just under 7 percent of CFOs are female). It is extremely rare for both CEO and CFO to be female (31 firms, i.e. around 0.5 percent of our observations). Our main results hold using this subsample.

[10] Geiler and Renneboog (2015) estimate that females earn 23% less than males, and Carter et al. (2017) estimate a 15% paygap in total compensation after controlling for personal- and firm-level determinants. In our setting, the median trade is 21% smaller for women. In our sample, the average male insider is 53.06 years old, and the average female insider is 52.86, thus differences across genders are unlikely to be driven by age differences. Generally, insiders who trade are older than the CEO/CFO, suggesting trading insiders are generally experienced and have deep pockets. We look in more detail at experience as measured by overlapping employment history in the following section.

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

Table 1, panel B, shows descriptive statistics of insider trading profitability. Consistent with prior research, we find that purchases earn positive abnormal returns, while sales do not (Jagolinzer et al. 2011; Lakonishok and Lee 2001), and that profitability is greater for men than women (Hillier et al. 2015; Inci et al. 2017). When we look for preliminary evidence of common gender effects, we find that mean and median profitability of sales are significantly greater for female insiders than for male insiders when the CEO or CFO is also a woman. The same is true for the median profitability of purchases. This suggests that female insiders may trade on private information in ways similar to male insiders and that risk aversion, ethics, or both, are not driving the overall lower average profitability of female insider trading.

Table 1, panel C, shows the annual average number of insiders who trade in firms where both the CEO and CFO are male (column 1) and in firms where at least one top executive is female (column 2). Less insiders trade in firms where at least one top executive is female (6.318) than in firms where both top executives are male (6.506). Although the magnitudes are economically comparable, this may indicate female top executives reduce the opportunities to trade. Importantly, the average number of female insiders and the ratio of female-to-male insiders are greater where at least one top executive is female. Indeed, the number of females trading almost doubles (from 0.549 in male CEO/CFO settings to 1.105 in female CEO/CFO settings) and so does the ratio of female-to-male insiders who trade. This suggests that opportunities for insider trading increase with common gender. Given that information access might differ across roles, in columns (3) to (6), we split insiders into those with high and low access to private information.[11] Information sharing through informal channels should particularly benefit insiders with low

[11] We use Thomson Reuters' ROLECODE1 to classify insiders. Insiders with ROLECODE1 CO (chief operating officer), CB (chairman of the board), P (president), OD (officer and director) or H (officer, director, and beneficial owner) are classified as having high access to information, based on the findings in Seyhun (1986) that chairmen of

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information access (i.e. those who would only have access to information through that channel.) Consistent with this idea, the difference in the number and proportion of female traders is greatest for low information access insiders, suggesting that these are the female insiders who benefit the most in the presence of a female top executive. Finally, Table 1, panel D, presents the correlation matrix.[12]

4. Research design and empirical results

Main analysis

We examine whether insider trading profitability depends on top executives gender, using the following model separately for male and female 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*. We follow Skaife et al. (2013) in using a one year window to assess returns, given that Section 16(b) of the Security and Exchange Act of 1934 prevents short-term insider trading profitability, by allowing shareholders to recover any profits made by insiders that make opposite trades within six months. Academic literature has confirmed that insider trading is associated with abnormal profits over a year or more (Ke et al. 2003, Lakonishok and Lee 2001). *Female_exec* is an indicator variable taking the value of 1 when at least one of the top executives (either the CEO, CFO, or both) is a female on the day of the trade and 0 otherwise. *Controls* are observable time-varying, firm, and insider characteristics, which we describe in detail below. (See Appendix 1 for details.) Our coefficient of interest is β_1, and we predict that it is negative and significant for male insiders and positive and significant for female insiders.

Regarding *Controls*, we control for *Size_day*, the natural logarithm of market equity of the firm on the day of the trade, to account for the greater profitability of trading in smaller firms (Lakonishok and Lee 2001). This also controls for the different trading patterns that insiders of large and small firms exhibit for

boards and officer-directors trade on more valuable information than other insiders; all other insiders are classified as having low access to information.

[12] See Appendix 1 for a full description of all variables, calculations, and sources.

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purchases and sales (Seyhun 1986). As insider trades have been found to relate to book-to-market ratio (Piotroski and Roulstone 2005), we include *BTM_day*, calculated as the book value of equity at the end of the fiscal year divided by the market value of equity on the day. Piotroski and Roulstone (2005) also state that insider trading activity is associated with the firm's contemporaneous stock returns. Therefore, we control for *BHARPRE*, the buy-and-hold abnormal returns over the year 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 the influence of firm performance on insider trading, we control for *ROA*, income before extraordinary items scaled by total assets. Ryan and Haslam (2005; 2007) show that women are more likely than men to be appointed in firms with poor performance; to control for the possibility that poor performance associated with the glass cliff phenomenon affects insider trading, we include in our model Altman's *Z-Score*, computed following Leary and Roberts (2005). Given that better corporate governance reduces the profitability of insider trades (Dai et al. 2016), we control for institutional ownership (*InstOwner*, the percentage of common shares outstanding owned by institutional shareholders), board independence (*BdIndep*, the ratio of independent directors to total directors), and the entrenchment index (*InvEindex*). We also include the inverse of the entrenchment index developed by Bebchuk et al. (2009). Frankel and Li (2004) find a positive association between return volatility and insider trading volume; to account for the potential impact of return volatility on insider trading activity we include the standard deviation of returns in the calendar year of the trade (*StdRet)*. Finally, we introduce a number of CEO and CFO characteristics following Hillier et al. (2015). These authors argue that individual characteristics might influence executives' skills, abilities, attitudes and general personal style, which might affect the profitability that can be derived from trading with the company's shares. Specifically, we include the age of the CEO and CFO, their tenure within the firm, and their total compensation, as reported by *Execucomp*. Where theses values are missing, we retain the maximum number of observations by replacing missing values by 0 but include a dummy variable which takes the value 1 to indicate that this is a missing

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value and reduce bias from this replacement.[13] Finally, we include firm fixed effects (γ_j) to absorb firm characteristics that are constant over time and difficult to measure otherwise, such as corporate culture and workplace practices (Adams 2016), and year fixed effects (τ_t) to control for general annual trends.

[INSERT TABLE 2 HERE]

Table 2 presents the results for the estimation of model (1). When a top executive is female, we find significantly lower profitability for male insiders and greater profitability for female insiders (coeff.=-0.017, *t-stat*=-3.895 for male insiders, and coeff.=0.035, *t-stat*=3.350 for female insiders).[14] This corresponds to a reduction in the one-year (unrealized), size-adjusted buy-and-hold abnormal returns of $15,045 for a trade at the mean value of $884,991 for male insiders and an increase of $21,139 for female insiders on the mean value of female insider trades at $603,970, ceteris paribus. Our results are not sensitive to excluding nonroutine trades or trades by CEOs and CFOs themselves.

For both male and female insiders, we find that trading is on average more profitable in larger firms, firms with higher book-to-market ratios and return volatility, and when CEOs/CFOs have higher compensation. Male insiders' profitability is negative affected by the firm's poor financial health, as suggested by the negative coefficient of *Z-Score*. Corporate governance proxies influence only the profitability of male insiders, as suggested by the coefficients of *InvEindex*, *InstOwner* and *BdIndep*.[15]

Social and contextual commonalities and information sharing

Next, we test the role of other commonalities and whether common effects cumulate; that is, whether sharing more than one common trait (for example, having the same gender *and* age) leads to higher insider

[13] Koh and Reeb (2015) investigate the difference between missing R&D values and zero R&D values on patents and advice caution in replacing missing values by 0. Simulation analysis shows that regardless of replacing missing R&D values by 0 or industry averages, one must include a blank dummy variable to denote the missing values.

[14] Common gender effects apply both in male-male and female-female cases. Corroborating that this effect works both for men and women, we find no evidence that gender composition of insider-top executive affects short term market reactions to purchases or sales based on market adjusted cumulative abnormal returns, CAR [-1,3].

[15] This result is in line with the evidence in Garcia Lara et al. (2017) of better corporate governance in firms that have greater gender diversity in their upper echelons. It suggests female insiders have better information access and trade more in firms that are better governed, which are also more likely to appoint female CEO/CFOs. Indeed, when we compare firm-years where all insider trading is made by men to firm-years where at least one female trades, we find these latter observations have better governance, as measured by *InvEindex*, *InstOwner* and *BdIndep*.

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trading profitability relative to sharing a single commonality. We study four other commonalities both in isolation and as moderators for the documented relation between common gender and insider trading: education, generation, ethnicity (which we categorize as social commonalities) and number of years spent together at the firm (which we refer to as a contextual commonality).

We collect data on the first three commonalities from CapitalIQ and BoardEx. These databases contain information about the colleges or universities attended by individuals in our sample, as well as their year of birth. Whenever an insider attended the same college or university as either the CEO or the CFO, we label them as sharing education (*Common_university* =1). Based on their year of birth, we identify the age of insiders, CEOs and CFOs in our sample. We then mark insider-CEO/CFO pairs as belonging to the same age group (*Common_age* =1) if their age is within eight years of difference (McPherson et al. 2001).[16] Using this procedure, we are able to identify for 2,341 male and 209 female insiders whether they have attended the same college or university with a CEO or CFO, and for 18,290 male and 2,127 female insiders whether they belong to the same age group as the CEO or CFO. Data on ethnicity is only available in BoardEx, which implies that we can only identify this trait for director insiders and the CEOs and CFOs. To retain as much data as possible, we take two steps in collecting this information. First, we identify CEOs, CFOs and those insiders with Boardex coverage on individual characteristics. Second, we use all the US BoardEx available data to create a dictionary of surnames and their corresponding ethnicities. Whenever a surname was associated to more than one ethnicity, we retained the most frequent one, and when we could not identify the most likely ethnicity (i.e., the surname "Smith" appears in 10 instances as British and in 10 instances as American), we drop that surname from the database. Using these inferred ethnicities, we match the remaining unidentified insiders. We are able to identify common ethnicity with either the CEO or the CFO for 9,304 male and 1,054 female distinct insiders.

[16] We follow McPherson et al. (2001) who suggest most social ties are within eight years of age difference. The results are qualitatively similar when we use six years age difference to identify age groups.

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For consistency among tests specification, we define the variable *Common_gender* to take the value 1 when the insider and the CEO/CFO are of the same gender,[17] and 0 otherwise. Column 3 in table 2 reports the results obtained for *Common_gender*. Consistent with our prediction, we find a positive and significant coefficient (coeff.=0.006, *t-stat*=3.256), consistent with common gender increasing profitability for both men and women. Panel A of table 3 shows correlation coefficients among the four social commonalities considered, which are low. This is encouraging, as it suggests low overlap of these social aspects, increasing the generalizability of our results.

[INSERT TABLE 3 HERE]

We also test whether insiders' profitability increases with overlapping tenure in the firm. People may trust individuals more when they have interacted longer with them (Alesina and La Ferrara 2002; Coleman 1994). Unlike *social* commonalities, which give an immediate sense of belonging to a social group (and are constant over time), this overlapping contextual commonality, by definition, needs time to enhance profitability and is likely to become more relevant over time. A potential scenario is that other commonalities prime an interaction between insiders and executives, and the time spent together at the firm enhances this relation. We therefore examine whether profitability increases with every additional year insiders spent together in a company where they share a social commonality with the top executives.

We estimate a regression model where the dependent variable is insider trading profitability for the subsample with available data regarding a particular social commonality at a time. We include the same controls as in our main analysis. Panel B of table 3 suggests that common age (coeff.=0.022, *t*-stat=4.865) and common ethnicity (coeff.=0.031, *t*-stat=2.714) are associated with more profitable insider trading. This corresponds to an increase in the one-year (unrealized), size-adjusted buy-and-hold abnormal returns of $18,938 for a trade at the mean value of $860,829 by insiders of the same age group as the CEO/CFO and $26,686 for those of the same ethnicity as the CEO/CFO, ceteris paribus.

[17] *Common_gender* = 1 for male insiders when both CEO and CFO are male, as well as for female insiders when at least one of the CEO or the CFO is a woman.

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Next, we add to the model in equation (1) the interaction between *Female_exec* and each of the other commonalities.[18] In all cases, the main effect of gender is retained. This suggests that common gender has a key role in insider-insider information sharing, which seems more pervasive than that of other commonalities. For instance, having attended the same university as the CEO/CFO does not influence the profitability of insiders beyond the effect of common gender. On average, male insiders from the same age group trade more profitability as suggested by the evidence in column 3 of panel C, table 3 (*Common_age*=0.024, *t*-stat=8.000). For female insiders, the opposite is true (coeff.=-0.021, *t*-stat=-2.100). However, when there is a female CEO or CFO, we do not find evidence that common age as an additional commonality fosters information sharing for either gender (coeff.=0.005, *t*-stat=0.597 for male insiders, coeff.=-0.005, *t*-stat=-0.209 for female insiders). Finally, we find that having the same ethnicity only increases the profitability of female insiders when there is a female CEO/CFO.

The stronger evidence for the common gender channel is consistent with our argumentation that gender may be a more salient commonality in firms' upper-echelons than other commonalities, fostering greater trust and connection, particularly for women.

To further exploit the effect of an additional commonality beyond gender on information sharing, we investigate the average marginal effects of each of the additional social commonalities. Figure 1 reveals some important insights: individuals that have both gender and education in common with the CEO/CFO register a profitability of 14.55 percentage points higher than same-gender insiders without a common education tie. Profitability is greater by 5.7 percenage points for insiders with common gender and common ethnicity relative to common gender insiders; and trades by insiders with both common gender and common age have a profitability 1.1 percentage points higher than insiders with only gender in common. Taken together, our evidence is suggestive of the additive nature of social commonalities.

[INSERT FIGURE 1 HERE]

[18] To retain a similar number of observation as in our main specification, in the regressions from panel C, table 6 each of the additional commonalities variables is replaced by the value zero when missing.

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Next, we study the effect of overlapping employment history on the relation between each social commonalty and insider trading profitability. We calculate the number of years of overlap between each insider and the CEO and CFO of the firm. We then compute an insider trader-firm-year overlap measure as the average of the number of years of overlap that an insider has with both the CEO and the CFO. Panel D of table 3 suggests that common gender effects grow over time. For the other commonalities, there are no clear patterns. We find evidence of higher profitability concentrated in the second year of overlap between insider and top executive (coeff.=0.117, *t*-stat=2.331 for university, coeff.=0.039, *t*-stat=2.408 for age group, and coeff.=0.102, *t*-stat=2.794 for ethnicity).

[INSERT FIGURE 2 HERE]

Figure 2 depicts the average profitability of male and female insiders separately as a function of the gender of the CEO/CFO and the number of years of overlap in the company. In both panels, dark grey is used for same-gender insider-top executives, and light grey for opposite-gender analyses. With every year when the CEO/CFO is a female, the average insider trading profitability of male insiders decreases, while that of female insiders increases. With every year when the CEO and the CFO are both male, women's trading profitability decreases even more. For male insiders and male CEOs and CFOs, which represent most of the sample, the profitability increases in the second year of tenure.

Information sharing via formal interactions

Our results so far indicate that insiders' access to private information depends on common gender with top executives. Next, we explore the channels that may facilitate information sharing. We first assess the role of observable formal interactions. To this end, we explore the extent to which insiders serve on committees and attend meetings together. We obtain data on meeting attendance and committee membership from ISS. We have data on members of the nominating, corporate governance, compensation, audit committees, or a combination of these. In less than 0.02% of cases a female insider sits on the same committee as a female CEO or CFO. We therefore restrict the common gender analysis to whether the insider serves on the same committee as a male executive. We generate *Any_overlap_mexec*, which takes the value of 1 if the insider

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serves on the same committee as a male CEO or CFO in the year of the trade and 0 otherwise. Since boards and committees may not change every year and firm fixed effects would absorb precisely the effect that we are trying to capture, in this specification, we include industry (4-digit sic code) and year fixed effects.

[INSERT TABLE 4 HERE]

Results are tabulated in Table 4, panel A. We find that serving on the same committee as a male CEO or CFO is associated with significantly greater profitability of male insiders' trades (coeff.=0.014, *t*-stat.=2.684) and lower profitability of female insiders' trades (coeff.=-0.032, *t*-stat.=-1.752). This result for female insiders is surprising and consistent with more extreme common gender bias. A plausible explanation is that committees may require a gender balance and include women out of necessity to comply with corporate policy, in which case women serving on the committee may be singled out as 'intruders' and excluded from informal networks. We include the variable *Female_exec* in columns 2 and 4 and find that our main result—that trading profitability decreases for male insiders and increases for female insiders when either the CEO or CFO is female—holds in this subsample. Including this control removes the negative effect of serving on a committee with a male CEO or CFO for female insiders. This is consistent with our argumentation on the benefits of proximity to the CEO or CFO for obtaining private information.

We also examine the profitability of insiders serving on the same committee as at least one female board member. The results are reported in Table 4, panel B. Our variable of interest is *More_fem*, which takes the value of 1 if there is another female serving on the same committee and 0 otherwise. We find a negative and significant association (coeff.=-0.007, *t*-stat=-1.780) for male insiders, and positive and significant for female insiders (coeff.=0.017, *t*-stat.=1.725), substantiating the argument that more women on a committee reduces information sharing among men and facilitates it among women.

Finally, we use this data to assess the trading profitability of insiders who attend meetings with more women. We generate a variable, *More_fem_meeting*, that takes the value of 1 if there are at least two other women in attendance (in addition to the insider) and 0 otherwise. Our results are presented in Table 4, panel C. We find higher profitability for women (coeff.=0.054, *t*-stat.=4.612). There is no such result for male insiders (coeff. 0.006, *t*-stat. = 1.582), consistent with this being an information channel between women.

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There are no significant results if we redefine this variable to identify the case when there is only one more woman at the meeting. This result comports with the literature that suggests a minimium of three women should be present in boards to have economic impact (Torchia et al. 2011). However, a critical mass in decision-making might not be needed (Adams 2016). We interpret our findings as suggesting a network effect that allows information sharing among common-gender insiders, rather than a critical mass for female board members to have a voice on the board. Taken together, these results indicate that profitability of insider trading is affected by formal proximity to people with private information of the same gender.

Female executives and corporate governance

Prior literature finds that female leadership, or gender diverse leadership, is associated with higher corporate governance quality, which manifests as less frequent cases of fraud (Cumming et al. 2015), greater conservatism in financial reporting (Ho et al. 2015) and, important to our setting, higher financial reporting quality (Barua et al. 2010; Abbott et al. 2012; Francis et al. 2015). Since stronger corporate governance reduces the profitability of insider trading (Cziraki et al. 2014, Ravina and Sapienza 2010), we explore whether female top executives provide better quality corporate governance relative to male top executives, lowering information asymmetry and reducing insider trading opportunities.

First, we regress profitability on both whether the CEO or CFO is female and the insider is female, as well as the interaction between the two, as in equation (3). This allows us to determine the overall effect of female leadership on insider trading profitability as well as whether men and women insiders generally make different profits on their trades in addition to the common gender effect.

$$Profitability_{i,j,t} = \mu + \beta_1\, Female_exec_{j,t} + \beta_2\, Female_insider_{i,j,t} + \beta_3\, Female_exec \times Female_insider_{i,j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \quad (3)$$

The results are presented in Table 5, Panel A. The negative, significant coefficient on *Female_exec* (coeff.=-0.026, *t*-stat=-7.946) indicates that the presence of a female CEO or CFO is indeed associated with lower overall insider trading profitability, consistent with a potential corporate governance improvement associated with female top executives. This corresponds to a decrease in the average profits (unrealized

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size-adjusted abnormal buy-and-hold returns) of $22,382 for the mean size trade, ceteris paribus. Female insiders also appear to trade less profitably than men (coeff.=-0.009, *t*-stat=-4.178), consistent with prior research (Hillier et al. 2015, Inci et al. 2017). This corresponds to lower average profits of $7,747. However, this latter effect disappears when including firm-fixed effects. The positive and significant coefficient for the interaction term (coeff.=0.029, *t*-stat=5.282) corresponds to an increase of $24,964 on the average trade and shows that the lower profitability associated with female executives and insiders, are, at least partly, mitigated by the positive effect of common gender.

Next, we look at three potential channels through which the effect of female leadersip on corporate governance may manifest. Specifically, we study whether, in our setting, female top executives are associated with: (1) improved financial reporting quality, (2) greater use of firm-level insider trading restrictions (ITRs), and/or (3) improved tone-at-the-top.

If female CEOs and CFOs improve financial reporting quality (Barua et al. 2010, Francis et al. 2015), this may limit information asymmetry and decrease 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). Gender differences may also exist in the adoption of 'blackout periods.' Insider trading restrictions (ITRs) prevent insiders from trading before important events for the firm, e.g. earnings announcements (Bettis et al. 2000). We therefore examine whether female top executives are more likely to implement ITRs. Finally, we explore whether female CEOs and CFOs set a different tone-at-the-top, as top management behavior influences employees' behavior (Jong and Hartog 2007, Starke 2012).[19] The work of Skaife et al. (2013) finds a link between material weaknesses due to a weak tone-at-the-top and insider trading profitability. Also along this line, the work of Gao et al. (2017) is consistent with female directors being more vigilant

[19] Bushman et al. (2018) finds that CEOs drive banks corporate culture and shows that employees with materialistic CEOs are more likely to exploit insider trading opportunities. More materialistic executives also promote a looser control environment thereby increasing the probability of insiders perpetrating fraud (Davidson et al. 2015).

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about ethical standards, compared with male directors. Thus, it is plausible that female top executives set a stronger tone-at-the-top that permeates throughout the organization, affecting insider trading behavior.

To examine these alternative effects, we analyze the effect of female top executives on each of these constructs. Specifically, we estimate the following regression:

$$X_{j,t} = \mu + \beta_1 \, Female_exec_{j,t} + \delta \sum Controls_{j,t} + \gamma_j + \tau_t + \varepsilon_{j,t} \quad (4)$$

Where $X_{j,t}$ is either the measure of financial reporting quality, ITRs, or tone-at-the-top. To measure low financial reporting quality (*Low_FRQ*), we use the absolute value of annual abnormal discretionary accruals estimated using the modified Jones (Dechow et al. 1995) model; higher abnormal discretionary accruals indicate lower financial reporting quality. To measure the adoption of ITRs, we follow Roulstone (2003) and use insider trading timing. The higher the percentage of trades executed in the short period of the allowed trading window (i.e., on average, 30 days following quartely earnings announcement), the more restricted insider trading is considered to be. Specifically, if 70% or more of all insider trades in the year take place in allowed trading windows, ITR takes the value of 1, and 0 otherwise. Finally, to compute tone-at-the-top (*TATT*), we obtain auditors' SOX 404 opinions from Audit Analytics. Following Skaife et al. (2013), we collect annual data on material weakness in internal controls and set *TATT* to 1 if there is a weakness due to key 13, "*Senior management competency, tone, reliability issues*" or key 21, "*Ethical or compliance issues with personnel*," and 0 otherwise.[20] The vector of controls includes the previously described controls, but we use yearly instead of trade-day values for size and book-to-market and we remove *BHARPRE* and the standard deviation of returns, as these relate only to insider trading profitability. In the *TATT* test, we follow Skaife et al. (2013) and additionally control for determinants of material weakness including *Big4* (set to 1 if the company is audited by one of the Big4 accounting firms), *M&A*

[20] 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. In line with Skaife et al. (2013), for *TATT* analyses, we include in model (3) a set of controls 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 firms uses a big four auditing firm (*Big4*).

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(equals 1 if the firm reports sales from mergers and acquisitions), *Inv_ratio* which is inventories divided by total assets, and *PctLoss* which is the percentage of the most recent three years that the firm reported a loss. We include industry fixed effects (γ_j) and year-fixed effects (τ_t), to control for industry standards and external regulations/trends affecting these corporate governance measures.

[INSERT TABLE 5 HERE]

Table 5, panel B, column 1 presents the result of estimating the effect of female top executives on discretionary accruals. Panel C, column 1 presents the results of a probit model regressing the likelihood of a firm having ITRs in place on the presence of a female top executive. Finally, panel D, column 1 presents the results of a probit model regressing tone-at-the-top on the presence of a female top executive. Overall, we only find support that female executives are associated with greater use of insider trading restrictions. Next, we test whether controlling for these specific factors have an impact on our main findings by regressing profitability on the gender of the executive and insiders as in equation 3, additionally controlling for these corporate governance mechanisms.

As shown in column 2 of Table 5, panel B, greater absolute discretionary accruals are associated with greater insider trading profitability (coeff.=0.009, *t*-stat=8.173). However, this does not seem to be driven by the gender of the executive and does not subsume neither the general effect of executive gender, *Female_exec* (coeff.=-0.027, *t*-stat=-8.087), nor the common gender effect, *Female_exec* × *Female Insider* (coeff.=0.029, *t*-stat=5.295). Panel C, column 2, shows that ITRs have a negative effect on insider trading profitability (coeff.=-0.003, *t*-stat=-1.701), but again, controlling for ITRs adoption does not remove the general effect of executive gender, *Female_exec* (coeff.=-0.029, *t*-stat=-7.481), nor the common gender effect, *Female_exec* × *Female_Insider* (coeff.=0.015, *t*-stat=2.282). Finally, as reported in Panel D, column 1, we do not find evidence to suggest that female CEOs/CFOs affect tone-at-the-top, however, as shown in column 2, reporting on tone-at-the-top violations seems to constrain insider trading profitability (coeff.=-0.043, *t*-stat=-2.095). This suggests that insiders are more wary of scruitiny given such an audit opinion and avoid trading on private information. Controlling for material weaknesses due to tone-at-the-top does not alter the main inferences, *Female_exec* (coeff.=-0.025, *t*-stat=-7.355), *Female_exec* × *Female_Insider*

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(coeff.=0.022, *t*-stat=4.078).[21] Taken together, our main inferences hold, and are consistent with common gender being a social commonality that facilitates information sharing whether or not women improve corporate governance quality.

Endogeneity tests

To alleviate endogeneity concerns, we take the following steps.[22] First, we include insider fixed effects in our main specification. This allows us to control for the trading patterns of the same individual over time. Any differences that remain likely relate to whether the company is led by male versus female executives. We re-estimate model (1) with insider fixed effects, in addition to the previously included year and firm fixed effects. The results in Table 6, panel A, lead to similar inferences: male insiders trade less profitably when at least one of the top executives is a female, while female insiders trade more profitably (coeff.=-0.036, *t*-stat=-6.889 for male insiders and coeff.=0.026, *t*-stat=2.044 for female insiders).

[INSERT TABLE 6 HERE]

Second, we explore our results on a subgroup of insiders that engage in insider trading under two different top executives. We retain only firms that change CEO or CFO during our sample period, and identify the group of individuals who trade both before and after the executive change. Any differences in the way the same insider trades between the two periods likely relate to the change itself, which allows us to hold the group of traders constant and exploit variation in insiders' trading patterns when changing the top executives of the firm. We estimate equation (1) for this subsample, including firm and year fixed effects. The results are reported in Table 6, panel B, and support our main results (coeff.=-0.047, *t*-stat=-3.490 for male insiders, and coeff.=0.066, *t*-stat=1.656 for female insiders).

[21] Given the sticky nature of the corporate governance mechanisms, we include fixed effects on the year and industry-level, as firm-fixed effects would likely subsume the variation we are attempting to measure. However, when including firm-fixed effects, corresponding coefficients are, when controlling for Low_FRQ: *Female_exec* (coeff.=-0.014, *t*-stat=-3.222), *Female_exec* × *Female Insider* (coeff.=0.013, *t*-stat=2.508), for ITR: *Female_exec* (coeff.=-0.033, *t*-stat=-6.465), *Female_exec* × *Female Insider* (coeff.=0.007, *t*-stat=1.089), and for TATT: *Female_exec* (coeff.=0.011, *t*-stat=2.129), *Female_exec* × *Female Insider* (coeff.=0.011, *t*-stat=1.943).

[22] Our main inferences are also robust to applying a difference-in-differences methodology, in which we compare insiders' profitability in firms that appoint a female executive with firms that appoint a male executive, using a propensity-score-matched sample (see Appendix 2).

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Third, unobservable shifts in corporate governance or corporate culture that spuriously coincide with the presence of a female top executive could be a potential source of endogeneity. We examine if this is the case by studying those firms in our sample that in one period have both a male CEO and CFO, followed by an appointment of either a female CEO or CFO, and then switch *back* to having both male CEO and CFO. Specifically, we check whether insider trading profitability reverses (i.e. increases for male insiders and decreases for female insiders) following the switch back to male CEO and CFO. If the change in insiders' profitability depends on 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, there is no reason to expect any change in insiders' profitability after one more executive switch. However, a reversal would support the idea that top executives' gender is associated with insiders' trading profitability. We retain the interval of four years before and four years after the switch and estimate the following regression on the sixty-three firms that meet these criteria.

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

The coefficient of interest is β_1. We predict that it is positive for male insiders and negative for female insiders. Results are reported in Table 6, panel C, and suggest that, after a male is appointed as top executive following the tenure of a female top executive, insider trading profitability increases for male insiders (coeff.=0.052, *t*-stat=2.247), while female insiders' profitability decreases (coeff.= -0.079, *t*-stat=1.692). These findings support the existence of the common gender effect.

5. Additional analyses

Who trades, what information they trade on, and when

We examine three more aspects regarding information sharing: which insiders benefit most from common gender information sharing, whether there are any differences between the type on information male and female insiders trade on, and what is the timing of insiders' trading relative to that of the CEO/CFO.

The greater profitability we have documented may be driven by better access to information through a channel other than common gender. For example, common gender insiders may be promoted to positions

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with more information access following the appointment of a new CEO/CFO. To mitigate this concern, we control for different levels of information access among insiders. Prior studies establish differences in trading profitability among insiders. Ravina and Sapienza (2010) shows that executive officers earn greater abnormal returns than independent directors. Inci et al. (2017) shows higher profitability for top executives, officers, and directors, in that order. Chen et al. (2018) shows that the profitability of trades by headquarters managers and divisional managers are different due to internal information asymmetry. To better grasp the extent to which common gender benefits different insiders, as in Table 1, we split insiders depending on their access to information into high and low access, according to ROLECODE1. We estimate model (1) separately for each of these groups.

[INSERT TABLE 7 HERE]

The results presented in Table 7, panel A, suggest that when the CEO or CFO is a female, both high and low access male insiders have lower profitability. We find no change for high access female insiders. Trades by female insiders with low access to information have higher profitability. If low-access insiders know and trade on private information, they likely did not have access to it because of their position within the firm, but because this information has been shared with them. The evidence in Table 1, panel C, supports this conclusion and suggests it is females with low information access who benefit more in common gender settings. At the same time, the fact that high-ranked female insiders do not trade more or less profitably under a female CEO or CFO reinforces the view that it is information beyond that received via role-driven information access that drives enhanced profitability. Higher litigation risk associated with trading on private information when holding higher positions in the company could also help explain this result.

Common gender effects exist both for men and women. However, the literature suggests that men and women share information differently. Further, gender might be a stronger identification factor for men than for women. For example, Cullen and Perez-Truglia (2020) show that male employees in a financial institution are promoted faster if the manager is also male, contributing to a third of the gender pay gap in the financial institution. Mengel (2020), in a lab experiment, shows that men and women network similarly but that male decision-makers reward men in their network more favourably with earnings and promotions.

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Campbell et al. (2019) show that male lenders are more likely to give loans to male borrowers based on soft information than female lenders to female borrowers. Also, men could benefit more from their professional networks than women (Fang and Huang 2017, Forret and Dougherty 2004, Ibarra 1992), and there is evidence that men evaluate other men less harshly in settings such as promotion committees or performance evaluations (Bagues et al. 2017, Grunspan et al. 2016, Mengel et al. 2019). To understand if differences exist in information sharing between men and women, we separately analyze purchases and sales. Distinguishing between them could evidence differences in the *type* of information that different insiders share, with insider purchases and sales identifying flows of private good and bad news information, respectively (e.g. Khalilov and Garcia Osma 2020). Prior work suggests, but does not test, that men and women mshare different types of information, with women being more likely to discuss tough issues (Gul et al. 2011; McInerney-Lacombe et al. 2008). If this holds, female insiders, through their communication with female top executives, may become particularly well-informed about bad news (economic losses), relative to their male counterparts, and trade more profitably on bad news than on good news. Results in Table 7, panel C, indicate that both men and women insiders reduce their purchases profitability in years when top executives are female. Interestingly, male and female insiders exhibit different trading patterns when it comes to sales: while male insiders register losses, female insiders profit from them—i.e. use private information to avoid losses—systematically anticipating bad news and stock price declines. This evidence is consistent with the aforementioned literature that suggests that females are more likely to share negative information and reinforces our findings of differential information flows between men and women.

Regarding the *timing* of information sharing between insiders and executives, while we cannot directly observe the information exchange, we can track trading patterns to infer timing. We graphically depict the number of days between trades made by insiders and those made by the CEO or CFO. If top executives share private information within the firm, insiders privy to this information are likely to trade shortly after trades made by the CEO or CFO. Therefore, if there is a common gender effect, we should observe clustering by gender around the trades of top executives. To understand whether this is true, for

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each firm and year, we identify all trades made by the CEO or CFO and track the trades made by all other insiders during the first three, seven, 11, and 15 days following the top executive's trade.

[INSERT FIGURE 3 HERE]

In Figure 3, the left (right) panel shows the average cumulative percentage of trades made by male (female) insiders, relative to the total annual number of trades in a firm. In each panel, we compute this measure separately based on trades that follow trades by male and by female top executives. Male insiders perform 19.57% of the total annual trades during the first three days following the trade of a male top executive. This percentage falls to 18.3% when the top executive is a female. Strikingly, the pattern is reversed for female insiders: they make 6.89% of the total annual trades during the first three days following the trade of a male top executive, and this percentage increases to 7.62% when the top executive is female. These percentages indicate that trades by female top executives shift female insiders' behavior to a greater extent (a 10.6% relative increase *versus* 6.5% for male insiders). This suggests that, in our setting, common gender effects among women may be more relevant than among men, perhaps due to the low absolute numbers of female insiders and top executives, which may enhance the importance of these relationships. Another observation from Figure 3 is that, for all insiders, the number of trades decreases over time. This pattern is consistent with insiders trading quickly after they receive private information from a top executive—and more so if they are of the same gender as the top executive.

Overall, these results are consistent with common gender effects. Results are robust to a number of alternative specifications and robustness checks, as well as to using reduced samples where we eliminate nonroutine trades or focus on settings with new information, such as stock splits (see Appendix 3).

Robustness tests

Hillier et al. (2015) and Inci et al. (2017) report that female insiders trade less profitably than male insiders. In this section, we explore whether such a result could be driven by the low number of female top executives and fewer opportunities to share information with female insiders. We split the full sample based on the gender of top executives and estimate the following model for each of the subsamples.

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$$Profitability_{i,j,t} = \mu + \beta_1 \, Female_insider_{i,j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \quad (6)$$

where all variables are as previously described. The results are presented in Table 8, panel A. We observe that women tend to trade less profitably than men only when the CEO and CFO are male (coeff.=-0.008, *t*-stat=-3.548); the result is reversed in firms with a female CEO or CFO, where women tend to obtain significantly higher profitability relative to male insiders (coeff.=0.010, *t*-stat=1.902). Given how few women are appointed to top executive positions, this likely explains findings in previous studies that document lower profitability for female insiders, thereby reporting an average effect as they do not split their samples by common gender with executives.

Second, we test whether our main findings hold for the small subsample of firms that have women appointed as both CEO and CFO. Most firms in our sample that have a female CEO or CFO have a male appointed for the other top executive position. If our results is triggered by the presence of the male, and not of the female top executive, then our main findings would disappear for firms that appoint women in both positions. *Post_FemaleDuo* is an indicator variable that takes the value one starting the year when both the CEO and CFO are women. Despite the small sample size (31 firms), our main results for female insiders remain the same, as can be seen in Table 8, panel B.

[INSERT TABLE 8 HERE]

Finally, we exploit heterogeneities in women employment by industry. Occupational research studies show that those in a minority in their workplace might be isolated from social interactions at work (Bergman 2008, Taylor 2010). In settings with more female employees, women inclusiveness may be facilitate, as well as the creation of information sharing channels among same-gender individuals. We manually collect the annual percentage of women to total employees by industry as reported by the US Bureau of Labor Statistics to identify the median percentage of female employment, which for our sample is 35.3% of total employees.[23] The industries with the lowest female employment ratios to total employees are mining (4.77%), railroads (9.23%) and construction and electrical work (9.35%), while health services (78.8%),

[23] Data available at https://www.bls.gov/cps/lfcharacteristics.htm#occind, accessed March 2021.

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banking (74.67%) and retail for clothing (72.08%) have the highest percentage of female workers. Each firm-year observation is then allocated to a group depending on whether its female employment levels are below- or above-median. With this partition, we re-estimate equation (1). As Panel C, table 8 shows, we find that male insiders' profitability is negatively associated with the presence of a female CEO or CFO, irrespective of whether the firm belongs to the low or high female employment group. This suggests that having a female CEO or CFO cuts information sharing channels for male insiders. When analyzing the female insiders subgroup, their profitability is higher when there is a female CEO or CFO, but only in high female employment industries. This reveals that a higher representation of females in companies boosts information sharing among them.

6. Conclusion

We examine gender-driven differences in within-firm information sharing and identify common gender as an important determinant of insider trading profitability. We find a decline in the profitability of male insiders' trades and an increase in that of female insiders when the CEO or CFO is female, consistent with common gender effects. Other commonalities between top executives and insiders matter also. Common education, age, ethnicity, and having worked in the same organization for several years also appear to foster information sharing, and insider trading profitability, albeit to a lesser extent than common gender. Importantly, some of these commonalities enhance the common gender effect: women of the same ethnicity or with overlapping historical employment particularly benefit from their common identity.

In terms of gender-driven differences in corporate governance, we find female top executives are more likely to impose insider trading restrictions, a measure that appears effective in reducing insider trading profitability, yet when we control for this effect in our tests, we still observe that female insiders achieve greater trading profitability when there is at least one woman among the CEO and CFO. This suggests gender affects both access to information via common gender and other commonalities, and that it limits using that information to extract rents from other shareholders via corporate governance.

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To pinpoint the mechanisms for information sharing, we explore observable formal interactions. We find that serving on the same board committees with common-gender insiders boosts insider trading profitability. Having more women on a committee appears to reduce information sharing among men and facilitate it among women. Women also earn higher profitability in years when they attend meetings with at least two more women, while there is no such result for male insiders. Female insiders appear to benefit in particular from bad news information flows, as reflected by increased profitability from insider sales. This is consistent with the literature suggesting female directors are more likely to discuss tough issues.

Male insiders' trading tends to be clustered in the days after a male executive trades to a greater extent than after a female executive trades, and the reverse is true for female insiders. Although not the only explanation, this pattern is consistent with insiders trading quickly after they receive private information from a top executive of the same gender.

Taken together, we provide empirical evidence of the existence of a novel channel that facilitates vertical information flows and within-firm information sharing, namely, common gender. These results reveal real economic consequences resulting from differential access to information, relevant to both investors and regulators. Our results contribute to existing research by identifying potential routes for information sharing and, also, by questioning the findings of lower female insider profitability. While we use the population of female CEO/CFOs and insiders, the increasing trends of female participation in top management teams and boards of directors no doubt brings about future opportunities for research on information sharing and further exploring common identity effects, once more women populate leadership roles. Finally, our results have implications for empirical research, given that by explaining firms' heterogeneity solely by firm characteristics, one may miss individual attributes, such as common gender, which are clearly important determinants of the observed differences insider trading profitability.

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Figure 1. The moderating effect of social commonalities on the relation between common gender and insider trading profitability

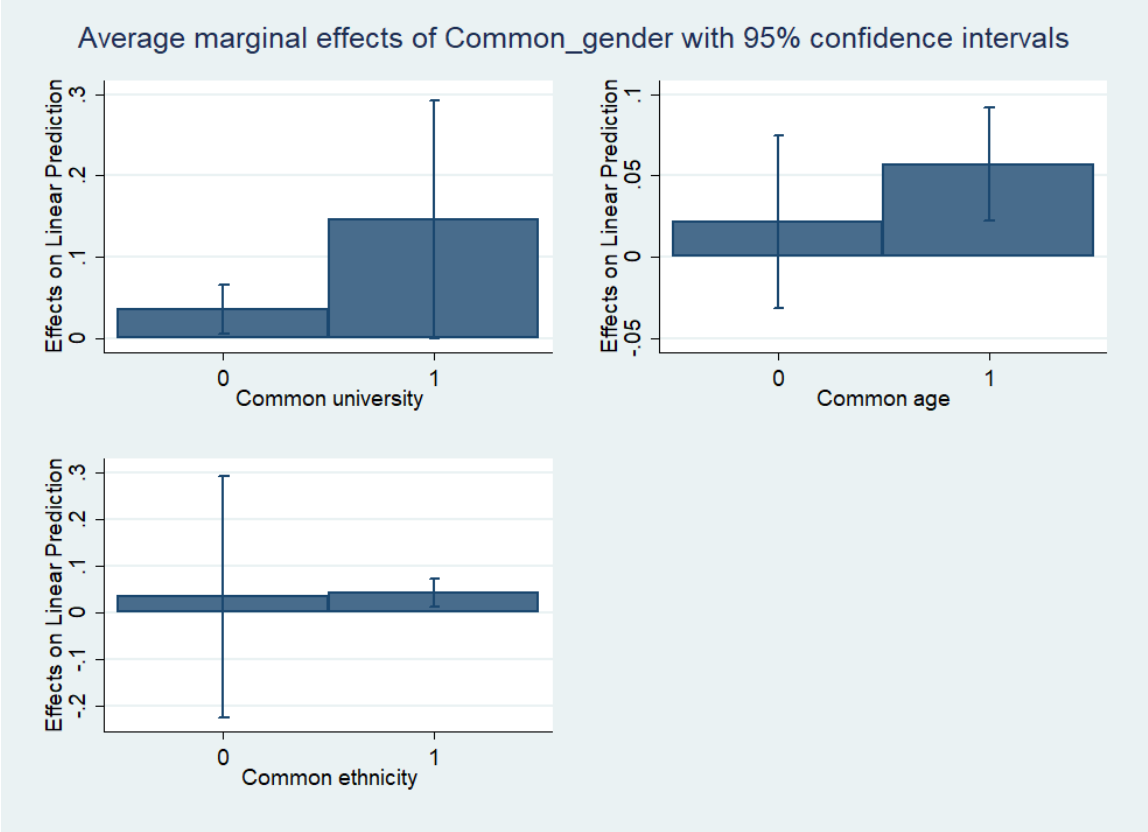

Figure 1 shows the effect that three social commonalities (common university, common age and common ethnicity) have on insider trading profitability for insiders of the same gender as the CEO/CFO.

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Figure 2. Profitability of insider trading by overlapping years in the company between insider and CEO/CFO

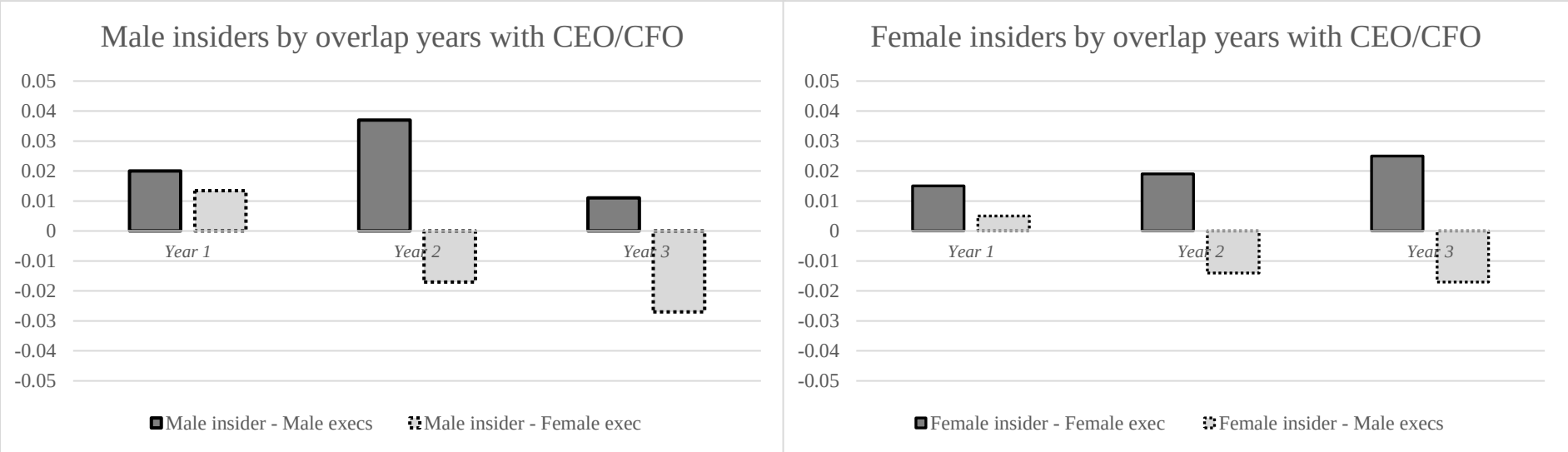

Figure 2 shows insider trading profitability obtained by insiders during years one, two and three of overlapping tenures with the CEO/CFO. The left (right) panel shows results for male (female) insiders. In both panels, the profitability of insiders of the same gender with the CEO/CFO is represented in dark grey, and the profitability of insiders of opposite gender to the CEO/CFO is represented in light grey.

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Figure 3. Trading patterns by male and female insiders in the days following trades by top executives

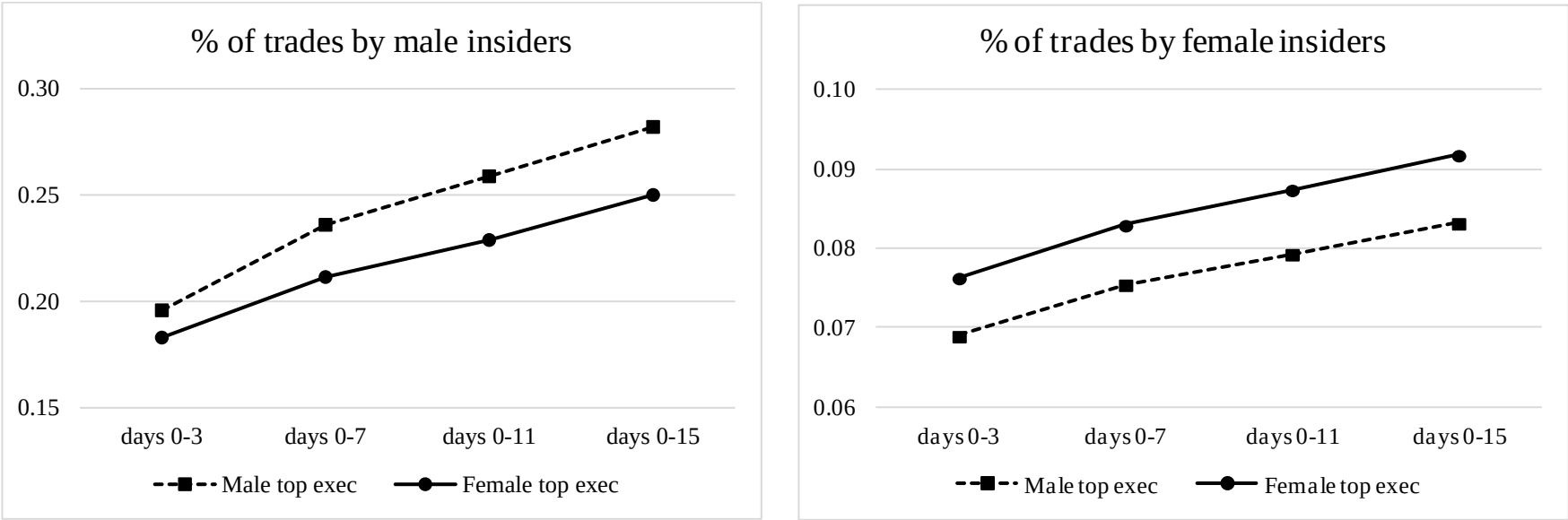

Figure 3 summarizes the cumulative percentage of trades by male and female insiders that take place up to 15 days after a trade by a male and female top executive. The left (right) panel shows results for male (female) insiders.

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TABLE 1

Summary Descriptive Statistics.

Panel A: Full Sample Descriptive Statistics of Profitability and Independent Variables

	Full sample - All observations				Full sample - Female CEO/CFO				Full sample - Male CEO&CFO			
Variable	*N*	*Mean*	*SD*	*Median*	*N*	*Mean*	*SD*	*Median*	*N*	*Mean*	*SD*	*Median*
Prof_BHAR_SA	381625	-0.01	0.40	0.01	33663	-0.02	0.38	0.00	347962	0.00	0.40	0.01
Trade value, male insiders	348566	0.89	10.60	0.89	27539	1.43	17.50	0.18	321027	0.84	9.83	0.15
Trade value, female insiders	33053	0.61	3.21	0.03	6124	0.67	1.94	0.17	26929	0.59	3.43	0.13
Size_day	381625	14.76	1.64	14.60	33663	14.85	1.65	14.68	347962	14.76	1.64	14.59
BTM_day	381625	0.40	0.44	0.30	33663	0.40	0.51	0.29	347962	0.40	0.44	0.31
ROA	381625	0.05	0.13	0.06	33663	0.07	0.13	0.07	347962	0.05	0.13	0.06
ZScore	381625	1.76	1.72	1.87	33663	1.94	1.47	2.04	347962	1.75	1.74	1.86
InvEindex	381625	-1.82	1.76	-2.00	33663	-2.03	1.76	-2.00	347962	-1.80	1.76	-2.00
InstOwner	381625	0.58	0.32	0.68	33663	0.57	0.34	0.69	347962	0.58	0.32	0.68
BdIndep	381625	0.21	0.33	0.00	33663	0.22	0.34	0.00	347962	0.20	0.33	0.00
BHARPRE_SA	381625	0.19	0.59	0.09	33663	0.19	0.53	0.11	347962	0.19	0.59	0.09
Retvol	381625	0.03	0.01	0.02	33663	0.03	0.01	0.02	347962	0.03	0.01	0.02
AgeCEO	381625	45.56	20.35	52.00	33663	47.65	17.81	52.00	347962	45.36	20.57	52.00
AgeCFO	381625	28.20	25.64	42.00	33663	32.24	24.29	45.00	347962	27.81	25.73	41.00
TenureCEO	381625	6.52	6.21	5.00	33663	6.20	6.01	4.00	347962	6.55	6.23	5.00
TenureCFO	381625	3.13	3.15	2.00	33663	3.14	3.17	2.00	347962	3.13	3.15	2.00
COMP_CEO	381625	4.16	9.94	2.03	33663	4.84	7.82	2.27	347962	4.09	10.11	2.01
COMP_CFO	381625	1.63	2.71	0.96	33663	1.75	2.86	1.09	347962	1.62	2.70	0.94

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Panel B: Insider trading profitability by gender of insiders and of CEO/CFO

	Male insiders			Female insiders				
All trades	*N*	*Mean*	*Median*	*N*	*Mean*	*Median*	*Difference in means*	*p-value*
Any CEO/CFO	348571	-0.004	0.014	33054	-0.015	0.003	0.010***	0.000
Male CEO and CFO	321032	-0.003	0.016	26930	-0.015	-0.002	0.013***	0.000
Female CEO or CFO	27539	-0.025	-0.01	6124	-0.012	0.025	-0.013**	0.017
Purchases								
Any CEO/CFO	47204	0.09	0.008	4124	0.075	0.018	0.015*	0.074
Male CEO and CFO	43529	0.09	0.009	3427	0.069	0.003	0.021**	0.018
Female CEO or CFO	3675	0.088	-0.007	697	0.106	0.047	-0.018	0.380
Sales								
Any CEO/CFO	301367	-0.019	0.015	28930	-0.027	0.002	0.008***	0.001
Male CEO and CFO	277503	-0.017	0.017	23503	-0.027	-0.002	0.010***	0.000
Female CEO or CFO	23864	-0.042	-0.01	5427	-0.027	0.02	-0.015**	0.005

Panel C: Number of insiders who trade by gender and access to information

	All Insiders				High Access Insiders				Low Access Insiders			
	Male CEO&CFO	Female CEO/CFO	Diff.	*p*-value	Male CEO&CFO	Female CEO/CFO	Diff.	*p*-value	Male CEO&CFO	Female CEO/CFO	Diff.	*p*-value
N. of insiders who trade per firm/year	6.506	6.318	-0.188**	0.019	7.752	7.594	-0.158	0.34	6.061	5.91	-0.151*	0.091
N. of female insiders who trade per firm/year	0.549	1.105	0.555***	0.000	0.047	0.091	0.044***	0	0.507	1.028	0.521***	0
Ratio female/male insiders	0.078	0.167	0.09***	0.000	0.008	0.016	0.008***	0	0.077	0.165	0.088***	0

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Panel D: Correlation matrix

Variables	*Prof*	*Female exec*	*Size_day*	*BTM_day*	*ROA*	*ZScore*	*InvEindex*	*InstOwner*	*BdIndep*	*BHARPRE_SA*	*Retvol*	*AgeCEO*	*AgeCFO*	*TenureCEO*	*TenureCFO*	*COMP_CEO*
Prof	1															
Female exec	-0.0136***	1														
Size_day	-0.0309***	0.0157***	1													
BTM_day	0.101***	-0.000394	-0.368***	1												
ROA	-0.0573***	0.0324***	0.215***	-0.200***	1											
ZScore	-0.0334***	0.0316***	0.0523***	-0.0717***	0.607***	1										
InvEindex	0.0164***	-0.0369***	-0.181***	0.0372***	-0.0591***	-0.0542***	1									
InstOwner	-0.0213***	-0.0019	0.0983***	-0.0499***	0.0883***	0.0884***	-0.215***	1								
BdIndep	-0.0099***	0.0089***	0.0795***	0.0264***	-0.0256***	0.0083***	-0.219***	0.0945***	1							
BHARPRE_SA	-0.0189***	-0.0003	0.0881***	-0.282***	0.0294***	0.00667***	0.0995***	-0.0570***	-0.0220***	1						
Retvol	0.0891***	-0.0190***	-0.356***	0.171***	-0.297***	-0.183***	0.269***	-0.155***	0.0292***	0.223***	1					
AgeCEO	-0.0287***	0.0320***	0.0790***	-0.0160***	0.0841***	0.0472***	-0.127***	0.0640***	0.0377***	-0.0331***	-0.148***	1				
AgeCFO	-0.0108***	0.0490***	0.0467***	0.0036*	0.0289***	-0.0084***	-0.212***	0.115***	-0.0044**	-0.0348***	-0.117***	0.413***	1			
TenureCEO	-0.0175***	-0.0161***	0.0144***	-0.0348***	0.0706***	0.0749***	-0.0103***	0.0122***	0.0306***	0.0057***	-0.0297***	0.291***	-0.0269***	1		
TenureCFO	-0.0155***	0.0012	0.0256***	-0.0096***	0.0378***	0.0550***	-0.150***	0.0970***	-0.0209***	-0.0032*	-0.0910***	-0.0053**	0.310***	0.178***	1	
COMP_CEO	0.0133***	0.0215***	0.306***	-0.0597***	0.0397***	-0.0077***	-0.0211***	0.0138***	0.0601***	0.0043**	-0.0148***	0.104***	-0.0069***	0.0719***	-0.0358***	1
COMP_CFO	-0.0056***	0.0131***	0.435***	-0.0819***	0.0375***	-0.0333***	-0.0725***	0.0343***	-0.0154***	-0.0168***	-0.101***	0.0118***	0.238***	-0.0322***	0.151***	0.294***

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. The variables in the rows corresponding to trade value for both male and female insiders are expressed in thousands, except for N (number of observations). 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 who trade, 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. Column (1) shows this for all insiders and columns 2 and (3) show this separately for insiders with high and low access to information as defined by ROLECODE1. Panel D presents the correlation matrix. Variables defined in Appendix 1. All continuous variables are winsorized at 0.5% by fiscal year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 2
Female top executives and insider trading profitability.

	Male insiders	Female insiders	All insiders
Female_exec	**-0.017*** **	**0.035*** **	
	(-3.895)	**(3.350)**	
Common_gender			**0.006*** **
			(3.256)
Size_day	0.185***	0.185***	0.183***
	(54.178)	(18.246)	(53.388)
BTM_day	0.180***	0.158***	0.178***
	(23.734)	(7.056)	(23.737)
ROA	0.001	0.032	-0.000
	(0.080)	(0.609)	(-0.005)
ZScore	-0.021***	-0.000	-0.019***
	(-7.234)	(-0.037)	(-6.826)
InvEindex	0.006***	0.003	0.005***
	(4.284)	(0.769)	(4.143)
InstOwner	-0.099***	-0.030	-0.095***
	(-11.117)	(-1.342)	(-11.023)
BdIndep	-0.035***	0.033	-0.027**
	(-2.636)	(0.978)	(-2.101)
BHARPRE_SA	-0.014***	-0.000	-0.014***
	(-4.461)	(-0.040)	(-4.450)
Retvol	3.241***	4.956***	3.353***
	(17.199)	(9.123)	(17.879)
AgeCEO	-0.002***	-0.002***	-0.000
	(-9.479)	(-3.741)	(-0.083)
AgeCFO	0.000	-0.001	-0.002***
	(0.172)	(-1.183)	(-9.543)
TenureCEO	-0.000	0.001	-0.000
	(-0.378)	(0.917)	(-0.087)
TenureCFO	-0.002***	-0.001	-0.002***
	(-4.296)	(-1.403)	(-4.418)
COMP_CEO	0.002***	0.000	0.002***
	(8.371)	(0.636)	(8.247)
COMP_CFO	0.003***	0.003**	0.003***
	(5.099)	(2.109)	(5.185)
Constant	-2.661***	-2.823***	-2.658***
	(-50.255)	(-17.501)	(-49.974)
Dummy controls included	*Yes*	*Yes*	*Yes*
Observations	348,571	33,054	381,625
R-squared	0.212	0.263	0.206
Year & Firm FE	*Yes*	*Yes*	*Yes*

This table 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. The vector of *Dummy controls* includes: *E_index_d, BdIndep_d, AgeCEO_d, AgeCFO_d, TenureCEO_d, TenureCFO_d*. T-stat are in parentheses and errors are robust and clustered by transaction date. All continuous variables are winsorized at 0.5% by fiscal year.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 3
Social and contextual commonalities and insider trading profitability

Panel A: Correlation matrix for social commonalities

	Common gender	Common_university	Common_generation	Common_ethnicity
Common gender	1			
Common_university	0.0553***	1		
Common_age	-0.126***	-0.222***	1	
Common_ethnicity	-0.0388**	0.0172	0.0240	1

Panel B: The effect of social commonalities on insider trading profitability

	Profitability	Profitability	Profitability
Common_university	**-0.002**		
	(-0.093)		
Common_age		**0.022*** **	
		(4.865)	
Common_ethnicity			**0.031*** **
			(2.714)
Constant	-4.134***	-2.866***	-3.032***
	(-17.255)	(-21.792)	(-27.719)
Observations	18,207	39,610	73,525
R-squared	0.367	0.301	0.252
Controls included	*Yes*	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*	*Yes*

Panel C: The role of social commonalities on the relation between common gender and insider trading profitability

	Male insiders	Female insiders	Male insiders	Female insiders	Male insiders	Female insiders
Female exec	-0.017***	0.035***	-0.018***	0.035***	-0.019***	0.027**
	(-3.885)	(3.330)	(-3.970)	(3.241)	(-4.090)	(2.368)
Common_university	0.000	0.029				
	(0.030)	(0.836)				
Female exec × Common_university	**-0.008**	**0.052**				
	(-0.168)	**(0.574)**				
Common_age			0.024***	-0.021**		
			(8.000)	(-2.100)		
Female exec × Common_age			**0.005**	**-0.005**		
			(0.597)	**(-0.209)**		
Common_ethnicity					-0.001	-0.028***
					(-0.531)	(-4.106)
Female exec × Common_ethnicity					**0.008**	**0.031** **
					(1.303)	**(2.017)**
Constant	-2.661***	-2.822***	-2.662***	-2.823***	-2.661***	-2.818***
	(-50.262)	(-17.496)	(-50.255)	(-17.506)	(-50.261)	(-17.497)
Observations	348,571	33,054	348,571	33,054	348,571	33,054
R-squared	0.212	0.263	0.212	0.263	0.212	0.263
Controls included	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

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Panel D: The moderating role of years spent at the firm on the relation between social commonalities and insider trading profitability

	Common gender			Common university			Common age			Common ethnicity		
	Year 1	*Year 2*	*Year 3*	*Year 1*	*Year 2*	*Year 3*	*Year 1*	*Year 2*	*Year 3*	*Year 1*	*Year 2*	*Year 3*
Common_gender	**0.006**	**0.015*** **	**0.026*** **									
	(1.399)	**(2.703)**	**(3.850)**									
Common_university				**0.012**	**0.117** **	**0.043**						
				(0.249)	**(2.331)**	**(0.956)**						
Common_age							**-0.004**	**0.039** **	**-0.026**			
							(-0.381)	**(2.408)**	**(-1.500)**			
Common_ethnicity										**0.012**	**0.102*** **	**0.044**
										(0.487)	**(2.794)**	**(1.123)**
Constant	-1.997***	-2.603***	-3.773***	-2.525***	-7.521***	-5.906***	-2.416***	-2.571***	-5.344***	-2.120***	-4.589***	-4.768***
	(-20.533)	(-20.564)	(-17.987)	(-5.466)	(-8.260)	(-5.058)	(-10.278)	(-7.154)	(-11.180)	(-6.989)	(-7.461)	(-5.609)
Observations	87,119	47,197	31,062	3,845	2,057	1,442	16,430	8,810	6,013	8,520	4,509	3,070
R-squared	0.366	0.399	0.477	0.628	0.614	0.590	0.471	0.459	0.546	0.551	0.581	0.507
Controls included	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

This table shows the effect of other commonalities on insider trading. Panel A shows the correlation matrix between the fours social commonalities. Panel B shows the effect of attending the same university (common_education), belonging to the same age group (common_age) and having the same ethnicity (common_ethnicity) on insider trading profitability. Panel C indicates the influence of each of the social commonalities previously mentioned on common gender. Panel D shows the way that each commonality contributes to insider trading profitability over the time that the tenure of the insider overlaps with that of the CEO/CFO (years 1, 2, 3 of overlap). The vector of *Controls* includes: *AgeCEO_d, AgeCEO, AgeCFO_d, AgeCFO, BdIndep, bdindep_d, BTM* (annual), *Eindex_d, InstOwner, InstOwner_d, InvEindex, ROA, Size, ZScore, COMP_CEO, COMP_CFO_d, COMP_CFO, COMP_CEO_d, TenureCEO, TenureCFO* and *tenurecfo_d*. T-stat are in parentheses and errors are robust and clustered by transaction date. All continuous variables are winsorized at 0.5% by fiscal year.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 4
Information sharing channels

Panel A: Sitting on the same committee as a male CEO/CFO and insiders' trading profitability

	Male insiders		Female insiders	
Any_overlap_mexec	0.014***	0.014***	**-0.032***	**-0.02**
	(2.684)	(2.702)	**(-1.752)**	**(-1.069)**
Female exec		-0.028***		0.044***
		(-5.358)		(3.084)
Constant	-0.234***	-0.222***	-0.360***	-0.371***
	(-6.393)	(-6.055)	(-2.861)	(-2.944)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	73,373	73,373	6,932	6,932
R-squared	0.050	0.051	0.100	0.102
Year & Industry FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel B: Sitting on the same committee as any other females and insiders' trading profitability

	Male insiders		Female insiders	
More_fem	**-0.007***	**-0.007***	**0.017***	**0.018***
	(-1.780)	**(-1.767)**	**(1.725)**	**(1.839)**
Female exec		-0.028***		0.049***
		(-5.350)		(3.423)
Constant	-0.238***	-0.226***	-0.345***	-0.366***
	(-6.483)	(-6.146)	(-2.790)	(-2.941)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	73,373	73,373	6,932	6,932
R-squared	0.050	0.051	0.100	0.102
Year & Industry FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel C: Full sample - Attending the same meeting as two women and insiders' trading profitability

	Male insiders		Female insiders	
More_fem_meeting	**0.005**	**0.006**	**0.054*** **	**0.049*** **
	(1.350)	**(1.582)**	**(4.612)**	**(4.103)**
Female_exec		-0.029***		0.040***
		(-5.427)		(2.750)
Constant	-0.225***	-0.212***	-0.320**	-0.339***
	(-6.093)	(-5.722)	(-2.571)	(-2.708)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	73,373	73,373	6,932	6,932
R-squared	0.050	0.050	0.102	0.103
Year & Industry FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel A shows the effect of serving on the same committee as a male CEO/CFO on insiders' trading profitability. The second and fourth columns include the variable *Female_exec* to control for the previously documented effect of the presence of a female CEO or CFO. The insiders included in this test are those who also serve on the company board. Panel B shows the effect of sitting on the same committee as any other females on insiders' trading profitability and panel C shows the effect of attending the same meeting as two women in the same year as the trade. The test uses all trades by male insiders. Industry (4-digit sic code) and year fixed effects are included. 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. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 5
Female executives and corporate governance

Panel A: Female CEO/CFO effect on insider trading profitability

	Profitability
Female_exec	**-0.026*** **
	(-7.946)
Female_insider	-0.009***
	(-4.178)
Female_exec × Female_insider	**0.029*** **
	(5.282)
Constant	-0.361***
	(-15.505)
Observations	381,625
R-squared	0.051
Controls included	*Yes*
Year &Industry FE	*Yes*

Panel B: Financial Reporting Quality

	Low_FRQ	Profitability
Female_exec	**-0.010**	**-0.027*** **
	(-0.529)	**(-8.087)**
Female_insider		-0.009***
		(-3.991)
Female_exec × Female Insider		**0.029*** **
		(5.295)
Low_FRQ		0.009***
		(8.173)
Constant	0.315***	-0.364***
	(2.923)	(-15.604)
Observations	23,494	380,273
R-squared	0.170	0.051
Controls included	*Yes*	*Yes*
Year & Industry FE	*Yes*	*Yes*

Panel C: Insider Trading Restrictions

	ITR	Profitability
Female_exec	**0.070***	**-0.029*** **
	(1.716)	**(-7.481)**
Female_insider		-0.011***
		(-4.184)
Female_ exec × Female_insider		**0.015** **
		(2.282)
ITR		-0.003*
		(-1.701)
Constant	0.121	-0.371***
	(0.340)	(-14.628)
Observations	15,005	277,676
(Pseudo) R-squared	0.0422	0.055
Controls included	*Yes*	*Yes*
Year & Industry FE	*Yes*	*Yes*

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Panel D: Tone at the top

	TATT	Profitability
Female_ exec	**0.069**	**-0.025*** **
	(0.391)	**(-7.355)**
Female_insider		-0.003
		(-1.396)
Female_ exec × Female_insider		**0.022*** **
		(4.078)
TATT		-0.043**
		(-2.095)
Constant	-2.167	-0.341***
	(-1.186)	(-12.541)
Observations	9,462	215,471
(Pseudo) R-squared	0.122	0.080
Controls included	*Yes*	*Yes*
Year & Industry FE	*Yes*	*Yes*

This table, Panel A shows the effect of female CEO/CFO on insider trading profitability (BHAR) for all insiders (column 1) and separately for female insiders (column 2). *Female_exec* takes the value of 1 if either the CEO or CFO is a woman; 0 otherwise. *Female_insider* takes the value of 1 if the insider is a woman; 0 otherwise. Panel B column 1 shows the effect of having a female CEO or CFO on the level of *Low_FRQ* (OLS regression) and panels C and D, the likelihood of *ITR* and *TATT* (probit models). Firm-year and executive controls are: *AgeCEO_d, AgeCEO, AgeCFO_d, AgeCFO, BdIndep, bdindep_d, BTM* (annual), *Eindex_d, InstOwner, InstOwner_d, InvEindex, ROA, Size, ZScore, COMP_CEO, COMP_CFO_d, COMP_CFO, COMP_CEO_d, TenureCEO, TenureCFO* and *tenurecfo_d*, and *TATT* controls are *Big4, M&A, Inv_ratio* and *PctLoss*. Column 2, Panels B-D show the effect on profitability of having a female CEO or CFO and insider gender as well as the corporate governance measure. For variable definitions, see Appendix 1. T-stat are in parentheses. Errors are robust. All continuous variables are winsorized at 0.5% by fiscal year.

*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 6
Endogeneity in common gender effects on insider trading**.**
Panel A: Full sample, insider fixed effects

	Male insiders	Female insiders
Female_exec	**-0.036*** **	**0.026** **
	(-6.889)	**(2.044)**
Constant	-3.422***	-4.252***
	(-48.827)	(-19.308)
Controls included	*Yes*	*Yes*
Observations	340,793	32,112
R-squared	0.412	0.414
Year&Firm&Insider FE	*Yes*	*Yes*

Panel B: Sample restricted to include the same insiders before and after top executive change

	Male insiders	Female insiders
Female_exec	**-0.047*** **	**0.066* **
	(-3.490)	**(1.656)**
Constant	-3.381***	-2.881***
	(-18.762)	(-4.977)
Controls included	*Yes*	*Yes*
Observations	30,788	1,683
R-squared	0.270	0.429
Year&Firm FE	*Yes*	*Yes*

Panel C: Male-to-Female-to-Male test

	Male insiders	Female insiders
Post	**0.052** **	**-0.079* **
	(2.247)	**(-1.692)**
Constant	-4.818***	-6.408***
	(-8.239)	(-4.989)
Controls included	*Yes*	*Yes*
Observations	4,195	803
R-squared	0.365	0.642
Year&Firm FE	*Yes*	*Yes*

Panel A shows the results of estimating equation (1) using firm-, year- and insider-fixed effects. Panel B uses a sample consisting only of trades by the same insiders that trade both before and after a CEO/CFO change. T-stat are in parentheses and errors are robust and clustered by transaction date. All continuous variables are winsorized at 0.5% by fiscal year. Panel C shows the effect of a female-to-male executive change on insiders' profitability. The test is performed on the subsample of treatment firms that have switched back to a male executive following a male-to-female CEO/CFO change. T-stat are in parentheses and errors are robust and clustered at trading day level.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 7
Who trades, what information they trade on, and when.

Panel A: Female top executives and insider trading profitability depending on insiders' access to information

	High-access Male insiders	Low-access Male insiders	High-access Female insiders	Low-access Female insiders
Female_exec	**-0.082*** **	**-0.013*** **	**-0.117**	**0.039*** **
	(-5.540)	**(-2.754)**	**(-1.630)**	**(3.748)**
Constant	-3.355***	-2.611***	-6.189***	-2.724***
	(-20.355)	(-48.911)	(-5.594)	(-16.116)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	35,927	312,402	1,349	31,634
R-squared	0.360	0.213	0.657	0.265
Year & Firm FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel B: Insiders' purchases and sales profitability

	Purchases profitability		Sales profitability	
	Male insiders	Female insiders	Male insiders	Female insiders
Female_exec	**-0.049*** **	**-0.121*** **	**-0.021*** **	**0.034*** **
	(-3.511)	**(-3.336)**	**(-4.725)**	**(3.262)**
Constant	3.534***	2.838***	-3.853***	-4.344***
	(30.688)	(6.729)	(-70.224)	(-27.410)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	47,022	3,851	301,317	28,849
R-squared	0.463	0.577	0.310	0.354
Year&Firm FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel A shows the main results by gender of insiders separately for high-access and low-access to information insiders. Panel B shows insiders' profitability separately for purchases and sales. T-stat are in parentheses and errors are robust and clustered by transaction date. All continuous variables are winsorized at 0.5% by fiscal year.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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TABLE 8
Cross-sectional tests

Panel A: Insider gender and profitability: full sample split by gender of top executives

	Male CEO and CFO	Female CEO or CFO
Female_insider	**-0.008*** **	**0.010***
	(-3.548)	**(1.902)**
Constant	-0.332***	-0.403***
	(-12.903)	(-5.906)
Controls included	*Yes*	*Yes*
Observations	347,962	33,663
R-squared	0.036	0.094
Year&Industry FE	*Yes*	*Yes*

Panel B: Female duos subsample

	Male insiders	Female insiders
Post_FemaleDuo	**-0.024**	**0.211** **
	(-0.599)	**(2.434)**
Constant	-3.326***	-7.956***
	(-3.359)	(-3.023)
Controls included	*Yes*	*Yes*
Observations	1,346	414
R-squared	0.614	0.612
Year & Firm FE	*Yes*	*Yes*

Panel C: Female-dominated industries

	Male insiders in low female employment industry	Male insiders in high female employment industries	Female insiders in low female employment industries	Female insiders in high female employment industries
Female_exec	**-0.013** **	**-0.015** **	**0.013**	**0.038*** **
	(-2.344)	**(-2.300)**	**(0.855)**	**(2.752)**
Constant	-2.450***	-3.344***	-2.355***	-3.517***
	(-37.866)	(-41.747)	(-9.788)	(-16.074)
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Observations	176,968	170,554	14,448	18,429
R-squared	0.198	0.272	0.255	0.326
Year & Firm FE	*Yes*	*Yes*	*Yes*	*Yes*

Panel A shows the effect of insider gender on profitability on a sample split by the gender of the top executive. Panel B shows the effect insider gender on male and female insiders' profitability for the firms that have in the same year a woman CEO and a woman CFO after excluding trades made by the CEO/CFO themselves. Panel C presents insider trading profitability for male and female insiders depending on how female-friendly an industry is as reflected in women employability data. T-stat are in parentheses and errors are robust and clustered by transaction date. All continuous variables are winsorized at 0.5% by fiscal year.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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Appendix 1. ***Variables definition***

Variable	Definition	Source
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 the 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.	ISS (formerly RiskMetrics)
bdindep_d	An indicator variable that takes 1 when the 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.	ISS (formerly 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
Common_age	An indicator variable that takes 1 when the age of an insider and the age of the CEO or the CFO are within eight years of difference.	BoardEx, CapitalIQ
Common_ethnicity	An indicator variable that takes 1 when the insider and the CEO or the CFO are of the same ethnicity.	BoardEx
Common_gender	An indicator variable that takes 1 when the insider and the CEO or the CFO have the same gender.	
Common_university	An indicator variable that takes 1 when the insider and the CEO or the CFO have attended the same college or university.	BoardEx, CapitalIQ
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 ISS (formerly RiskMetrics)
Female_insider	Indicator variable that takes 1 for a female insider and 0 otherwise.	
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

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Gender Equality Index	US 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 1 if the insider is female, based on the first name of the insider, 0 if male.	Social Security Administration, https://www.ssa.gov/oact/babynames/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 total 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.	ISS (formerly RiskMetrics)
Low_FRQ	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
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
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*(year- the first year the insider traded during the tenure of the CEO+1 + year – 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
Post_FemaleDuo	Indicator variable that takes 1 starting the years when a firm has had a transition to both the CEO and CFO being women, and 0 in the years before the year of the transition.	
Post_MtFtM	Indicator variable that takes 1 in the years after a firm has had a transition back to a male CEO or CFO after a transition from a male to a female CEO/CFO, 0 in the years before and missing in the year of the transition.	ExecuComp

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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
TATT	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
COMP_CEO	Total CEO compensation as reported by ExecuComp, multiplied by 1000 for consistency with Compustat, set to 0 when missing.	ExecuComp
COMP_CEO_d	An indicator variable that takes 1 when the missing value for COMP_CEO has been replaced by 0.	
COMP_CFO	Total CEO compensation as reported by ExecuComp, multiplied by 1000 multiplied by 1000 for consistency with Compustat, set to 0 when missing.	ExecuComp
COMP_CFO_d	An indicator variable that takes 1 when the missing value for COMP_CFO 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.	
Treat	Indicator variable that takes 1 if the firm switches from a male to female CEO or CFO during our sample period.	ExecuComp
ZScore	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

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Appendix 2. *Difference-in-differences on matched sample*

To further assuage endogeneity concerns we employ a difference-in-differences (DiD) 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). Also, 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 based on gender in either of these ways, then our results could be driven by firm characteristics associated with such behavior. The DiD methodology helps correct for this potential 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.

The PSM approach matches a treatment firm with a control firm, allowing 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). 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 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 size (*Size*), book-to-market (*BTM*), return on assets (*ROA*), 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 is 257.9 (p-value = 0.0325) and suggests that the model is statistically significant.

The results reported in Table 2.2, panel A indicate that firms that appoint a female CEO or CFO are larger, older, have higher board independence, lower entrenchment, and are financially healthier. 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 with more female employees are more likely to appoint a female top executive.

Next, we match firms with male-to-female top executive switches to firms with male-to-male switches in the same year and with the same type of executive change (i.e. CEO or CFO) based on the propensity scores obtained. 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).[28] Our final matched sample consists of 138 pairs of firms. Table 2.2, panel B shows that the matching procedure successfully eliminates differences between treatment and control groups in the year of the executive change. To remove the effect of other potential time series changes within the firm, contemporaneous to

[28] 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.

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the CEO or CFO turnovers, and similar to Francis et al. (2015) and Huang and Kisgen (2013), we employ a DiD approach, as explained. Compared to panel data with fixed effects, the DiD 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:

$$Profitability_{i,j,t} = \mu + \beta_1 \, Post_{i,t} + \beta_2 \, Treat_i + \beta_3 \, PostTreat_{i,t} +$$

$$+ \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \qquad \text{(B2)}$$

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 1. Our coefficient of interest is β_3 and we predict it is negative and significant. Table 2.1, 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. In panel D of the table, we show results from the same analysis separately for male and female insiders and we find a significant decrease in the profitability of male insiders following the appointment of a female CEO or CFO, but results are not significant for female insiders.

The appropriateness of our DiD approach is subject to the validity of the critical parallel paths assumption, that the average change in the outcome variable for the treated if untreated is equal to that of the controls. To test for parallel trends before the change in executive, we regress the profitability measure against year fixed effects (years -3, -2, -1 before the change) and interactions of year fixed effects with the treatment indicator variables. The coefficients on these three interaction terms estimate the differences in trends between the treatment and control groups in each of the three years prior to the change in top executive. The plot in Figure 2.1 shows the differences between these coefficients, together with the 95% confidence intervals of these coefficients, and they are not significantly different from zero, therefore we cannot reject the parallel trend assumption.

On these smaller samples, we obtain asymmetric results for the male and female subsamples. This could be driven either by the relatively smaller sample of female-to-female matches, or by a differential effect of the common identity bias.[29] Regarding the sample size, it is important to note that both tests rely on a small fraction of the observations in the full sample employed, of which female-related observations were already significantly fewer than those for males. Also, both CEO and CFO are male when *Female_exec* takes 0, but only one of them is female when *Female_exec* takes 1.

[29] Differential effects of common gender have been found by prior studies. 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. 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.*" An alternative explanation is that 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.

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Figure 2.1. Testing for parallel trends

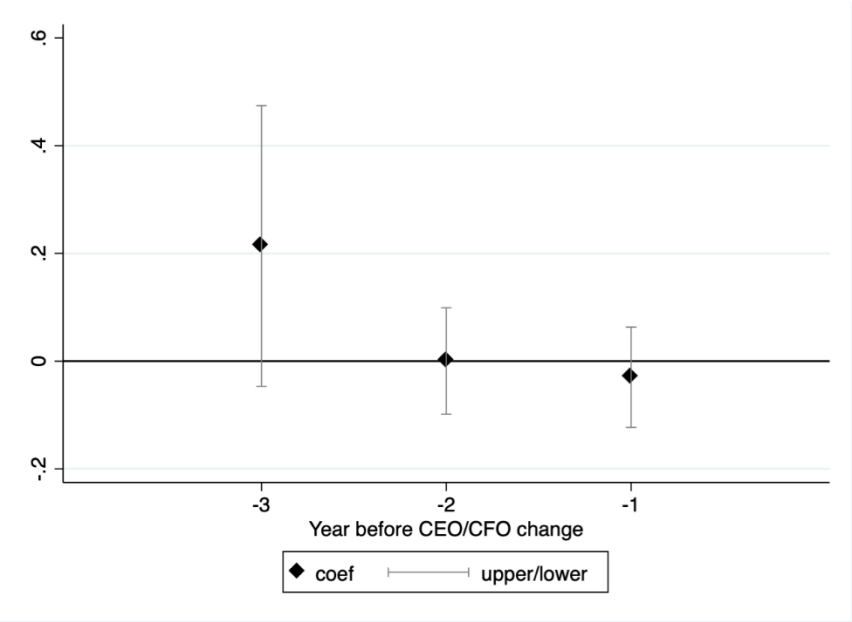

TABLE 2.1.
Propensity Score Matching

Panel 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	

(continued in next page)

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TABLE 2.1. (cont'd)
Propensity Score Matching

Panel 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

Panel 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*	

Panel D: PSM sample - The effect of appointing a female top executive on male and female insiders' profitability

	Male insiders		*Female insiders*	
	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	
Controls included	*Yes*		*Yes*	
Year and industry FE	*Yes*		*Yes*	

This table reports the results of our propensity score matching procedure (Panel A) and the outcome of the matched sample (Panel B). Panels C and D show 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.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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Appendix 3. *Other robustness tests*

Non-routine trades

We next investigate whether our results are subject to differences between more or less informed trading that insiders might engage in. 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 from the full sample all same-direction trades that an insider makes in the same month, for at least three consecutive years. The results, presented in Table 3.1, are qualitatively the same as those presented in our main analysis: male (female) insiders trade less (more) profitably when a top executive is a female. This suggests that our results are not due the inclusion in the sample of trades that could be argued to be recurrent and potentially not based on private information.

TABLE 3.1.
The effect of female top executives on insider trading profitability for non-routine trades

	Profitability	
	Male insiders	*Female insiders*
Female_exec	**-0.010****	**0.046*****
	(-2.235)	**(3.937)**
Constant	-1.926***	-2.243***
	(-30.620)	(-12.044)
Observations	292,640	27,283
R-squared	0.211	0.283
Controls included	*Yes*	*Yes*
Year and Firm FE	*Yes*	*Yes*

This table shows the effect of a female executive on insiders' profitability on a sample of trades classified as non-routine trades. Firm and year fixed-effects included. T-stat are in parentheses and errors are robust and clustered by transaction date.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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Trading around stock splits

We also examine more closely trades 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. As presented in Table 3.2, we 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 (82 trades) and therefore unlikely to yield significant results.

TABLE 3.2.
Trading around stock splits

	Exploit	
	Male insiders	*Female insiders*
Female_exec	**-0.681*** **	**9.064**
	(-3.120)	**(0.605)**
Constant	2.889***	154.885
	(3.499)	(0.918)
Observations	624	82
R-squared	0.580	0.917
Controls included	*Yes*	*Yes*
Year and industry FE	*Yes*	*Yes*

This table shows the effect of a female executive on insiders' profitability on a measure of the extent to which insiders trade around stock splits. Industry and year fixed-effects are included. T-stat are in parentheses and errors are robust and clustered by transaction date.
*, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

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