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Do commonalities facilitate private information channels? Evidence from common gender and insider trading☆

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ABSTRACT

We examine insider trading profitability and common identity between insiders and top executives. We argue that common gender and the resulting social connections influence access to private information, wherby 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 find that, in isolation, other social and professional commonalities, such as 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 commonalities enhance the common gender effect when combined with it. 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 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 or 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 commonality channels influence their informational advantage, as reflected in the profitability of insider trading (Aboody and Lev, 2000).

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

Focusing on common gender provides several benefits. First, gender is a salient commonality that can be perceived without need for the parties to exchange information, and it does not relate to the type of information being transmitted (i.e., company-related). Gender is particularly salient within firms' upper echelons: few women hold top management positions, making gender a more defining commonality. Gender also allows us to identify common identity and to isolate it from other commonalities that may proxy for additional social or professional characteristics. For example, attending the same Ivy League university (common education) may also indicate a common socioeconomic background. Third, while no specific evidence exists on how common gender influences information-sharing, research has indicated common gender influences other economic decisions.[2] Therefore, gender is the commonality for which we expect stronger effects.

Our focus on gender allows us to add to a second strand of literature. Inci et al. (2017) and Mobbs et al. (2021) document that women insiders obtain lower profitability on their trades than men, although this effect is attenuated when more women are present in the firm. We add to their work by proposing that common gender facilitates information-sharing, fostering insider trading profitability *both* for women and men and explaining why the presence of more women attenuates gender differences in profitability. Second, we study the role of female executives in corporate governance, to examine the finding of lower insider trading profitability for women. Insider trading profitability may reflect opportunistic information usage (Skaife et al., 2013) that can be reduced with stronger corporate governance (Ravina and Sapienza, 2010; Cziraki et al., 2014). Consequently, 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 the information insiders are privy to, as proxied by their trading under common- and opposite-gender top 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. Second, we examine the role of other commonalities in facilitating 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 top executives in our sample impose stronger corporate governance.

Our tests yield the following key findings. When the CEO or CFO is a woman, the profitability of males' insider trades declines, while that of women's insider trades increases and tends to be higher than that of male counterparts. Our analysis reveals a reduction in the one-year (unrealized), size-adjusted buy-and-hold abnormal returns (BHAR) of \$15,045 for a trade at the mean value of \$885,001 for male insiders and an increase of \$21,139 for a trade at the mean value of \$605,918 for female insiders, ceteris paribus. This is consistent with common gender effects for both men and women and suggests vertical information flows from CEOs and CFOs to common gender insiders with less access to information.

We next study other commonalities, in particular, education, age, ethnicity, and having worked in the same organization. Consistent with evidence of Bradley et al. (2020), Cohen et al. (2010), and Hwang and Kim (2009) on the role of these ties in facilitating insider-outsider exchanges, these commonalities also foster insider trading profitability, though 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 comports with the discussion of McPherson et al. (2001), that "similarity breeds connection" (p. 415), whereby connections strengthen 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

[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 or 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 characteristics as "commonalities" and refer to them as "common gender," "common age," "common ethnicity," and "common education," respectively.

[2] McNeilly and Russ (2000) show that managers' perceptions of their sales representatives' performance are higher when a manager and a sales rep 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).

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 executives disrupting the channels that facilitate trading with private information, since that would lead to reduced insider trading profitability for *all* insiders, both men and women. Yet our setting permits conducting analyses to better understand whether CEO or CFO gender affects corporate governance practices and whether this influences the gender-driven differences in the information insiders receive. We examine three governance mechanisms: financial reporting quality, insider trading restrictions, and ineffective internal controls. We find that only insider trading restrictions are more common in firms with female leadership. However, none of these governance channels removes the effect of common gender on profitability.

Next, we analyze insiders' trading patterns. We find that male insiders' trades tend to cluster 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 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.[3]

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 identify practices, such as attending board meetings or belonging to the same board committees as top executives, that foster information transfers.

Second, our study reveals that other commonalities also influence insider trading profitability, though less than common gender. Interestingly, some commonalities enhance the effect of gender. This adds to prior work focused 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 day-to-day interactions between insiders and that context may influence which commonalities are salient and likely to have economic consequences. Collectively, our findings suggest that *different* commonalities may act as channels that facilitate *different* information exchanges.

Third, we contribute to the corporate governance literature, where there is great interest in understanding the drivers and consequences of gender differences. Our results enrich the evidence of Inci et al. (2017) and Mobbs et al. (2021) on gender effects in insider trading. 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 of 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 explains 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. This extends the findings of Mobbs et al. (2021), who examine female directors' insider trading profitability and find that their low profitability is concentrated among firms that have fewer female directors and where female directors have less industry expertise and are more geographically dispersed. Prior evidence indicates less expertise and geographical dispersion of firm monitoring mechanisms lead to a poorer information environment (e.g., Ma et al., 2020).

2. Background and predictions

Corporate insiders, such as directors, officers or employees, often legally trade in the shares of their own companies, earning 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 use private information (Rozeff and Zaman, 1988; Seyhun, 1988).[4] Therefore, insider trading is an excellent proxy for tracking information-sharing, given that its profitability hinges on the existence of private

[3] The two alternative measures of profitability are the alpha from the four-factor Fama and French (1993) and Carhart (1997) model over the 180 days following each transaction, and the one-year size-adjusted buy-and-hold-return multiplied by the dollar-value of the trade, each multiplied by −1 for sale transactions.

[4] This may limit the gains from stock research, making it less valuable (Fernandes and Ferreira, 2009), and motivate insiders to disclose low-quality information (Zhang and Zhang, 2018). In response to these concerns, to increase oversight, the Sarbanes-Oxley (SOX) Act of 2002 requires insider trades to be publicly disclosed to the SEC within two business days. However, to date, these regulatory efforts have not eliminated profitable insider trading (Jagolinzer et al., 2011). The act defines insiders as directors, officers, and principal stockholders with a stake of 10% or more. Prior to SOX, the requirement was to disclose the trade by the end of the month (Brochet, 2010).

information. We investigate whether some insiders, by developing close ties with top executives, gain better access to private information and therefore more profitable insider trades.[5]

2.1. Social commonalities and information flows within the firm

A principle in network formation is that similarity fosters connection. In turn, connections are an important source of private information in economic settings (Cohen et al., 2008; Fracassi, 2017). Social networks can be heterogenous with respect to sociodemographic characteristics, such as ethnicity, age, gender, occupation, or education. Studies in organizational psychology find 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 having the same gender can be such ties. Studies have 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 a driver of economic outcomes. The sense of belonging to abstract social categories, such as "male" and "female," can affect individual interactions. Individuals are more likely to favor those who resemble themselves and, for example, recommend candidates for a job or evaluate managers and subordinates more favorably (Baskett, 1973; Pulakos and Wexley, 1983). This perception of commonalities applies to gender (Akerlof and Kranton, 2000), religion, language, ethnicity (Fisman et al., 2017; Guiso et al., 2009; Ravina, 2019), and age (Joshi et al., 2010).

Consistent with the view that commonalities 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. Cohen et al. (2010) interpret their findings as evidence that having the same alma mater fosters information access and thus informational advantage. Similarly, studying sell-side analysts, Bradley et al. (2020) find evidence that a common employment background with management gives analysts an advantage in acquiring and 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 finance and 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. 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 the workplace. Unlike gender, traits such as education, religion, or even age and nationality require interactions for people to become aware of their commonality. Also, as noted by McPherson et al. (2001), similarity effects depend on the demography of the potential tie pool.[6] 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.[7]

Evidence suggests common gender effects may exist, generally leading to economic benefits.[8] However, Akerlof and Kranton (2000) argue that common identity explains negative behavior, too, where those who do not share an identity are mistrusted and excluded from information-sharing and decision-making. This is relevant in our setting, since studies of managers and entrepreneurs indicate that men have more same-gender networks, especially where they are a strong majority (Ibarra, 1992, 1995, 1997). 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 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 of it, including, for example, smoking together during breaks (Cullen and Perez-Truglia, 2019), playing golf, or jogging 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 arguments by exploring whether other commonalities affect information-sharing and whether sharing more than one enhances the commonality effect. For instance, individuals who are both of the same gender and have graduated

[5] Informational advantage may come from tips, informal discussions, or attendance to internal firm presentations about current and future operations, investments and financing, in terms of new providers, customers, business alliances, the launch of new products, breakthroughs, and failures in the research and development projects underway, granular details of geographic and product segments under- or over- performance, regulatory threats, early information on involvement in governmental bids, changes in accounting treatments, material concerns in expanded audit reports, or shifts in corporate social and responsibility strategy (e.g., Caglio et al., 2020; Dou, 2017; Moroney et al., 2021).

[6] According to Marsden (1987), the underlying pool of ties and its heterogeneity influences which commonalities are salient. Consider, as an example, a board of directors on which a young Italian woman sits. If all other board members are also Italian women but of diverse ages, then gender and ethnicity would not be salient commonalities. However, age may matter as connection with someone from the same generation may be likely.

[7] 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 over 18% of all connections. In the upper echelons of the workplace, being a woman is arguably a more salient connection than having attended Harvard, which was salient for sell-side analysts.

[8] For example, 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), and female directors help other women reach management positions (Matsa and Miller, 2011).

from the same university might build stronger ties than those who have only gender in common. To test this scenario, we collect data on additional commonalities, namely ethnicity (nationality), education, age, and number of years spent at the same firm. These commonalities, particularly school ties, have been explored elsewhere in some detail examining whether common identity fosters insider-outsider information flows. However, firm selection processes may make certain commonalities less salient (if most insiders share them). Ultimately, the extent to which commonalities matter in information-sharing, influence the propensity to interact, or give rise to sharing a particular type of information (Lazarsfeld and Merton, 1954; Schneider et al., 1997) are empirical issues of interest. The answers depend not only on the underlying distribution of commonalities but also on such factors as whether enough people share that commonality to achieve a critical mass that may foster information-sharing (e.g., Mobbs et al., 2021), or whether individuals classify themselves as researchers do and actually feel that they share the objectively identified commonality (Lawrence and Shah, 2020).

2.2. *The role of corporate governance in insider trading*

Research has examined whether female leadership is associated with higher corporate governance quality through the predominantly female traits of ethical sensitivity and 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 (Huang and Kisgen, 2013; Faccio et al., 2016; Levi et al., 2010), while other studies find that, after controlling for endogeneity and biases in appointments, no gender-driven differences remain (García Lara et al., 2017; Sila et al., 2016).[9]

Arguably, 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. Female executives then 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 to 2016 and, following prior research, retain only open-market transactions, excluding stock-based compensation. For each insider, we identify whether the trade is a purchase or a sale. Next we compute the trader-firm-day one-year BHAR (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.[10] If available, we use the middle name 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 (4099 women and 37,156 men) in 2586 unique US firms.

3.1. *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).[11] 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

[9] This is 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 overconfidence and risk taking, are not necessarily similar to gender gaps among executives. See also Bugeja et al. (2012), Law and Mills (2017), and Adams and Ragunathan (2017).

[10] 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

[11] We use both the CEO and CFO gender, given that less than 9% of our observations have a female in either role (just over 2% of CEOs and just over 7% of CFOs are female). It is extremely rare for both CEO and CFO to be female (25 firms and around 0.3% of our observations).

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	381,625	−0.01	0.4	0.01	347,962	0	0.4	0.01	33,663	−0.02	0.38	0
Trade value, male insiders	348,566	0.89	10.6	0.89	27,539	1.43	17.5	0.18	321,027	0.84	9.83	0.15
Trade value, female insiders	33,053	0.61	3.21	0.03	6124	0.67	1.94	0.17	26,929	0.59	3.43	0.13
Size_day	381,625	14.76	1.64	14.6	347,962	14.76	1.64	14.59	33,663	14.85	1.65	14.68
BTM_day	381,625	0.4	0.44	0.3	347,962	0.4	0.44	0.31	33,663	0.4	0.51	0.29
ROA	381,625	0.05	0.13	0.06	347,962	0.05	0.13	0.06	33,663	0.07	0.13	0.07
ZScore	381,625	1.76	1.72	1.87	347,962	1.75	1.74	1.86	33,663	1.94	1.47	2.04
InvEindex	234,088	−2.97	1.29	−3	211,842	−2.95	1.29	−3	22,246	−3.07	1.23	−3
InstOwner	313,936	0.7	0.2	0.74	287,143	0.7	0.2	0.73	26,793	0.72	0.2	0.76
BoardIndep	113,005	0.69	0.18	0.73	102,925	0.69	0.18	0.73	10,080	0.72	0.16	0.75
BHARPRE_SA	381,625	0.19	0.59	0.09	347,962	0.19	0.59	0.09	33,663	0.19	0.53	0.11
Retvol	381,625	0.03	0.01	0.02	347,962	0.03	0.01	0.02	33,663	0.03	0.01	0.02
AgeCEO	324,511	53.58	7.58	54	294,366	53.61	7.57	54	30,145	53.21	7.62	53
AgeCFO	212,539	50.63	6.65	51	190,733	50.73	6.7	51	21,806	49.77	6.19	50
TenureCEO	381,625	6.52	6.21	5	347,962	6.55	6.23	5	33,663	6.2	6.01	4
TenureCFO	304,749	3.92	3.06	3	276,578	3.94	3.05	3	28,171	3.76	3.11	3
COMP_CEO	301,372	1994.21	2201.85	1297.34	273,543	1993.55	2218.45	1285.09	27,829	2000.69	2031.49	1394.31
COMP_CFO	372,642	4045.15	6051.32	2099.23	339,568	3981.78	6014.36	2080.09	33,074	4695.72	6382.31	2357.32

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

All trades	Male insiders			Female insiders			Difference in means	p-value
	N	Mean	Median	N	Mean	Median		
Any CEO/CFO	348,571	−0.004	0.014	33,054	−0.015	0.003	0.010***	0.000
Male CEO and CFO	321,032	−0.003	0.016	26,930	−0.015	−0.002	0.013***	0.000
Female CEO or CFO	27,539	−0.025	−0.01	6124	−0.012	0.025	−0.013**	0.017
Purchases								
Any CEO/CFO	47,204	0.09	0.008	4124	0.075	0.018	0.015*	0.074
Male CEO and CFO	43,529	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	301,367	−0.019	0.015	28,930	−0.027	0.002	0.008***	0.001
Male CEO and CFO	277,503	−0.017	0.017	23,503	−0.027	−0.002	0.010***	0.000
Female CEO or CFO	23,864	−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	0.340	6.061	5.910	−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***	0.000	0.507	1.028	0.521***	0.000
Ratio female/male insiders	0.078	0.167	0.09***	0.000	0.008	0.016	0.008***	0.000	0.077	0.165	0.088***	0.000

Panel D: Number of firms, CEO/CFOs and insiders by common gender

Number of…	Total	Common gender = 1
Unique firms	2586	2553
Observations	381,625	327,156
Male CEO&CFO	6722	6700
Female CEO/CFO	695	510
Male insiders	37,156	35,227
Female insiders	4099	849

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 millions, 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 number of firms, CEOs/CFOs and insiders by common gender. All variables are 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.

Table 2
Female top executives and insider trading profitability.

	Male insiders	Female insiders	All insiders	Male insiders	Female insiders	All insiders
Female_exec	−0.015***	0.037***		−0.017***	0.035***	
	(−3.311)	(3.510)		(−3.816)	(3.323)	
Common gender			0.006***			0.006***
			(2.969)			(3.186)
Size_day	0.187***	0.188***	0.185***	0.186***	0.185***	0.184***
	(55.667)	(19.095)	(54.848)	(53.772)	(18.231)	(53.090)
BTM_day	0.181***	0.162***	0.179***	0.180***	0.158***	0.179***
	(24.134)	(7.281)	(24.163)	(23.732)	(7.019)	(23.719)
ROA	−0.003	0.017	−0.005	−0.001	0.024	−0.002
	(−0.172)	(0.331)	(−0.260)	(−0.048)	(0.455)	(−0.134)
ZScore	−0.021***	0.001	−0.020***	−0.020***	0.000	−0.019***
	(−7.202)	(0.252)	(−6.801)	(−7.221)	(0.067)	(−6.804)
BharPre	−0.016***	−0.003	−0.016***	−0.014***	0.000	−0.014***
	(−5.171)	(−0.373)	(−5.141)	(−4.575)	(0.037)	(−4.541)
Retvol	3.513***	4.847***	3.605***	3.239***	4.921***	3.351***
	(18.628)	(9.052)	(19.197)	(17.205)	(9.055)	(17.885)
InvEindex				0.005***	0.002	0.005***
				(3.969)	(0.613)	(3.792)
InstOwner				−0.098***	−0.030	−0.093***
				(−10.981)	(−1.327)	(−10.877)
BoardIndep				−0.043***	−0.098***	−0.046***
				(−3.935)	(−3.565)	(−4.315)
AgeCEO				−0.002***	−0.002***	−0.002***
				(−9.444)	(−3.574)	(−9.491)
AgeCFO				0.000	−0.001	−0.000
				(0.113)	(−1.420)	(−0.192)
TenureCEO				−0.000	0.000	0.000
				(−0.290)	(0.824)	(0.004)
TenureCFO				−0.002***	−0.001	−0.002***
				(−4.291)	(−1.383)	(−4.409)
COMP_CEO				0.002***	0.000	0.002***
				(8.408)	(0.651)	(8.282)
COMP_CFO				0.003***	0.003**	0.003***
				(5.047)	(2.127)	(5.135)
Constant	−2.888***	−3.036***	−2.877***	−2.665***	−2.723***	−2.653***
	(−57.045)	(−19.444)	(−56.376)	(−49.377)	(−16.652)	(−49.114)
Observations	348,571	33,054	381,625	348,571	33,054	381,625
R-squared	0.209	0.260	0.203	0.212	0.263	0.207
Dummy controls included	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*	*Yes*	*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, BoardIndep_d, AgeCEO_d, AgeCFO_d, TenureCEO_d, TenureCFO_d*. T-stats 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.

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.[12] 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.

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 from those that do not, 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 for women (Hillier et al., 2015; Inci et al., 2017). When we seek preliminary evidence of common gender effects, we find that mean and median profitability of female insiders' sales significantly exceed those for male insiders when the CEO or CFO is 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

[12] Geiler and Renneboog (2015) estimate that females earn 23% less than males, and Carter et al. (2017) estimate a 15% pay gap 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 or 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.

insider trading.

Columns (1) and (2) of Table 1, panel C, show the annual average number of insiders who trade in firms where both the CEO and CFO are male and in firms where at least one top executive is female. Less insiders trade in firms where at least one top executive is female (6.318) than 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.[13] Information-sharing through informal channels should particularly benefit insiders with low 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 number of firms, CEO and CFOs, and insiders by common gender.[14]

4. Research design and empirical results

4.1. Main analysis

We examine whether insider trading profitability depends on top executives' gender, using the following model separately for male and female insiders.

$$Profitability_{i,j,t} = \mu + \beta_1 \ Female\_exec_{j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \tag{1}$$

where *Profitability* is the one-year size-adjusted buy-and-hold abnormal return of the net trade by insider *i* in firm *j* on day *t*. Insider trading is associated with abnormal profits over a year or more (Ke et al., 2003; Lakonishok and Lee, 2001), and thus we follow Skaife et al. (2013) in using a one-year window.[15] *Female_exec* is an indicator variable taking the value of 1 when at least one of the top executives 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 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 is associated with the firm's contemporaneous stock returns. Therefore, we control for *BHARPRE*, the BHAR 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. Moreover, Frankel and Li (2004) find a positive association between return volatility and insider trading volume; therefore, we control for the standard deviation of returns in the calendar year of the trade (*StdRet)*. To control for the influence of firm performance, we control for *ROA*, income before extraordinary items scaled by total assets. Ryan and Haslam (2005, 2007) show that women are appointed in firms with poor performance; to control for the possibility that poor performance associated with the "glass cliff" affects insider trading, we include in our model Altman's *Z-Score*, computed following Leary and Roberts (2005).

Next, we control for corporate governance and CEO and CFO characteristics to the greatest extent possible, given that better corporate governance reduces the profitability of insider trades (Dai et al., 2016), and that individual characteristics of the CEO and CFO may influence executives' skills, abilities, attitudes and general personal style (Hillier et al., 2015). However, our original sample is reduced by 71% when incorporating these variables. Moreover, due to the various sources for this data, observations are not missing at random, and deleting them may yield biased estimates. For example, the remaining companies are larger, more likely to employ a female CEO or CFO, and more profitable but have higher *Z-Scores*. Hence the complete cases do not represent the population, making listwise deletion inappropriate (Acock, 2005). A solution used by studies with similar data issues (García Lara et al., 2016; Pontiff and Woodgate, 2008) is to assign the value zero to these variables in instances when they are missing and include an indicator variable that marks the missing value. This allows us to retain the maximum sample size without affecting the inferences of our main result. We include controls for institutional ownership (*InstOwner*, the percentage of common shares outstanding owned by institutional

[13] 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 of Seyhun (1986) that chairmen of boards and officer-directors trade on more valuable information than other insiders; all other insiders are classified as having low access to information.

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

[15] Section 16(b) of the Security and Exchange Act of 1934 prevents short-term profitability by allowing shareholders to recover any profits made by insiders that make opposite trades within six months.

Table 3
Social and contextual commonalities and insider trading profitability

Panel A: Social commonalities description

	Entire sample		Common gender		Different gender	
	obs.	firms	obs.	firms	obs.	firms
Common_university	1723	197	1488	166	235	41
Common university between top executives and insider	16,623	864	14,117	796	2506	254
Different universities attended by executives and insider	18,346	955	15,605	872	2741	281
Common_age	18,637	1256	15,777	1155	2860	352
Common age between top executives and insider	21,160	1514	18,350	1413	2810	358
Different ages between top executives and insider	39,797	1776	34,127	1674	5670	534
Common_ethinicity	72,515	1574	59,237	1513	13,278	765
Common ethnicity between top executives and insider	1133	236	927	208	206	47
Different ethnicities between top executives and insider	73,648	1578	60,164	1517	13,484	768

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_ethinicity			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)

(*continued on next page*)

Table 3 (*continued*)

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
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*

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	3845	2057	1442	16,430	8810	6013	8520	4509	3070
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 four 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, BoardIndep, BoarddIndep_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-stats 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.

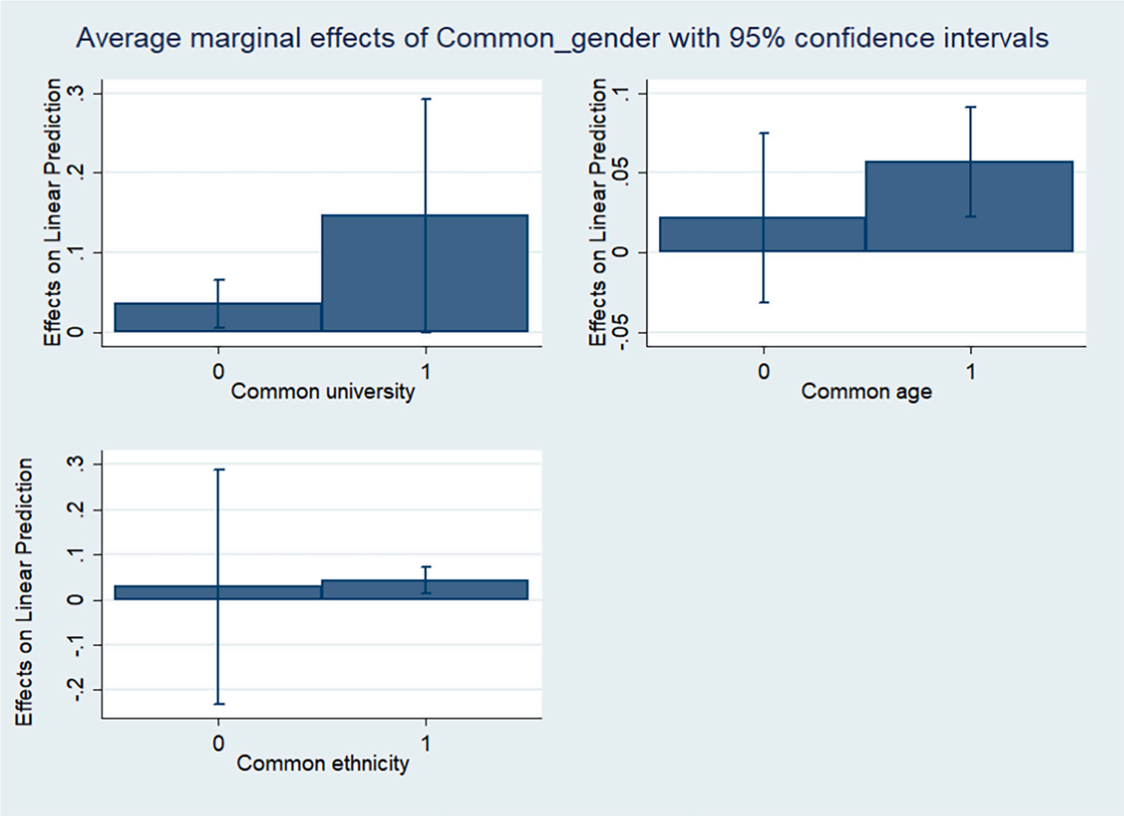

Fig. 1. The moderating effect of social commonalities on the relation between common gender and insider trading profitability.
Fig. 1 shows the effect that social commonalities (common university, common age and common ethnicity) have on insider trading profitability for insiders of the same gender as the CEO or CFO.

shareholders), board independence (*BoardIndep*, the ratio of independent directors to total directors), and the inverse of the entrenchment index (*InvEindex*) developed by Bebchuk et al. (2009). For CEO and CFO characteristics, we follow Hillier et al. (2015) and include the age of the CEO and CFO, their tenure within the firm, and their total compensation, as reported by ExecuComp.

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.

Table 2 presents the results for the estimation of model (1) under two specifications, controlling for firm-level characteristics with full data available (columns 1–3) and for firm-specific characteristics together with corporate governance and CEO and CFO characteristics (columns 4–5). For simplicity and because of the similar implications of both specifications, we discuss the results of the second specification. 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 = −3.816 for male insiders, and coeff. = 0.035, *t*-stat = 3.323 for female insiders).[16] This corresponds to a reduction in the one-year (unrealized), size-adjusted BHAR 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 at the mean value of female insider trades at $603,970, ceteris paribus.[17] Our results are not sensitive to excluding nonroutine trades or trades by CEOs and CFOs themselves. We find that trading is on average more profitable in larger firms, those with higher book-to-market ratios and return volatility, and when CEOs and CFOs have higher compensation. Male insiders' profitability is hurt by the firm's poor financial health, as suggested by the negative coefficient of *Z-Score*. Corporate governance

[16] 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 the gender composition of insiders and top executives affects short-term market reactions to purchases or sales based on market-adjusted cumulative abnormal returns, CAR [−1,3].

[17] Inci et al. (2017) show that female insiders on average make 68% of the cumulative market adjusted returns made by male insiders in the first 50 days after a purchase. Table 1, panel B, shows that female insiders make 77% of the one-year size-adjusted BHAR earned by male insiders' purchases when both the CEO and CFO are male. This figure increases to 120% in the presence of a female CEO or CFO.

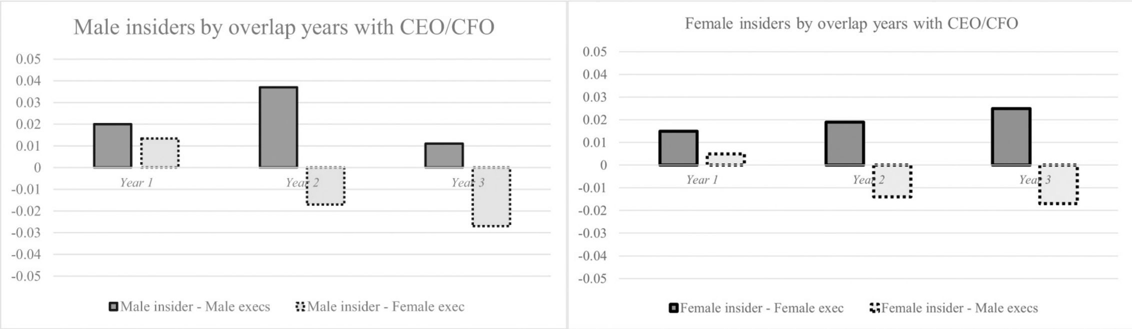

Fig. 2. Profitability of insider trading by overlapping years in the company between insider and CEO/CFO.
Fig. 2 shows insider trading profitability obtained by insiders during years one, two and three of overlapping tenures with the CEO/CFO. The left (right) panel shows results for male (female) insiders.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

proxies influence only the profitability of male insiders, as suggested by the coefficients of *InvEindex*, *InstOwner*, and *BoardIndep*.[18,19]

4.2. 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 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, generational identity, 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).[20] Using this procedure, we can identify, for 2341 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 2127 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 identify this trait only 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 is associated to more than one ethnicity, we retain the most frequent one, and when we could not identify the most likely ethnicity (e.g., 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 identify common ethnicity with either the CEO or the CFO for 9304 distinct male and 1054 distinct female insiders.

For consistency, we define *Common_gender* to take the value 1 when the insider and the CEO or CFO are of the same gender[21] and 0 otherwise. Column 3 in Table 2 reports the results for Common_gender. We find a positive and significant coefficient for this variable (coeff. = 0.006, *t*-stat = 2.969), consistent with our prediction that common gender increases profitability for both men and women.[22] Untabulated correlation coefficients among the commonalities considered are low. This suggests low overlap of these social aspects,

[18] This result comports 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 or 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 *BoardIndep*.

[19] Untabulated results show that the inclusion of controls for corporate governance and CEO/CFO characteristics only negligibly increases the R-squared and leave the coefficients of interests largely unchanged.

[20] 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.

[21] *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.

[22] Mobbs et al. (2021) argue that female directors have lower profitability in firms where few women directors are present and fail to achieve a critical mass. To explore this argument, we look separately at insider profitability where fewer than three female directors are present. This is a substantial restriction, in that most firms (71% of our sample) have fewer than three female directors. The coefficient on common gender is still positive and significant (coeff = 0.011, *t*-stat = 1.758). This implies that our common gender channel works in settings where a critical mass of directors, as defined in Mobbs et al. (2021), is not present.

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*	−0.020
	(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)
Observations	73,373	73,373	6932	6932
R-squared	0.050	0.051	0.100	0.102
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Year&Industry FE	*Yes*	*Yes*	*Yes*	*Yes*
Panel B: Sitting on the same committee as any other females and insiders' trading profitability				
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)
Observations	73,373	73,373	6932	6932
R-squared	0.050	0.051	0.100	0.102
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
Year&Industry FE	*Yes*	*Yes*	*Yes*	*Yes*
Panel C: Full sample - Attending the same meeting as two women and insiders' trading profitability				
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)
Observations	73,373	73,373	6932	6932
R-squared	0.050	0.050	0.102	0.103
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
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. 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. Industry (4-digit SIC code) and year fixed effects are included. The vector of *Controls* includes: *AgeCEO_d, AgeCEO, AgeCFO_d, AgeCFO, BoardIndep, BoardIndep_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*. In the case of the committees tests (panels A and B) we also control for whether the insider serves in any of the committees. T-stats 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.

increasing the generalizability of our results. Panel A of Table 3 provides a detailed matrix describing the diversity of our pool of insiders, presenting the number of observations of the different commonalities both in the entire sample and overlapping with common gender.

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, 1990). 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 likely becomes 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 regression models where the dependent variable is insider trading profitability for the subsample with available data regarding a particular social commonality. 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 BHAR of $18,938 for a trade at the mean value of $860,829 by insiders of the same age group as the CEO or CFO and $26,686 for those of the same ethnicity as the CEO or CFO, ceteris paribus.

Next, we add to the model in Eq. (1) the interaction between *Female_exec* and each of the other commonalities.[23] In all cases, the main effect

[23] To retain a similar number of observations 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.

Table 5
Female executives and corporate governance.

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

	Profitability
Female_exec	−0.026***
	(−7.842)
Female_insider	−0.009***
	(−4.040)
Female_exec × Female_insider	0.027***
	(5.048)
Constant	−0.335***
	(−14.285)
Observations	381,625
R-squared	0.052
Controls included	*Yes*
Year&Industry FE	*Yes*

Panel B: Financial Reporting Quality

	Low_FRQ	Profitability
Female_exec	−0.009	−0.026***
	(−0.471)	(−7.990)
Female_insider		−0.009***
		(−3.843)
Female_exec × Female_insider		0.027***
		(5.064)
Low_FRQ		0.009***
		(8.167)
Constant	0.322***	−0.331***
	(2.972)	(−14.128)
Observations	23,494	380,273
R-squared	0.170	0.052
Controls included	*Yes*	*Yes*
Year&Industry FE	*Yes*	*Yes*

Panel C: Insider Trading Restrictions

	ITR	Profitability
Female_exec	0.072*	−0.029***
	(1.746)	(−7.303)
Female_insider		−0.011***
		(−3.909)
Female_ exec × Female_insider		0.014**
		(2.043)
ITR		−0.004*
		(−1.794)
Constant	−0.006	−0.341***
	(−0.018)	(−13.046)
Observations	15,005	277,676
(Pseudo) R-squared	0.0422	0.056
Controls included	*Yes*	*Yes*
Year&Industry FE	*Yes*	*Yes*

Panel D: Tone at the top

	TATT	Profitability
Female_ exec	0.069	−0.025***
	(0.391)	(−7.368)
Female_insider		−0.003
		(−1.387)
Female_ exec × Female_insider		0.022***
		(4.050)
TATT		−0.041**
		(−2.030)
Constant	−2.167	−0.333***
	(−1.186)	(−11.891)
Observations	9462	215,471
(Pseudo) R-squared	0.122	0.080
Controls included	*Yes*	*Yes*
Year&Industry FE	*Yes*	*Yes*

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, BoardIndep, BoardIndep_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-stats 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.

of gender is retained. This suggests that common gender has a key role in insider information-sharing, which is more pervasive than that of other commonalities. For instance, having attended the same university as the CEO or 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 (coeff. = 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 or CFO.

The stronger evidence for the common gender channel is consistent with our argument that gender may be a more salient commonality in firms' upper echelons than other commonalities, fostering greater trust and connection, particularly for women. The fact that a commonality may matter more than others in a particular setting links to its salience. A commonality is salient when it generates the biggest divide in a particular network and its structure, influencing the type of information that is shared through this channel (e.g., Schneider et al., 1997). While acknowledging the challenge of identifying and measuring different dimensions of homophily and where they may matter, the findings in the homophily literature suggest different commonalities may differently spur the propensity to interact and the nature of the social interactions they foster (Lazarsfeld and Merton, 1954; Lawrence and Shah, 2020). It thus follows that certain commonalities may promote the exchange of particular information (likely related to the commonality) and open different communication channels in different settings. Our evidence is consistent with this view, albeit limited by the underlying diversity in our pool of insiders. This is particularly the case for ethnicity. In ethnically diverse countries such as the United States, nuances of ethnicity or ethnic heritage can be difficult to ascertain without interviews.

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. Fig. 1 reveals some important insights: individuals who have both gender and education in common with the CEO or CFO register a profitability of 14.55 percentage points higher than same-gender insiders without a common educational tie. Profitability is greater by 5.7 percentage points for insiders with common gender and ethnicity, relative to just 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 indicates the additive nature of social commonalities.

Next, we study the effect of overlapping employment history on the relation between each social commonality 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-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). Effects are not as clear for the third year, likely due to the reduction in sample size as we require more years at the same firm.

Fig. 2 depicts the average profitability of male and female insiders separately as a function of the gender of the CEO or CFO and the number of years of overlap in the company. In both panels, dark gray is used for same-gender insider-top executives and light gray for opposite-gender analyses. With every year when the CEO or 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.

We try to tease out what type of information is shared via the commonality channels. Given that our evidence is concentrated on insider sales, we examine three cases of large corporate events where insiders may acquire private information they can trade on. Building on the work of Dou (2017), who proposes that some observable firm actions, such as dividend reductions or increases in debt, are proxies for meaningful information rich events, we examine cases where there is a drop of more than 10% in dividends and cases where there are increases in total debt of more than 10%. Additionally, and for completeness, we analyze increases in equity of at least 10% to understand whether commonalities enhance profitability surrounding events that affect the stake of current investors in the company. Untabulated results confirm that common gender and ethnicity appear particularly relevant, while other commonalities appear to be information- or context-specific. This again suggests different commonalities may facilitate different types of information-sharing.

4.3. 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 *Overlap_male_exec*, which takes the value of 1 if the insider 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 (four-digit SIC code) and year fixed effects.

Results are presented 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 for male insiders' trades (coeff. = 0.014, *t*-stat. = 2.684) and lower profitability for 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 argument 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 *Female_committee*, 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 a positive and significant one 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. When we examine particular committee membership, we find, consistent with Mobbs et al. (2021), that belonging to the audit and compensation committee appears to foster information flows more than belonging to the nomination or corporate governance committee.

Finally, we use this data to assess the trading profitability of insiders who attend meetings with more women. We generate a variable, *Female_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. 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 is consistent with the literature that suggests a minimum 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.

4.4. Female executives and corporate governance

The literature finds that female leadership or gender diverse leadership is associated with higher corporate governance quality, which manifests as less frequent 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 Eq. (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.

$$Profitability_{i,j,t} = \mu + \beta_1\ Female\_exec_{j,t} + \beta_2\ Female\_insider_{i,j,t} + \beta_3\ Female\_exec \times Female\_insider_{i,j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}. \tag{3}$$

The results are presented in Table 5, panel A. The negative, significant coefficient on *Female_exec* (coeff. = −0.026, *t*-stat = −7.842) 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 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 = −4.040), consistent with prior research (Hillier et al., 2015; Inci et al., 2017). This corresponds to lower average profits of $7747. However, this latter effect disappears when including firm-fixed effects. The positive and significant coefficient for the interaction term (coeff. = 0.027, *t*-stat = 5.048) 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 examine three ways the effect of female leadership 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, or (3) improved internal control mechanisms.

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. 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; García Osma et al., 2020;

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**
	(−6.885)	(1.996)
Constant	−3.406***	−4.176***
	(−47.898)	(−18.893)
Observations	340,793	32,112
R-squared	0.412	0.414
Controls included	*Yes*	*Yes*
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)
Observations	30,788	1683
R-squared	0.270	0.429
Controls included	*Yes*	*Yes*
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)
Observations	4195	803
R-squared	0.365	0.642
Controls included	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*

Panel A shows the results of estimating Eq. (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-stats 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.

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, for example, 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 foster a better system of internal controls in the firm. We explore auditors' internal control opinions regarding tone-at-the-top, referring to top management's attitude toward promoting ethics in the workplace. Top management behavior influences employees' behavior (De Jong and Den Hartog, 2007; Starke, 2012),[24] and, as a result, the tone-at-the-top is considered the base of internal effective control (Skaife et al. Skaife et al., 2013). Skaife et al. (2013) find a link between material weaknesses, due to a weak tone-at-the-top and insider trading profitability. Similarly, the work of Gao et al. (2017) is consistent with female directors being more vigilant about ethical standards, compared with males. Thus, it is plausible that female top executives set a stronger tone-at-the-top that permeates the organization, affecting insider trading.

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

$$X_{j,t} = \mu + \beta_1\ Female\_exec_{j,t} + \delta \sum Controls_{j,t} + \gamma_j + \tau_t + \varepsilon_{j,t}, \tag{4}$$

[24] Bushman et al. (2018) find that CEOs drive banks' corporate culture and show 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 fraud by insiders (Davidson et al., 2015).

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 quarterly earnings announcement), the more restricted insider trading is considered to be. Specifically, if 70% or more of all insider trades in the year occur 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 weaknesses 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.[25] 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*, which equals 1 if the company is audited by one of the Big Four accounting firms; *M&A*, which 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 (γ_j) and year fixed effects (τ_t), to control for industry standards and external regulations or trends affecting these corporate governance measures.

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 that female executives are associated with greater restrictions on insider trading. Next, we test whether controlling for these factors affects our main findings by regressing profitability on the gender of the executive and insiders as in Eq. 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 = 8.167). However, this does not seem to be driven by the gender of the executive and does not subsume either the general effect of executive gender, *Female_exec* (coeff. = −0.026, *t*-stat = −7.990), or the common gender effect, *Female_exec* × *Female_insider* (coeff. = 0.027, *t*-stat = 5.064). Panel C, column 2, shows that ITRs reduce insider trading profitability (coeff. = −0.004, *t*-stat = −1.794), but again controlling for ITRs adoption does not remove the general effect of executive gender, *Female_exec* (coeff. = −0.029, *t*-stat = −7.303), nor the common gender effect, *Female_exec* × *Female_insider* (coeff. = 0.014, *t*-stat = 2.043). Finally, as reported in panel D, column 1, we do not find evidence to suggest that female CEOs or 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. = −0.041, *t*-stat = −2.030). This suggests that insiders are more wary of scrutiny, 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 = −7.368), *Female_exec* × *Female_insider* (coeff. = 0.022, *t*-stat = 4.050).[26] Taken together, our main inferences hold and are consistent with common gender being a commonality that facilitates information-sharing, whether or not female top executives improve corporate governance quality.

4.5. Endogeneity tests

To alleviate endogeneity concerns, we take the following steps.[27] 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, while female insiders trade more profitably when at least one of the top executives is a female (coeff. = −0.036, *t*-stat = −6.885 for male insiders and coeff. = 0.026, *t*-stat = 1.996 for female insiders).

Second, we explore our results on a subgroup of insiders who 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

[25] This data is available from 2004 and for 2288 firms in our sample, corresponding to 16,798 firm-year observations. 3479 (20.71%) of our firm-year observations relate to firms that have at least one material weakness opinion. Two hundred and forty-six (1.46%) of these observations relate to firms where at least one of the material weakness opinions was 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 auditor (*Big4*).

[26] Given the sticky nature of corporate governance, 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).

[27] 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).

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)
Observations	35,927	312,402	1349	31,634
R-squared	0.360	0.213	0.657	0.265
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
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)
Observations	47,022	3851	301,317	28,849
R-squared	0.463	0.577	0.310	0.354
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
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-stats 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.

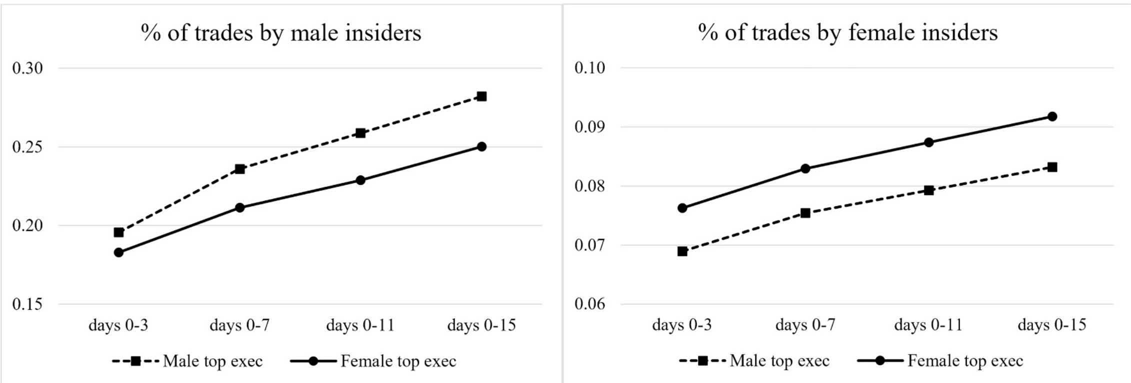

Fig. 3. Trading patterns by male and female insiders in the days following trades by top executives.
Fig. 3 summarizes the cumulative percentage of trades by male and female insiders that take place up to 15 days after a trade by a male and female top executive. The left (right) panel shows results for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

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 Eq. (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).

Third, unobservable shifts in corporate governance or culture that spuriously coincide with the presence of a female top executive could be a source of endogeneity. We examine whether this is the case by studying those firms in our sample that appoint either a female CEO or CFO after a period when both the CEO and CFO were male 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

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)
Observations	347,962	33,663
R-squared	0.036	0.094
Controls included	*Yes*	*Yes*
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)
Observations	1346	414
R-squared	0.614	0.612
Controls included	*Yes*	*Yes*
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)
Observations	176,968	170,554	14,448	18,429
R-squared	0.198	0.272	0.255	0.326
Controls included	*Yes*	*Yes*	*Yes*	*Yes*
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-stats 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.

switch and estimate the following regression on the 63 firms that meet these criteria.

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

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) and decreases for female insiders (coeff. = −0.079, *t*-stat = 1.692). These findings support the existence of the common gender effect.

5. Additional analyses

5.1. Who trades, what information do 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 the timing of insiders' trading relative to that of the CEO or 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 with more information access following the appointment of a new CEO or CFO. To mitigate this concern, we control for different levels of information access among insiders. Studies establish differences in trading profitability among insiders. Ravina and Sapienza (2010) show that executive officers earn greater abnormal returns than independent directors. Inci et al. (2017) find higher profitability for top executives, officers, and directors, in that order. Chen et al. (2018) show that the profitability of trades by headquarters managers and divisional managers differ, 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.

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 precisely 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 (2019) 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 favorably with earnings and promotions. Campbell et al. (2019) show that male lenders are more likely to give loans to male borrowers based on soft information than female lenders do 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 such settings as promotion committees or performance evaluations (Bagues et al., 2017; Grunspan et al., 2016; Mengel et al., 2019). To understand whether 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). Research suggests, but does not test, that men and women share 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 B, 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—that is, use private information to avoid losses—systematically anticipating bad news and stock price declines. This evidence is consistent with the literature that suggests that females are more likely to share bad news 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 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.

In Fig. 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 Fig. 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 a reduced sample where we eliminate nonroutine trades (see Appendix 3).

5.2. 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.

$$Profitability_{i,j,t} = \mu + \beta_1 \ Female\_insider_{i,j,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \tag{6}$$

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 are triggered by the presence of the male top executive, then our main findings would disappear for firms with 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.

Finally, we exploit heterogeneities in female 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, female inclusiveness may be facilitated 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.[28] 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%), 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 the median. With this partition, we re-estimate Eq. (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 industry. 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 industries with high female employment. This indicates that 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 the profitability of insider trading. 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 too. Common education, age, ethnicity, and having worked in the same organization for several years appear to foster information-sharing as well as insider trading profitability, though 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 past employment particularly benefit from their common identity. Our evidence suggests that different commonalities may foster different types of information exchanges, though we are constrained by the underlying diversity in our pool of insiders. Future work might explore these commonality channels, identifying settings where different levels of diversity exist along the different commonalities and where further analyses can be conducted. In terms of gender-driven differences in corporate governance, we find female top executives are more likely to impose insider trading restrictions, which appears to reduce 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 may limit the use of that information to extract rents from other shareholders via corporate governance.

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

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

trades, and the reverse is true for female insiders. This pattern is consistent with insiders trading quickly after they receive private information from a top executive of the same gender.

Overall, we demonstrate 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 research by identifying potential routes for information-sharing and by questioning the findings elsewhere of lower female insider profitability. While we use the population of female CEO and CFOs and insiders, the increasing trends of female participation in top management teams and boards of directors will bring future opportunities for research on information-sharing and further exploring common identity effects once women hold more of these leadership roles. Finally, our results have implications for empirical research. By explaining firms' heterogeneity solely by firm characteristics, researchers may miss individual attributes, such as common gender, which are clearly important determinants of the observed differences insider trading profitability.

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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.	
BoardIndep	The number of independent directors divided by total directors per firms with missing values being set to 0.	ISS (formerly RiskMetrics)
BoardIndep _d	An indicator variable that takes 1 when the missing value for BoardIndep has been replaced by 0.	
BHARPRE	Buy-and-hold abnormal returns (BHAR) 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
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.	
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_committee	Indicator variable that takes 1 if there is another female serving on the same committee and 0 otherwise.	ISS (formerly RiskMetrics)
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)

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Variable	Definition	Source
Female_insider	Indicator variable that takes 1 for a female insider and 0 otherwise.	
Female_meeting	Indicator variable that takes the value of 1 if there are at least two other women in attendance (in addition to the insider) and 0 otherwise.	ISS (formerly RiskMetrics)
FemEmpl	Annual percentage of women to total employees for an industry in a given year as reported by the US bureau of labour statistics.	Manually collected from the bureau of labour statistics: https://www.bls.gov/opub/ee/archive.htm
FirmAge	The number of years since the firm's IPO.	Compustat
Gender Equality Index	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
Overlap_male_exec	An indicator variable that takes the value of 1 if the insider serves on the same committee as a male CEO or CFO in the year of the trade and 0 otherwise.	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 years after a firm transitions back to a male CEO or CFO after a male to female CEO/CFO transition, 0 in the years before and missing in the year of the transition.	ExecuComp
PostTreat	Indicator variable that takes 1 for treatment firms after the transition from a male to a female CEO/CFO, 0 in the years prior to the transition and missing in the year of the transition.	
Profitability	One-year buy-and-hold return starting one day after transaction date minus the average buy-and-hold return for equally sized firms using the NYSE/AMEX/NASDAQ size deciles.	CRSP
Profit	Profitability multiplied by the dollar value of the trade.	
Return	End-of-fiscal year return of $1 invested in a firm's stock on the first day of the fiscal year (%).	CRSP
ROA	Income before extraordinary items scaled by total assets.	Compustat
Size	Log of annual market equity.	Compustat
Size_day	Log of daily market equity.	Compustat
StdRet	Standard deviation of returns during the calendar year.	CRSP
TATT		Audit Analytics

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(*continued*)

Variable	Definition	Source
	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.	
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

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 9989 observations corresponding to 150 male-to-female top executive changes and 1031 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 2.1, 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).[29] Our final matched sample consists of 138 pairs of firms. Table 2.1, 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 the CEO or CFO turnovers, and similar to Francis et al. (2015) and

[29] 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.

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:

$$Profitability_{i,j,t} = \mu + \beta_1\ Post_{i,t} + \beta_2\ Treat_i + \beta_3\ PostTreat_{i,t} + \delta \sum Controls_{i,j,t} + \gamma_j + \tau_t + \varepsilon_{i,j,t}, \tag{B2}$$

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 Fig. 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.[30] 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.

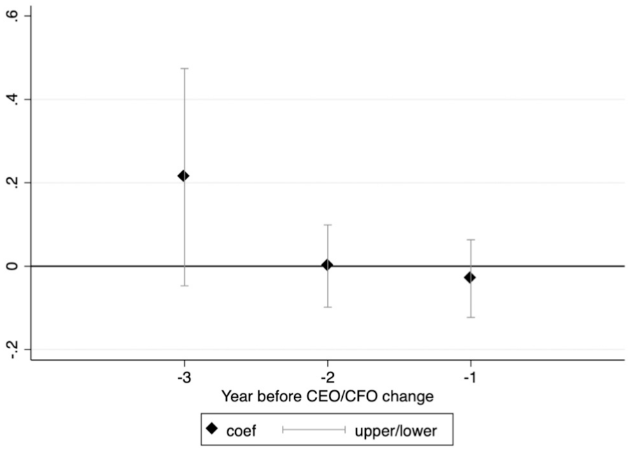

Fig. 2.1. Testing for parallel trends.

[30] 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.

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	9984	
LR-Chi squared	257.9	
p-value	0.0325	
Year FE	*Yes*	

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&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		3051	
R-squared	0.133		0.226	
Controls included	*Yes*		*Yes*	
Year&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.

Appendix C. Other robustness tests

C.1. 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 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 and common gender between insider and top executive generates significantly more profitable trades. 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 A3.1 The effect of female top executives on insider trading profitability for non-routine trades.

	Profitability		
	Male insiders	*Female insiders*	*All insiders*
Female exec	**−0.018*** **	**0.036*** **	
	(−4.018)	**(3.271)**	
Common Gender			**0.008*** **
			(3.986)
Constant	−2.586***	−2.814***	−2.589***
	(−48.083)	(−16.831)	(−47.992)
Observations	326,405	30,702	357,109
R-squared	0.214	0.270	0.209
Controls included	*Yes*	*Yes*	*Yes*
Year&Firm FE	*Yes*	*Yes*	*Yes*

This table shows the effect of a female executive and common gender on insiders' profitability on a sample of trades classified as non-routine trades. Firm and year fixed-effects included. T-stats 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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