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Abstract

We investigate gender differences in insider trading behavior of senior corporate executives in the U.S. between 1975 and 2008. We find that, on average, both female and male executives make positive profits from insider trading. Males, however, earn about twice as much as females and also trade more than females. All these results also hold for the sub-sample of very top executives. The results are consistent with the view that female executives have a disadvantage relative to males in accessing inside information even if they have equal formal status. We are able to rule out gender differences in dispositional factors such as overconfidence and risk-aversion as sole explanations for our results.

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1 Introduction

In this paper, we investigate gender differences in insider trading behavior and returns. The increasing presence of females in executive suites has heightened the interest in understanding potential differences in the decision making styles of male and female executives and their implications to organizational effectiveness.[1] It has been suggested that changes in the gender composition of executives have implications to organizational design and corporate performance.[2] There has been a spate of recent studies attempting to link the gender of top executives to firm performance.[3]

The observed differences between the female and male executives' behavior have been attributed to dispositional factors (e.g., confidence, risk-aversion) as well as to situational factors such as limited access to information arising from the dynamics created by structural issues, particularly the predominance of males in top corporate jobs (see Riger and Galligan (1980) for a review of these factors). We use the context of insider trading to examine the role of dispositional factors such as overconfidence, risk-aversion, and propensity to use insider information, and situational factors such as access to information, in explaining gender differences in executive behavior.

We use an insider trading database from 1975 to 2008, limiting the analysis to purchases. Since profit is the primary motive for purchases unlike for sales which could be also motivated by portfolio diversification or liquidity reasons, purchases provide a cleaner test for analyzing

[1] Catalyst, an organization that works to expand options for women, reports that the proportion of female corporate officers in Fortune 500 firms has increased from 8.7% in 1995 to 16.9% in 2008 (Catalyst (2009)). According to Catalyst (2009), the proportion of female CEOs in Fortune 500 firms has increased from 0.4% in 1998 to 6% in 2008.

[2] Kanter (1977) suggests that the gender composition of top management teams may have implications for organizational design. She argues that diverse top management teams require mechanisms in addition to formal incentives to induce cooperation.

[3] Welbourne, Cycyota, and Ferrante (2007) show that the presence of females in the top management team of firms going public has a positive association with short-term performance, as measured by Tobin's Q, three-year stock price growth, and growth in earnings per share. Francoeur, Labelle, and Sinclair-Desgagne (2008) find that, in a sample of 230 large Canadian firms operating in "complex" environments, firms with a high proportion of female executives generate positive and significant abnormal returns compared to other firms. Levi, Li, and Zhang (2008) find that bidders with female CEOs paid over 70% less premium than bidders with male CEOs. They also find that female representation on the board was inversely related to bid premiums.

gender differences in trading behavior. In our database, females make up 4.3% of the purchases in terms of the number of transactions and 1.1% by dollar value. About 90% of the purchases by (constant) dollar value occur during 1995-2008. The key findings of our paper are as follows. First, both male and female insiders (top executives, board members, and other senior officers) make significant average positive excess returns from their insider purchases. Second, males on average make greater excess returns on insider purchases than females in the same executive position. This result holds regardless of their position (officers, board members or top executives) in the firm. Finally, on average, males trade more often than females in the same executive position. Figure 1 shows the market-adjusted returns for 100 trading days before and after the purchase dates for female and male executives. It can be seen that, on average, executives of both genders time their purchases when the stock price is at its lowest, indicating that they are trading on information. The 50-day market-adjusted return after purchase is positive for both genders: about 2.8% for male executives and 1.9% for female executives, a significant difference.[4]

We explore four hypotheses to explain these results. Specifically, we investigate if gender differences in access to information, overconfidence, risk-aversion or propensity to use insider information can explain our findings. Each of these hypotheses has a different implication for trading behavior and returns. The information access hypothesis predicts that male executives will trade more and earn greater returns than female executives because they have better access to information. Males' informational advantage derives from being in more senior positions and presumably from being better connected. The overconfidence hypothesis implies that male executives will trade more and earn lower returns than female executives because they are more overconfident (see for example, Odean (1998) for a theory of overconfidence with these implications). The risk-aversion hypothesis implies that male executives will trade more than female executives adjusted for the quality of the information because males are less (or no more) risk-averse than females (see for example, Croson and Gneezy (2004) for an excellent survey on gender differences in preferences); or equivalently, adjusted for the size of their trades, male executives will earn lower returns than female executives because the information content of male trades

[4]As a comparison, Seyhun(1986) reports insiders' abnormal profits to be 3.0% after 50 days for all purchases between 1975 and 1981.

will be lower. Finally, the propensity hypotheses suggests that females are less willing to exploit insider information due to the threat of civil and criminal penalties and/or ethical differences. The implications of these hypotheses and our results are summarized in Figure 2.

Hypothesis	Implications	Results
Information access: Male executives have better access to valuable information than females.	Males trade more and earn greater returns than females.	Supported.
Overconfidence: Male executives are more overconfident than females.	Males trade more and earn lower returns than females.	Not supported.
Risk-aversion: Male executives are no more risk-averse than females.	Males earn lower returns than females adjusted for trade size.	Not supported.
Propensity to use insider information : Female executives are less willing to use insider information than females.	Females are less likely to exploit information events such as earnings announcements than males.	Not supported.

Fig. 2: Summary of hypotheses, their implications, and the results.

The result that male executives trade more and earn more than female executives is consistent with the information hypothesis. This result also leads us to conclude that overconfidence alone cannot explain the gender differences in executive trading behavior and returns as overconfident male executives, while trading more, should earn lower returns than female executives. In fact, we can rule out overconfidence as the sole explanation regardless of which of the two genders is more overconfident. If females are more overconfident, we should observe them trading more and earning lower returns, which we do not find. We can also eliminate risk-aversion as the sole explanation for our results. We find that, controlling for trade size, male executives earn greater

returns than female executives. This result is inconsistent with the risk-aversion hypothesis. If male executives are less risk-averse, they should be trading on less private information than female executives in order for their trades to be of similar size, which in turn should result in male executive trades earning a lower return.[5]

Finally, we test if there are gender differences in the propensity to trade by comparing male and female purchases before potentially informative events such as announcements of earnings, dividends, and stock splits. The propensity to trade is measured as the number information events before which an executive traded divided by the total number of such information events available to the executive to exploit. We find that female executives trade no less frequently (and in fact trade significantly more) than their male counterparts before potentially informative events. Taken together, all these results leads us to suggest that female executives may have limited access to inside information in comparison to their male counterparts.

The paper is organized as follows. Section 2 discusses the four hypotheses in detail and presents the existing literature in psychology and economics that provides a basis for the implications. Section 3 describes the data and provides the summary statistics. Section 4 presents the main results regarding gender differences in insider trading behavior and returns. Section 5 discusses the results and their consistency with the hypotheses. Section 6 concludes.

2 Theoretical Predictions and Tests

In this section, we discuss the Information access, Overconfidence, Risk-aversion, and Propensity to trade on insider information hypotheses in greater detail and summarize the literature on each of these hypotheses and the basis for their implications. The first hypothesis suggests that gender differences arise from situational factors while the other three imply that gender differences arise from dispositional factors.[6]

[5]This implication follows from most informational trading models (see Grossman and Stiglitz (1980), for example).

[6]We do not imply that these hypotheses are mutually exclusive.

2.1 Information access hypothesis

This hypothesis posits that male executives on average have access to better quality information about their firms' future actions and prospects than female executives. This disadvantage to female executives could arise from the fact that females are not yet well-represented in top corporate ranks. Bertrand and Hallock (2001) find that females constituted 2.4% of the top five executives in S&P 500, S&P Midcap 400, and S&P Smallcap 600 firms during 1992-97 while Farrell and Hersch (2005) find that the proportion of female directors increased from 5.6% to 12.3% from 1990 to 1999 in a sample of 300 unregulated Fortune 1000 firms. Catalyst (2009) reports that females constitute only 6% of CEO's in 2008. These figures and our own data indicate that females are significantly under-represented in top executive ranks leaving them at a disadvantage in terms of access to inside information.

A related reason for the informational disadvantage might be the weak social networks of female executives. Social psychologists have argued that what occurs in organizations is only partially related to formal ranks and responsibilities and that interaction networks play a critical role in both individual effectiveness and organizational functioning (see Miller (1986) and Ibarra (1993) for excellent expositions of this view and reviews of this literature). Furthermore, whereas the organizational chart simply indicates the presence or absence of a relationship, it is suggested that networks are the determinants of the nature and strength of the relationship. Network researchers offer two reasons why females may be viewed as less desirable network contacts. The human capital perspective (see Ibarra (1992) for a review) argues that the weaker position of females is due to differences between genders with respect to achievement (i.e., education, experience, and expertise) and formal position (i.e., rank, department, and occupation). The systemic barriers perspective (Morrison and Von Glinow (1990)) suggests that gender differences in network access reflect the expectations and biases of organizational members. In our data, both genders hold similar formal positions and therefore any difference in network access is unlikely to be attributed to human capital, but more to barriers inherent in organizations. There is considerable evidence in the social psychology literature that there are gender differences in homophily (i.e., tendency to form same-sex network relationships) and in rates of return from networks. Ibarra (1992) finds

that males are more likely to form homophilous ties across multiple networks and to have stronger homophilous ties. Males also reap greater returns from their investment in networks. More interestingly for our paper, these results hold for communication networks. Gender differences in access to information can arise from not only differences in intra-firm networks, but also inter-firm networks. Westphal and Minton (2000) find that investment in external social networks can yield returns by mitigating the negative effects of race and gender with regard to a director's influence over decision- making on the board.

In summary, the information access hypothesis predicts that female executives will trade less and make lower profits than male executives because of less access to information.

2.2 Overconfidence hypothesis

Overconfidence is usually measured in one of two ways: 1) miscalibration, i.e., the tendency to overestimate the precision of one's information; or 2) better than average effect (BAV), i.e., the tendency to think that one is better than others with regard to skills or positive personality attributes. Benos (1998), Caballé and Sákovics (1998), Daniel, Hirshleifer and Subrahmanyam (1998, 2001), Gervais and Odean (2001)), Kyle and Wang (1997), and Odean (1998), Wang (1998, 2001), model overconfidence as miscalibration and all predict a positive relation between overconfidence and trading activity. Odean (1998) also shows that overconfidence is positively related to insider trading volume and inversely related to insider trading profits.

The empirical evidence about gender differences in overconfidence is mixed. Barber and Odean (2001), using a database of actual trades of online broker investors, find that males trade more frequently than females and earn greater negative gross and net excess returns and interpret this result as evidence of greater overconfidence in males. Niederle and Vesterlund (2007) find that males have a preference for the more competitive tournament setting in a laboratory experiment and part of this preference can be explained by greater male overconfidence as measured by their self-beliefs about relative performance. On the other hand, Biais, Hilton, Mazurier, and Pouget (2005), measure overconfidence in graduate business/finance students in a laboratory trading

game using a confidence-interval task and find no evidence for greater overconfidence in males. They also find that males do not trade more than females. In a similar vein, Deaves, Lüdors, and Luo (2003) first calibrate overconfidence using a confidence-interval task in undergraduate students and find no evidence for greater overconfidence in males. They find, however, that overconfident participants trade more but perform less well. Glaser and Weber (2007) employ surveys of online broker investors to measure overconfidence using both miscalibration and BAV measures. They find, however, that investors who think that they are above average in terms of investment skills or past performance (but who did not have above-average performance in the past) trade more, but that measures of miscalibration are, contrary to theory, unrelated to measures of trading volume. They find that gender is not significantly related to trading volume.[7] In summary, while it appears that there is disagreement about gender differences in overconfidence, there is consensus that overconfidence results in increased trading and reduced profits.

2.3 Risk-aversion hypothesis

The consensus in the literature in psychology and sociology is that women are more risk-averse than men. Byrnes, Miller and Schafer (1999) analyzed 150 studies from 1967 to 1997 in which the risk-taking tendencies of male and female participants were compared in a variety of settings and found that in 14 out of 16 tasks, males were more risk taking. Intellectual and physical risks produced larger gender differences than, for example, health risks like smoking.

Eckel and Grossman (2003) survey the economics literature, comparing the results across abstract gambles, contextual experiments and field studies. They conclude that while results from field studies show that women are more risk-averse, the findings of laboratory experiments are less conclusive.[8] While most of the empirical work on risk-aversion in financial decision

[7]Ben-David, Graham, and Harvey (2007) find that companies with overconfident CFOs use lower discount rates to value cash flows, invest more, use more debt, are less likely to pay dividends, and are more likely to repurchase shares.

[8]Dwyer, Gilkeson and List (2002), using survey data from mutual fund investors, find evidence that females take less risk than men in their last, largest, and riskiest mutual fund investments. However, the observed difference in risk-taking is substantially attenuated when investors possess financial investment knowledge, but is

making has been focused on individual decision making, there are a few papers that investigate gender differences in risk-aversion in a managerial setting. The results are mixed. Johnson and Powell (1994) find no difference in risk taking between genders in a managerial population of potential and actual managers. Atkinson, Baird and Frye (2003) compare the performance and investment behavior of male and female fixed-income mutual fund managers and find that male and female managed funds do not differ significantly in terms of performance, risk, and other fund characteristics. Niessen and Ruenzi (2007) find that female fund managers are more risk-averse than male fund managers: females deviate less from benchmarks, follow less extreme investment styles that are also temporally stable than those of male fund managers. Furthermore, female fund managers trade less than male fund managers. However, using various risk-adjusted performance measures, they do not find any significant difference in the average performance of female- and male- managed funds. In summary, most of the evidence points to gender differences in risk-aversion, with females being more risk-averse (the very least, no less risk-averse).

In order to obtain implications for the hypothesis that females are more risk-averse, consider an information-based model of trade such as that in Grossman and Stigliz (1980). The quantity of the risky asset X demanded by an informed investor, with risk-aversion coefficient a is given by,

$$X = \frac{\phi p}{a}$$

where ϕ is the payoff from investing in the risky asset (i.e., value of the information), and p is the precision with which the insider observes the payoff. An immediate implication that follows from the equation above is that, adjusted for quality of the information (i.e., value ϕ and precision p of the information), the less risk-averse gender will trade more. It also follows from the above equation that, for a given trade size, the more risk-averse gender will also have better quality

still statistically significant. Jianakoplos and Bernasek (1998) and Sunden and Surette (1998), using data from the Survey of Consumer Finances, find that single women are significantly more risk-averse (i.e., hold a smaller percentage of their wealth in the form of risky assets) than single men. Bajtelsmit and Van Derhei (1997), Hinz, McCarthy and Turner (1997), and Bernasek and Shwiff (2001) use pension fund data and find that women allocate their pension more conservatively than men. In contrast, Schubert, Gysler, and Brachinger (1999) observe in a laboratory setting no gender differences in risk propensity of males and females when subjects face contextual decisions.

information (i.e., better value and precision). Since the existing literature on gender differences indicates that females are more risk-averse than males (or at best similar in risk aversion to males), the risk-aversion hypothesis implies that, for the same trade size, females will be better informed and hence earn greater returns than males (or at best the same returns as males if they are equally risk averse).

2.4 Propensity to use insider information hypothesis

This hypothesis suggests that there may be gender differences in the propensity to trade on insider information, even if there were no gender differences in access to information. There is risk of scrutiny in insider trading with resultant consequences such as civil and criminal penalties and loss of job and reputation.[9] It is well-documented that males are dominant in most types of crimes (see Heidensohn (1989, 2006), Wilson and Herrnstein (1985), Walklate (2004), for example). Specifically, it is also true that males are more dominant in white-collar crimes such as fraud, forgery, and embezzlement, though less so than in violent crimes. If we interpret the lower prevalence of female white-collar offences as lower propensity to commit such crimes, then it is likely that female executives are more likely to refrain from trading on insider information to avoid criminal prosecution. It is also possible that there are gender differences in ethics regardless of the probability of adverse consequences. Results from the research on gender differences in ethics are, unfortunately, inconclusive (see, Loe, Ferrell, and Mansfield (2000), and Roxas and Stoneback (2004) for an excellent review on the issues and findings about gender differences in ethics). Most of the papers in the ethics literature conclude that women are more ethical than men in their decision making (see Volkema (2004), Valentine and Rittenburg (2007), for example) or that there is no gender difference in ethical behavior (see Derry and Kelley (1989),

[9]Insider Trading Sanctions Act of 1984 (ITSA, signed into law on August 10, 1984) and Insider Trading and Securities Fraud Enforcement Act of 1988 (ITSFEA, signed into law on November 19, 1988) significantly increased the penalties for insider trading. Penalties for criminal insider trading convictions include possible prison sentence of up to ten years for each offense, one million dollars in fines, and payment of damages up to three times the profits. In addition to these penalties, the new laws also created a bounty program providing up to ten percent of the insider trading profits to informants. For insiders' response to ITSA and ITSFEA, see Seyhun (1992).

Tsalikis and Ortiz-Buonafina (1990), and Roxas and Stoneback (2004), for example).[10] If indeed female executives are more ethical, then we expect to see a lower propensity to trade on inside information.

3 Data and Sample Selection

The insider trading data in the study is obtained from a compilation by the Securities and Exchange Commission (SEC) - Ownership Reporting System - that is made available for sale. The data contains all open market insider trading of shares by officers, directors, and beneficial owners (direct or indirect owners of more than 10% of any equity class of securities) of publicly traded firms between January 1975 and October 2008.[11] For the purposes of this study, only open market trades by individuals are included. Shares acquired through exercise of options, stock awards, and trades with corporations are excluded. The data on stock market returns are obtained from the Center for Research in Security Prices (CRSP). The sample contains all insider trades between January 1975 and October 2008 in firms for which stock return data is available in CRSP. The final sample is limited to firms for which stock return data is available in CRSP and to trades for which the insider relationship (CEO, CFO, etc.) is reported. In addition, firms with missing market capitalization data in CRSP are screened out.

In order to identify the insider's gender, we tried to match the names in our data set[12] to the database of all male and female baby names for every decade from 1900 till 1980, recorded by the U.S. Census Bureau[13]. The matching process produced three categories – clear male names,

[10]Some researchers believe that even if there were some innate gender differences in ethics, such differences are mitigated by structural roles and rewards. See Ambrose and Schminke (1999) for a concise exposition of this view.

[11]For most of the sample period analyzed here, Section 16(a) of the Securities and Exchange Act requires that insider transactions be disclosed within the first 10 days of the month following the month of the trade. Section 16(b) prohibits insiders from profiting from short-term price movements defined as profitable offsetting pairs of transactions within 6 months of each other, while Section 16(c) prohibits profiting from short-sales. Sarbanes-Oxley Act of 2002 (effective August 29, 2002) has modified insider trading regulations in many significant ways. First, the new reporting requirement states that insider transactions must be reported electronically by the end of the second business day following the day on which the transaction is executed both through EDGAR and corporate public websites. Sarbanes-Oxley also prohibits purchase and sale of securities during black-out periods.

[12]Insiders are required to report their full legal name on Forms 3, 4 and 5.

[13]We obtain this information from http://www.ssa.gov/OACT/babynames.

clear female names, and gender neutral/unclassifiable names. For the third category we searched Factiva for news stories mentioning the specific insider during the time period identified in our data set to identify the gender. As a further check we also obtained the gender from the Executive Comp database from 1992 to 2008 and cross-checked it with the gender as obtained using the first procedure. They matched almost completely; the few mismatches were again searched in Factiva to obtain a definitive confirmation of the gender.

We separate insider trades by purchases and sales. We report only the results pertaining to the purchase subsample. The reason is that purchases are most likely motivated by information whereas sales may be driven by multiple motivations (diversification, information exploitation, personal liquidity shocks, etc.), making the interpretation of the results from the purchase subsample cleaner. We also provide a brief discussion of the (unreported) results from the sales subsample.

Panel A of Table 1 provides the summary statistics of insider purchases by top executives, officers and directors of both genders. There are 18,021 firms in the sample with trading reported by males in 17,948 firms and by females in 5,614 firms. The total value of the transactions during the sample period is $251.59 billion measured in 1984 constant dollars (using the consumer price index from the U.S Department of Labor: Bureau of Labor Statistics), with the females' share being 1.1%; there are 764,957 transactions, with the females' share being 4.3%. The average size of a male (female) purchase, calculated as total male (female) dollar purchases divided by the total number of male (female) purchase transactions is $0.34 ($0.08) million in constant dollars.

We group the insiders into three categories, namely, Top Executives, Directors, and Officers. We classify as Top Executives those who are designated as CEO, CFO, Chairman of the Board, COO, Executive Vice-President, General Partner, Director and Officer, and those who hold more than 10% equity in addition to being a Director and an Officer. Directors include members of the board of directors other than those included in the Top Executives category. Other executives are classified as Officers. Females make up 5.9% of all the insiders in our sample, 7.8% of the Officers, 5.2% of the Directors, and 3.5% of the Top Executives.

Panel B of Table 1 provides the summary statistics of insider trades by male and female

corporate insiders for different firm-size groups. We divided the firms in the sample into four size groups (less than $50 million, $50 – $250 million, $250 – $1,000 million, and greater than $1,000 million), all in 1984 constant dollars, based on their equity market capitalization at the end of the calendar year in which the trade took place. The number of male and female transactions decline with firm size. The average per-trade value of males is greater than that of females in every firm-size group ranging from about two to nine times.

Table 2 provides the distribution of insider trading activity of males and females over three sub-periods. The value of the transactions (in constant dollars) shows more than a sixteen-fold increase between the earliest and the most recent sub-periods. In fact, 90% of the trading by value occurs in the most recent sub-period. The number of transactions has also increased over time with the transactions in the most recent time period being about 3.3 times that of the earliest period. The number of insider transactions by females as a proportion of the total, has steadily increased over time, from 2.4% to 5.1%. Moreover, the average value of females' purchases is lower than that of males in each sub-period.

Table 3 provides trading statistics of the three categories of insiders, namely Officers, Directors and, Top Executives.[14] Among the three categories, Directors and Top Executives make up the bulk of the value of male trades (59% and 34%, respectively) while Officers account for only 7%. The figures are similar for females: Directors account for 60% of the value of the trades while Top Executives account for 30%. The proportion of female trades of the total, both in value and number of transactions, declines as the seniority increases, probably reflecting the lower female representation in senior ranks. Males and females differ in the per-trade value of their purchases and this difference depends on their insider position. However, regardless of position, the average per-trade value of purchases (calculated as total purchases divided by the total number of transactions) of males is greater than that of females: the per-trade value of male purchases varies between 2.7 to 5 times that of females, across the different positions.

[14]The total number of transactions and total value of purchases in Table 3 are slightly less than the corresponding figures in Tables 1 and 2 because we could not classify a few of the insiders as their position field was blank in the database.

4 Results

In this section, we provide the main results of our paper regarding gender differences in profitability and intensity of insider trades.

4.1 Profitability of insider trading transactions

We measure profitability of trades by the cumulative market-adjusted abnormal daily stock returns (CAR) starting from the trade date (date 0) for a period of T days:

$$CAR_{i,T} = \sum_{t=0}^{T} (r_{i,t} - r_{m,t}),$$

where $r_{i,t}$ is the cum-dividend return to stock i for day t, and $r_{m,t}$ is the cum-dividend return to the CRSP equally-weighted portfolio of all New York Stock Exchange, American Stock Exchange and NASDAQ stocks for day t. We report the CAR for a 50-day period and obtain similar results when we use a 100-day period.

Figure 1 shows the cross sectional mean (across trades) of the cumulative market-adjusted returns of male and female executives (Officers, Directors, and Top Executives) for 100 trading days before and after a purchase. It appears that both male and female executives, on average, time their purchases as the returns for both genders display a trough on the purchase date. It can be seen that purchases by males result in greater returns subsequent to the trade over practically every duration.

Table 4 provides the univariate results. The trading profitability of each insider holding a specific title in each firm is computed as the trade size weighted average of the CAR of all trades by that insider, with the trade size measured in 1984 dollar values. Thus all purchases by an insider holding a specific title in each firm are collapsed into a single observation.[15] The mean

[15] An executive who worked for more than one firm during the sample period is counted as more than one observation as is an executive who held different titles within the same firm.

return of male purchases over the following 50-day period is 343 basis points while that of females is 175 basis points. Both are significantly different from zero implying that both male and female insiders profit from insider purchases on average. Males earn excess returns twice as much as females; the difference is 168 basis points over 50 days from the purchase date and this difference is statistically significant at the 1% level. The median excess return of males is 132 basis points while that of females is 25 basis points, and the difference is significant at a p-value of 0.0001 using a Wilcoxon rank sum test (not reported). The Kolmogorov-Smirnov test for the equality of the insider trading returns distribution of males and females is rejected at a p-value of 0.0001. These results collectively indicate that while both males and females profit from their purchases on average, the profits earned by males are economically and statistically greater than that of females. The results also show considerable skewness in insider profits as the mean is much greater than the median.

Table 4 also provides the profitability of males and females for each position. Note that the sum of the observations across positions does not match the total number of observations because some executives are unclassified. It can be seen that, regardless of position, the mean return of males is economically and statistically significantly positive and greater than that of the females in the same position.[16] Also, Top Executives earn more than Officers in the case of males but not females.

The univariate analysis presented shows that males earn higher insider profits than females, with both genders earning positive profits. However, the measure we have used is the buy and hold abnormal return (BHAR). It has been noted (Barber and Lyon (1997)), however, that while BHAR precisely measures investor experience, simulation evidence shows that common estimation procedures produce biased test statistics. In particular, biases arise from new listings, rebalancing of benchmark portfolios, and skewness of multiperiod abnormal returns. In addition, BHAR methodology ignores cross-sectional dependence of event-firm abnormal returns that are overlapping in calendar time (which is a very common feature of our data as multiple executives across firms trade during similar time windows) and is likely to produce overstated test statis-

[16]Ravina and Sapienza (2007) also find that independent directors and the firm's officers earn substantial positive returns from their insider purchases.

tics. Therefore, Lyon, Barber and Tsai (1999), Fama (1998), and Mitchell and Stafford (2000) advocate a calendar-time portfolio approach for measuring long-term abnormal performance. By forming daily calendar-time portfolios, all cross-correlations of event-firm abnormal returns are automatically accounted for in the portfolio variance. The distribution of this estimator is better approximated by the normal distribution, allowing for classical statistical inference.[17]

We use the calendar-time approach similar to that employed by Barber and Odean (2001) and Barber, et al (2007). We form two portfolios, one each for males and females. The male portfolio on any given date consists of all stocks purchased by male executives during the 50 trading days ending on that date. During this interval, if more than one male executive purchased a particular stock, or if the same executive purchased a stock multiple times, then that stock will appear multiple times in the portfolio. The portfolio return on date t is given by

$$\frac{\sum_{i=1}^{n_t} x_{i,t}\ R_{i,t}}{\sum_{i=1}^{n_t} x_{i,t}},$$

where R_{it} is the gross date-t return on purchase i, n_t is the number of purchases in the portfolio (corresponding to n_t insider purchase events in the previous fifty trading days) [18], and x_{it} is the is the aggregate value of all males purchases of stock i from trading day *(t - 50)* through *(t - 1)*. We replicate our tests using two different portfolios, one in which the same nominal dollar amount is invested in each purchase (equally-weighted or EW) and one in which the actual dollar value invested by the male insider is used (value-weighted or VW). This portfolio is updated daily by deleting stocks purchased more than fifty days earlier. This calculation yields a time series of daily returns for the male portfolio. The daily returns for the female portfolio are determined in a similar fashion.

Abnormal return is calculated as the intercept α_j, from the four-factor model, in the following

[17] All results reported in this paper are qualitatively identical when we estimate regressions with BHAR as the dependent variable.

[18] We require n_t to be atleast thirty purchases made by executives over the preceeding fifty trading days in constructing our portfolio. Otherwise, we invest the portfolio proceeds for that day into T-bills yielding the risk-free rate for that day.

time series regression for each portfolio j (where all daily returns are expressed in basis points)

$$R_{jt} - R_{ft} = \alpha_j + b_j(R_{mt} - R_{ft}) + s_j(SMB_t) + h_j(HML_t) + u_j(UMD_t) + \epsilon_{jt},$$

where the right hand side variables are the Fama-French three-factor model variables augmented with a momentum factor. R_{jt} is the daily return (EW or VW) on the calendar-time portfolio, R_{mt} is the return on a value-weighted market index, R_{ft} is the daily return on a three-month Treasury bill, SMB_t is the difference in returns of value-weighted portfolio of small stock and big stocks, HML_t is the difference in returns of value-weighted portfolio of high and low book-to-market stocks and UMD_t is the difference in returns of a value-weighted portfolio of stocks with high and low recent (6 months) returns. The estimate of the intercept α_j provides a test of the null hypothesis that the mean daily return on the calendar-time portfolio is zero.

Table 5, Panel A presents the average daily abnormal returns to the EW portfolios of the male and female executives. As reported in Panel A (Columns 1, 3, and 5), for the full sample of male executives during entire sample period, the portfolio of mimicking their purchases has a significant (at the 1% level or better) average daily abnormal return of 22.17, 20.95, and 21.64 basis points using the CAPM, three-factor, and four factor-models respectively as the benchmark. Columns 2, 4, and 6 present the same information for female executives. The portfolio mimicking their purchases also has an significant (at the 1% level or better) average daily abnormal return of 19.12, 17.84, and 18.27 basis points using the CAPM, three-factor, and four factor-models as the benchmark respectively. Thus, both male and female executives earn significant abnormal returns from insider trading in our sample. Specifications 7 through 9 present the results of a portfolio that buys male executives' purchases and shorts the female executives' purchases. This portfolio earns an abnormal return of 3.05 - 3.37 basis points per day depending on the benchmark model. For example, using the four-factor model, the abnormal return differential of 3.37 basis points per day represents an annualized return differential between male and female executives of about 8.8%, a number that is statistically significant and economically large. Panel B repeats the analysis of Panel A using the value-weighted approach where the trade size of each executive is used as the weight in constructing the portfolios. The results are qualitatively similar to that

of Panel A and the abnormal returns of female portfolios are uniformly lower than that of male portfolios. The abnormal return differential (specification 9) between male and female portfolios is now 9.50 basis points per day and statistically significant (at the 1% level), representing an annualized return differential of about 27%. Overall, we conclude that male executives trade more profitably on their insider information relative to their female counterparts.

A potential explanation for the gender difference in trading profits in insider purchases is that males possess more information about their firm's prospects by virtue of being, on average, in more senior positions. Bertrand and Hallock (2001), for example, report that the fraction of females in top management positions is an order of magnitude lower than the fraction of females in lower management positions. Catalyst (2009) reports that while 16.9% of the top officers in Fortune 500 firms are females, only 5.6% are top-5 earners and 6.0% are CEOs. Consistent with these findings, Table 3 reports that of the 33,002 purchases made by female Officers, Directors, and Top Executives in our sample, only 5,456 (16.5%) are made by female Top Executives.

In order to address the possibility that the lower female profits from insider purchases is due to their under-representation in top-most positions, we report in Table 6 the results of a four-factor model regression similar to the one reported in Table 5, but separately for Officers, Directors and Top Executives. It can be seen from Panel A of Table 6 that the males-female difference portfolio (specification 3 and 6) earns a statistically significant abnormal return of 2.95 (EW, significant at the 5% level) and 3.74 (VW, significant at the 10% level) basis points per day. Both male and female officers earn positive returns from insider trading as can be seen from the intercepts in regression specifications 1, 2, 4, and 5 respectively. This result implies that female officers earn lower positive returns than their male counterparts.

Panels B and C help us draw similar conclusions for directors and top executives.[19] Panel B reveals that the males-female directors difference portfolio (specifications 3 and 6) earns a statistically significant abnormal return of 9.22 (EW, significant at the 1% level) and 9.66 (VW, significant at the 5% level) basis points per day. Panel C shows that the males-female top

[19]Due to the paucity of female top executives and their trades, we require n_t (the number of stocks in the portfolio corresponding to n_t insider purchase events in the previous fifty trading days) to be atleast ten. Otherwise, we invest the portfolio proceeds for that day in T-bills yielding the risk-free rate for that day.

executives difference portfolio (specifications 3 and 6) earns a statistically significant abnormal return of 6.27 (EW, significant at the 5% level) and 14.08 (VW, significant at the 1% level) basis points per day.

Table 6 also provides a comparison of the profits made by mimicking the trades of Top Executives, Officers, and Directors of both genders. We compare the gender-wise returns of each insider position from the intercepts of the regression specification 1, 2, 4, and 5 in each panel. It can be seen that generally insiders holding all three positions make statistically significant positive returns over the 50-day time period from purchases, regardless of gender (since all the intercepts in all the regression specifications are positive and statistically different from zero). Not surprisingly, male Top Executives make the most profits. Females, regardless of their position, earn lower returns than males in the same position. Perhaps surprisingly, in the VW regressions, male Officers (intercept of 16.90 basis points in Panel A, specification 4) earn greater returns than female Top Executives (intercept of 8.97 basis points in Panel C, specification 5).

The above results are based on a subsample of insider purchases only. Since insiders may sell stock for motives other than profit from information, such as portfolio diversification and liquidity needs, we do not expect to see as strong a gender difference in profits in the sales sub-sample as in the purchase sub-sample. Unreported results confirm our prior. The average size of a male (female) sale is \$1.60 (\$1.94) million. It appears that females make substantially smaller purchases but greater sales per trade than males. The number of sales per year by females were also greater. The mean magnitude 50-day excess return of males' sales is 329 bps while that of females is 328 bps. Both are significantly different from zero, implying that both male and female insiders profit from insider sales. The difference in return from sales between males and females is economically negligible (one basis point) and statistically insignificant. The Kolmogorov-Smirnov test for the equality of the insider trading returns distribution of males and females for sales cannot be rejected. The results indicate that while both males and females earn positive returns from insider sales on average, males' returns are not economically and statistically different from that of females. Perhaps, the possibility that sales are driven by multiple motivations precludes us from providing a clean interpretation of the sales results.

In summary, our results show that male executives earn greater excess returns than females in similar positions. We conclude that females earn lower profits compared to males regardless of their position in all firm-size groups in a statistically and economically meaningful manner.

4.2 Intensity of trading activity of insiders

In this section, we investigate the differences in the trading intensity between males and females. As indicated in the hypothesis section, gender differences in overconfidence, risk-aversion, access to information, and propensity to use information should all result in gender differences in trading activity.

We use three metrics to measure trading activity: the dollar value of the trade, the number of shares traded, and the number of trades, all on a per-year basis. To measure of the frequency of trading, we define the tenure of the insider in our database as the period between the first trade and the last trade (purchase or sale) made by the insider in the same firm's stock. For example, if an insider in a firm first appeared in our database because of a sale of that firm's stock in 1982 and appeared last because of a purchase of the same firm's stock in 1987, we count this insider's tenure as six years. Insiders who trade only once during the sample period are considered to have a tenure of one year. The trading activity in terms of dollar value is the total dollar value of all purchases made by an insider measured in 1984 constant dollars divided by his/her tenure. Similarly, trading activity in terms of number of shares (number of trades) is the total number of all shares purchased by an insider (total number of purchase transactions by an insider) divided by his/her tenure. Therefore, for each insider in a firm who has purchased shares there will be one observation.

Table 7, Panel A provides the univariate statistics of the purchasing activity measured using the three metrics. It can be seen that females purchase less frequently than males in similar positions in terms of dollar value, shares purchased, and number of trades. Panel B shows results of a Fama-McBeth regression with the dependent variable being trading activity. Trading activity is measured by three different metrics: log of dollar value purchased, log of number of shares

purchases, log of number of purchases, all on a per-year basis. However, as discussed in the case of returns using the trading measures as described in the summary statistics ignores cross-sectional dependence of event-firm that are overlapping in calendar time. This overlap is a very common feature of our data as multiple executives across firms trade in similar time windows and is likely to produce overstated test statistics. To address this issue, we redefine the dependent variable as the trading activity of each executive in each calendar year. Thus, all executives' trading activity is perfectly aligned in calendar time (where the unit of observation is a calendar year) in this approach. Then we estimate cross-sectional regressions for each calendar year and take the time-series averages of the slopes and assess statistical significance. As can be seen from table 7 Panel B, the female dummy is negative and statistically significant at the 1% level regardless of the metric of trading activity. Top Executives purchase more and more often than Officers or Directors and the difference is economically and statistically significant.

Panel C of Table 7 shows that the reduced purchasing activity of females is not due to the fact that they are under represented in the top-most executive ranks. In these tables, the trading activity is the dependent variable with independent variables including dummies for firm-size groups and for cross products of gender with position. As the table shows, in each position, females trade less than males and the difference is significant at the 1% level (see bottom of table for the significance of the differences).

In summary, our results show that females trade less than males. This difference exists when we compare the genders within each position.

5 Discussion of the results

Our results collectively indicate that female executives trade less than males and earn lower returns. These results are clearly consistent with the information access hypothesis that suggests that female executives, despite their formal rank, are informationally disadvantaged. In this section, we discuss the consistency of the results with the disposition hypotheses suggested earlier.

5.1 Can overconfidence explain the results?

The overconfidence hypothesis suggests that an overconfident agent trades more and earns lower returns compared to a less overconfident/rational agent. Suppose males are considered more overconfident than females. While males trade more than females in our setting (consistent with overconfidence), the fact that they earn *higher* profits than females is inconsistent with the predictions of the overconfidence hypothesis. Suppose females are considered more overconfident than males. The fact that females earn lower profits than males is consistent with overconfidence. However, the fact that they trade *less* than males is inconsistent with the predictions of the overconfidence hypothesis. Thus, we conclude that overconfidence cannot be the sole explanation for our results.

5.2 Can risk-aversion explain the results?

As explained earlier, one of implications of the risk-aversion hypothesis is that females will trade less than males. The results in Table 7 indicate that this is indeed the case and therefore there appears to be a case for risk-aversion as an explanation for our results. However, the information access hypothesis also implies that females will trade less. In order to differentiate between the two hypotheses, we test the implication of the risk-aversion hypothesis, namely that females will earn greater returns than males for the same trade size. For this purpose, we divide our sample into three groups based on the distribution of trade value in real dollar terms: the lowest third (Group 1), the middle third (Group 2) or the top third (Group 3). Thus, within each group we may treat the trade-size to be approximately the same for all executives. Then, within each trade-size group, we repeat the calendar time portfolio approach of Table 5. There are 99,375 executives in the lowest trade size group, 83,901 executives in the middle trade size group and 32,823 executives in the largest trade size group.

Table 8 provides a regression analysis of the determinants of insider profits from purchases (males-females) for each trade-size group (both EW, and VW portfolios as before). In all the trade-size groups of EW and VW portfolios, we find that males earn greater profits (the abnormal

return after controlling for the factors) than females. The profits seem to be increasing monotonically across the groups. All of these results suggest that the risk-aversion hypothesis alone cannot explain our results: while the risk-aversion hypothesis would suggest that the insider trading profits of females (the value of information) is strictly greater than that of males (conditioning on trade size), we find that the profits of males are strictly greater than that of females in all our specifications.

5.3 Can gender differences in the propensity to trade on insider information explain the results?

As discussed in section 2.4 (Propensity hypothesis), females might have a lower propensity to trade on insider information than males because of ethical concerns, or the desire to avoid criminal and civil prosecutions, or loss of job and reputation. This hypothesis would then explain why females trade less and make lower profits than males rather than the alternative view that they are disadvantaged in accessing insider information.

To examine this possibility we design the following test. We posit that the likelihood of scrutiny and penalties from regulators are likely to be much higher if insider trading occurred before corporate events that disclose material information to the market. We designate these events as "information-rich" events and include dividend initiations and announcements, earnings announcements, and stock splits announcements in this category.[20] We designate about six weeks (45 calendar days) before these announcements as the period in which insiders might have access to material non-public information regarding these events. We obtain the announcement dates of these events from the CRSP database. We then construct the variable *Exploit*, which is a fraction. The numerator of *Exploit* is the number of times an executive traded in the six-week period before an information-rich event, as a proxy for an executive's willingness to exploit an information-rich event. The denominator of *Exploit* is the number of times an executive could

[20]Meulbroek (1992) reports that over 80% of illegal insider trading is associated with earnings, dividends and merger and acquisition announcements. Moreover, 87% of these events are associated with good news. The reason we did not consider merger events is because there were very few such events associated with females to make a difference.

have traded in the six-week period before an information-rich event, as a proxy for an executive's ability to exploit such events. As before, each executive in a specific position in each firm is counted as one observation. We regress *Exploit* on our control variables and expect to observe a negative and significant coefficient on the female dummy, if the propensity to trade hypothesis is true. We consider two econometric specifications: First, a firm fixed-effects (FE) regression, and second, a generalized linear model (GLM as in Papke and Woolridge(1996)) that explicitly recognizes the fact that the dependent variable is a proportion between zero and one.

The regression results are presented in Table 9. Specifications 1 (FE) and 2 (GLM) indicate that females actually exploit information-rich events more often than males: the coefficient on the female dummy is positive and significant. Specifications 3 (FE) and 4 (GLM) indicate that the above difference between the genders is reliably prevalent for Officers and Directors (see bottom of the table for the F-statistic and p-value for the test of significant gender differences). Specifications 1 and 2 indicate that Top Executives as a group are less likely to exploit information-rich events. This makes sense as Top Executives are also most likely to be targeted by regulators, given their visibility in the organization. However, specifications 3 and 4 indicate that there is no reliable gender difference among Top Executives in exploiting information-rich events.

For robustness, we repeat the tests above using a subset of information rich events, namely, those for which the 2-day market-adjusted abnormal return is greater than the 75th percentile of the abnormal return distribution (which equals 2.6%) of all information rich events. Thus, we condition only on those events most likely to attract scrutiny from the regulators and examine the gender difference in the propensity to trade. Specifications 5 through 8 in Table 9 replicate the tests in specifications 1 through 4, respectively, for this sub-sample. The results are qualitatively identical and our inferences remain unchanged. Collectively, these results indicate that females' lower propensity to trade on insider information is unlikely to be the driving force behind our results.[21]

[21] We also examine if financial expertise differences between males and females could be driving our results. We construct a portfolio that consists of CEO and CFO trades of males and females and examine the return differences, similar to the exercise in Table 6, Panel C. We find that males earn more than females in terms of risk-adjusted abnormal returns as before, suggesting that differences in financial expertise is unlikely to be driving our results.

The results and analysis of this section enable us to rule out gender differences in dispositional factors such as overconfidence, risk-aversion and the propensity to trade on insider information as the sole explanations of our results. This, in combination with the support for the information hypothesis, leads us to conclude that male executives possess sufficient informational advantage over their female colleagues to overwhelm their dispositional differences.

6 Conclusion

We find that there are gender differences in insider trading behavior. Our main results are: 1) Both male and female insiders earn economically and statistically significant positive returns on average; 2) Males earn greater returns than females (mean return of males is 343 basis points over a 50-day window after insider purchase compared to 175 basis points for females); and 3) Males trade more frequently than females, and the difference is particularly notable in terms of the value of the trades. These gender differences exist across the firm among officers, board directors, top executives, and surprisingly, even CEOs and CFOs.

The most straightforward explanation for why male executives trade more and earn more than their female counterparts is that males possess more or better information. Before we can conclude that situational factors give male executives an informational advantage, we need to consider if the observed gender differences in trading frequency and profits can be explained by dispositional factors such as overconfidence, risk-aversion, and propensity to trade on inside information. We rule out gender differences in overconfidence as the sole explanation of our results as follows. Models of overconfidence predict that overconfidence results in an inverse relationship between trading profits and frequency whereas we find a direct relationship. We conclude gender differences in risk-aversion cannot be the sole explanation of our results as follows. The standard prediction from information-based trading models is that, for a given trade size, risk-aversion and information quality should be directly related. The evidence from psychology and sociology literature overwhelmingly supports the notion that females are more risk-averse. Given this result, if risk-aversion were the sole explanation, we should find females' information, and hence profits,

to be superior when adjusted for trade size. We find just the opposite. Finally, we rule out the possibility that males' greater profits are due to greater propensity to trade on inside information. We find that males do not trade any more than females before potential information events such as announcements of earnings, dividends, and stock splits.

Therefore, we suggest that the finding that males executives trade more and earn more than their female counterparts is consistent with the notion that males possess an informational advantage over females in firms. Even if gender differences in dispositional factors are present, they are overwhelmed by the informational advantage due to situational factors. We offer no explanations as to the potential sources of this advantage. Nevertheless, the finding that the advantage exists even among the very top executives indicates that explanations based solely on differences in human capital are not likely to explain our results. Instead, exploration of the possibility that our findings are an indication of males' superior communication networks is likely to be more fruitful.

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Table 1 Panel A: Summary Statistics. This table presents the summary statistics on insider trading by male and female executives (Officers, Directors and Top Executives) for the period 1975-2008. Amounts are measured in 1984 constant dollars. The last column reports statistics for females as a percentage of the total. The table also reports the number of unique executives in the database and also the number of executives by title. Since the same individual could have held multiple titles at different points in time and in different firms, the sum of the sub groups will not add up to the total number of executives.

	Total	Male	Female	Female (%)
Number of firms	18,021	17,948	5,614	31.2%
Value of Purchases ($ bn)	251.59	248.93	2.66	1.1%
No. of Purchases	764,957	731,893	33,064	4.3%
Number of Executives	160,243	150,774	9,469	5.9%
Officers	57,726	53,247	4,479	7.8%
Directors	78,777	74,653	4,124	5.2%
Top Executives	35,053	33,841	1,212	3.5%

Table 1 Panel B : Trading by male and female executives stratified by firm size. Firm size is measured as equity market capitalization at end of the year of the trade. Average value of purchases is defined as the total dollar value of purchases divided by total number of transactions. All monetary amounts are measured in 1984 constant dollars.

Value of purchase transactions ($ bn)			
Firm Size	Total	Male	Female
< $50	125.74	124.86	0.88
		(99.3%)	(0.7%)
$50- $250	36.46	35.61	0.85
		(97.7%)	(2.3%)
$250- $1000	56.39	56.11	0.28
		(99.5%)	(0.5%)
> $1000	33.00	32.35	0.65
		(98.0%)	(2.0%)
Total	251.59	248.93	2.66
		(98.9%)	(1.1%)
No. of purchase transactions			
Firm Size	Total	Male	Female
< $ 50	298,508	287,083	11,425
		(96.2%)	(3.8%)
$50- $250	241,095	230,992	10,103
		(95.8%)	(4.2%)
$250- $1000	131,322	125,428	5,894
		(95.5%)	(4.5%)
> $1000	94,032	88,390	5,642
		(94.0%)	(6.0%)
Total	764,957	731,893	33,064
		(95.7%)	(4.3%)
Average value of purchases ($ mn)			
Firm Size	Total	Male	Female
< $50	0.42	0.43	0.08
$50- $250	0.15	0.15	0.08
$250- $1000	0.43	0.45	0.05
> $1000	0.35	0.37	0.12
Total	0.33	0.34	0.08

Table 2: Distribution of year by year insider trading activity of males and females 1975-2008. Average value of purchases is defined as the total dollar value of purchases divided by total number of transactions. All monetary amounts are measured in 1984 constant dollars.

Value of purchase transactions ($ bn)			
Period	Total	Male	Female
1975-1984	15.65	15.58	0.07
		(99.6%)	(0.4%)
1985-1994	10.68	10.42	0.26
		(97.6%)	(2.4%)
1995-2008	225.26	222.93	2.33
		(99.0%)	(1.0%)
Total	251.59	248.93	2.66
		(98.9%)	(1.1%)
No. of purchase transactions			
Period	Total	Male	Female
1975-1984	134,124	130,941	3,183
		(97.6%)	(2.4%)
1985-1994	192,985	185,312	7,673
		(96.0%)	(4.0%)
1995-2008	437,848	415,640	22,208
		(94.9%)	(5.1%)
Total	764,957	731,893	33,064
		(95.7%)	(4.3%)
Average value of purchases ($ mn)			
Period	Total	Male	Female
1975-1984	0.12	0.12	0.02
1985-1994	0.06	0.06	0.03
1995-2008	0.51	0.54	0.10
Total	0.33	0.34	0.08

Table 3 : Insider trading statistics based on the position of the insiders. Average value of purchases is defined as the total dollar value of purchases divided by total number of transactions. Since the position of the insiders could not be classified for some of the transactions, aggregates in this table will be different from the ones in tables 1 and 2. All monetary amounts are measured in 1984 constant dollars.

Value of purchase transactions ($ bn)			
Position	Total	Male	Female
Officers	16.54	16.27	0.27
		(98.4%)	(1.6%)
Directors	149.04	147.44	1.60
		(98.9%)	(1.1%)
Top Executives	85.63	84.85	0.78
		(99.1%)	(0.9%)
Total	251.21	248.56	2.65
		(98.9%)	(1.1%)
No. of purchase transactions			
Position	Total	Male	Female
Officers	183,340	170,344	12,996
		(92.9%)	(7.1%)
Directors	349,399	334,849	14,550
		(95.8%)	(4.2%)
Top Executives	231,258	225,802	5,456
		(97.6%)	(2.4%)
Total	763,997	730,995	33,002
		(95.7%)	(4.3%)
Average value of purchases ($ mn)			
Position	Total	Male	Female
Officers	0.09	0.10	0.02
Directors	0.43	0.44	0.11
Top Executives	0.37	0.38	0.14
Total	0.33	0.34	0.08

Table 4 : Profitability of insider purchase transactions This table reports in basis points, the distribution of the cumulative abnormal returns (market-adjusted) over the first fifty days after the insider trade, weighted by the real dollar value of the trade for each executive. Thus all purchases by an executive holding a specific title in each firm is collapsed into a single observation. Since the identity of the insiders could not be classified for some of the transactions, aggregate number of observations will be different from the totals obtained by adding the subgroups.

Purchases	N	Mean	Std.Dev	1^{st} Percentile	Median	99^{th} Percentile
Males	168,851	343	2187	-4808	132	7429
Females	9,760	175	2277	-5301	25	7183

Kolmogorov Smirnov Test for equality of distributions

	D-Value	p - value
Males Vs Females	0.0408	0.000

Officers	N	Mean	Std.Dev	1^{st} Percentile	Median	99^{th} Percentile
Males	52,899	365	2171	-4823	155	7429
Females	4,131	287	2477	-5759	96	8620
Directors	N	Mean	Std.Dev	1^{st} Percentile	Median	99^{th} Percentile
Males	80,028	255	1989	-4435	79	6696
Females	4,387	45	1769	-4913	-56	5620
Top Execs	N	Mean	Std.Dev	1^{st} Percentile	Median	99^{th} Percentile
Males	35,627	511	2590	-5614	241	8881
Females	1,037	269	3053	-6927	93	8295

Kolmogorov Smirnov Test for equality of distributions

	D-Value	p - value
Officers : Males Vs Females	0.0308	0.0010
Directors : Males Vs Females	0.0552	0.0000
Top Execs : Males Vs Females	0.0624	0.0020

Table 5 - Regression analysis of the determinants of insider trading profits. This table reports the results of daily Fama and French (1993) three factors augmented with momentum factor regressions using daily calendar time returns (expressed in basis points) of males, females and males-females insider trading portfolios. The portfolios are constructed by allocating insider trades according to gender. The trades stay in their respective portfolios for fifty trading days after the trading date of the insider. In the event of no trading by an insider or less than thirty insider trades over the preceding fifty trading days, it is invested in T-bills earning the daily risk free rate. If more than one insider is trading a particular stock on a given date, then that stock will appear multiple times in the portfolio on that date, once for each insider purchase. Panel A results are based on portfolios with equal investment in each trade while in Panel B each trade is weighted by the dollar value of the trade. The regression model is given below:

$$R_{pt} - R_{ft} = \alpha_p + b_p(R_{mt} - R_{ft}) + s_p(SMB_t) + h_p(HML_t) + u_p(UMD_t) + \epsilon_t,$$

where the right hand side variables are the Fama-French three-factor model variables augmented with a momentum factor. We report the standard errors below the coefficients. (*** Significant at one percent level, ** Significant at five percent level ,* Significant at ten percent level)

PANEL A	Males	Females	Males	Females	Males	Females	**Males-Females**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Const.	22.17***	19.12***	20.95***	17.84***	21.64***	18.27***	3.05***	3.12***	3.37***
	(.55)	(1.03)	(.44)	(.97)	(.43)	(.97)	(.95)	(.95)	(.95)
MKT-RF	.68***	.67***	.81***	.81***	.80***	.80***	.008	.004	-.002
	(.005)	(.01)	(.005)	(.01)	(.005)	(.01)	(.009)	(.01)	(.01)
SMB			.61***	.59***	.61***	.60***		.01	.01
			(.008)	(.02)	(.008)	(.02)		(.02)	(.02)
HML			.26***	.29***	.21***	.26***		-.03	-.05**
			(.01)	(.02)	(.01)	(.02)		(.02)	(.02)
UMD					-.14***	-.09***			-.05***
					(.006)	(.01)			(.01)
Obs.	8532	8532	8532	8532	8532	8532	8532	8532	8532
R^2(%)	64	34	78	41	79	41	0.01	0.05	0.20

PANEL B	Males	Females	Males	Females	Males	Females	**Males-Females**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Const.	23.07***	13.03***	22.14***	11.91***	22.44***	12.94***	10.04**	10.23***	9.50**
	(3.46)	(1.99)	(3.45)	(1.96)	(3.46)	(1.96)	(3.92)	(3.93)	(3.94)
MKT-RF	.95***	.92***	1.06***	1.05***	1.05***	1.03***	.03	.009	.02
	(.03)	(.02)	(.04)	(.02)	(.04)	(.02)	(.04)	(.04)	(.05)
SMB			.62***	.68***	.62***	.69***		-.06	-.07
			(.07)	(.04)	(.07)	(.04)		(.08)	(.08)
HML			.13*	.18***	.11	.12***		-.05	-.009
			(.08)	(.04)	(.08)	(.04)		(.09)	(.09)
UMD					-.06	-.22***			.15***
					(.05)	(.03)			(.06)
Obs.	8532	8532	8532	8532	8532	8532	8532	8532	8532
R^2(%)	8	20	9	23	9	24	0.007	0.02	0.10

Table 6 - Regression analysis of the determinants of insider trading profits and the effects of position. This table reports the results of daily Fama and French (1993) three factors augmented with momentum factor regressions using daily calendar time returns (expressed in basis points) of males, females and males-females insider trading portfolios. The portfolios are constructed by allocating insider trades according to gender. The trades stay in their respective portfolios for fifty trading days after the trading date of the insider. In the event of no trading by an insider or less than thirty (ten) insider trades over the preceding fifty trading days, it is invested in T-bills earning the daily risk free rate in the case for officers, directors (top executives). If more than one insider is trading a particular stock on a given date, then that stock will appear multiple times in the portfolio on that date, once for each insider purchase. In each panel, specifications one through three results are based on portfolios with equal investment in each trade while in specifications four through six each trade is weighted by the dollar value of the trade. Panel A, reports the results for Officers, Panel B, reports the results for Directors, and Panel C reports the results for Top Executives. The regression model is given below:

$$R_{pt} - R_{ft} = \alpha_p + b_p(R_{mt} - R_{ft}) + s_p(SMB_t) + h_p(HML_t) + u_p(UMD_t) + \epsilon_t,$$

where the right hand side variables are the Fama-French three-factor model variables augmented with a momentum factor. We report the standard errors below the coefficients. (*** Significant at one percent level, ** Significant at five percent level ,* Significant at ten percent level).

Panel A - Officers	Males	Females	Males-Females	Males	Females	Males-Females
	(1)	(2)	(3)	(4)	(5)	(6)
Const.	19.89***	16.95***	2.95**	16.90***	13.16***	3.74*
	(.43)	(1.17)	(1.15)	(1.59)	(1.53)	(2.15)
MKT-RF	.85***	.71***	.14***	.98***	.88***	.10***
	(.005)	(.01)	(.01)	(.02)	(.02)	(.02)
SMB	.63***	.57***	.05**	.64***	.60***	.04
	(.008)	(.02)	(.02)	(.03)	(.03)	(.04)
HML	.25***	.20***	.05*	.19***	.35***	-.16***
	(.01)	(.03)	(.03)	(.04)	(.03)	(.05)
UMD	-.18***	-.20***	.02	-.17***	-.18***	.01
	(.006)	(.02)	(.02)	(.02)	(.02)	(.03)
Obs.	8532	8532	8532	8532	8532	8532
$R^2(\%)$	81	29	1	29	25	0.60

Panel B - Directors	Males	Females	Males-Females	Males	Females	Males-Females
	(1)	(2)	(3)	(4)	(5)	(6)
Const.	18.85***	9.63***	9.22***	18.19***	8.53***	9.66**
	(.40)	(.89)	(.92)	(3.36)	(1.88)	(3.81)
MKT-RF	.80***	.73***	.07***	1.12***	.93***	.18***
	(.005)	(.01)	(.01)	(.04)	(.02)	(.04)
SMB	.59***	.45***	.14***	.68***	.62***	.06
	(.008)	(.02)	(.02)	(.06)	(.04)	(.07)
HML	.22***	.27***	-.05**	.26***	.07*	.19**
	(.009)	(.02)	(.02)	(.08)	(.04)	(.09)
UMD	-.13***	-.11***	-.02*	-.17***	-.20***	.03
	(.006)	(.01)	(.01)	(.05)	(.03)	(.06)
Obs.	8532	8532	8532	8532	8532	8532
$R^2(\%)$	81	41	1	10	22	0.20

Panel C - Top Executives	Males	Females	Males-Females	Males	Females	Males-Females
	(1)	(2)	(3)	(4)	(5)	(6)
Const.	26.85***	20.58***	6.27**	23.05***	8.97***	14.08***
	(.80)	(2.67)	(2.72)	(3.36)	(2.41)	(4.09)
MKT-RF	.77***	.59***	.18***	.99***	.78***	.21***
	(.009)	(.03)	(.03)	(.04)	(.03)	(.05)
SMB	.65***	.64***	.007	.69***	.70***	-.006
	(.02)	(.05)	(.05)	(.06)	(.05)	(.08)
HML	.21***	.23***	-.02	.10	.14***	-.04
	(.02)	(.06)	(.06)	(.08)	(.05)	(.09)
UMD	-.14***	-.10**	-.05	-.06	-.26***	.20***
	(.01)	(.04)	(.04)	(.05)	(.04)	(.06)
Obs.	8532	8532	8532	8532	8532	8532
$R^2(\%)$	50	5	0.60	9	11	0.50

Table 7, Panel A : Insider trading statistics based on the position of the insiders. We use three variables to capture the intensity of trading of the insiders The first variable is the the value of trade in millions of constant 1984 dollars, made per year, by each executive in the sample. The second variable in the number of shares purchased per year, by each executive in the sample. The third variable is the number of trades per year, by each executive in the sample. For each executive in each firm in each position held, we generate one observation. We report the averages for each variable in each group.

	Purchases								
	Value			Shares			Trades		
Insider	Total	Males	Females	Total	Males	Females	Total	Males	Females
Officers	0.20	0.21	0.05	6,946	7,069	5,468	1.91	1.92	1.85
Directors	1.38	1.44	0.30	21,289	21,501	17,375	2.16	2.18	1.90
Top Executives	0.95	0.96	0.51	53,968	54,805	29,839	3.11	3.13	2.53
Total	0.91	0.95	0.21	23,367	23,942	13,659	2.28	2.30	1.95

Table 7 Panel B: Fama-Mcbeth regression analysis of the determinants of intensity of insider trading activity. The dependent variable in specification 1 is the log of the value of trade made per year by each executive in the sample. The dependent variable in specification 2 is the log of the number of shares purchased per year by each executive in the sample. The dependent variable in specification 3 is the log of the number of trades per year by each executive in the sample. For each executive in each firm in each position held each calendar year, we generate one observation. Time series averages of the cross sectional regression coefficient estimates are reported. (*** Significant at one percent level, ** Significant at five percent level ,* Significant at 10 percent level)

	Fama-McBeth		
Trading per year	log(Value)	log(Shares)	log(Trades)
Const.	-5.16***	7.13***	.55***
	(.07)	(.11)	(.02)
Female	-.72***	-.80***	-.10***
	(.02)	(.02)	(.01)
Directors	.82***	.70***	.07***
	(.03)	(.03)	(.01)
Top Execs	1.03***	1.14***	.21***
	(.03)	(.03)	(.02)
$50-$250 million	.36***	-.55***	-.05***
	(.02)	(.03)	(.009)
$250-$1000 million	.60***	-.75***	-.13***
	(.05)	(.05)	(.02)
> $1000 million	.84***	-.96***	-.18***
	(.07)	(.07)	(.02)

Table 7 Panel C: Fama-Mcbeth regression analysis of the determinants of intensity of insider trading activity by position. Variables used are identical to those in Panel B.

	Fama-Mcbeth		
Trading per year	log(Value)	log(Shares)	log(Trades)
Const.	-5.16***	7.13***	.55***
	(.07)	(.11)	(.02)
Female * Officers	-.74***	-.81***	-.05***
	(.04)	(.05)	(.01)
Male * Directors	.83***	.70***	.08***
	(.03)	(.03)	(.01)
Female * Directors	.04	-.17***	-.06***
	(.04)	(.04)	(.009)
Male * Top Execs	1.02***	1.13***	.21***
	(.03)	(.03)	(.02)
Female * Top Execs	.71***	.79***	.10***
	(.08)	(.09)	(.02)
$50 -$250 million	.36***	-.55***	-.05***
	(.02)	(.03)	(.009)
$250-$1000 million	.60***	-.75***	-.12***
	(.05)	(.05)	(.02)
> $1000 million	.85***	-.95***	-.18***
	(.07)	(.07)	(.02)
Test of (Male-Female)	F	F	F
coefficient differences	(p-value)	(p-value)	(p-value)
Directors	798.03	917.12	166.44
	(0.000)	(0.000)	(0.000)
Top Execs	17.04	12.72	21.54
	(0.000)	(0.000)	(0.000)

Table 8 - Regression analysis of the determinants of insider trading profits and the effects of position controlling for trade size. We divide our sample into three groups where each group consists only of trades whose size is in the lowest third (Group 1), middle third (Group 2) or the top third (Group 3) of the distribution of trade size in real dollar terms. Thus with in each group we fix trade size to be approximately the same for all executives. Specifications one through two of this table reports the results of daily Fama and French (1993) three factors augmented with momentum factor regressions involving equal-weighted and value weighted by the trade size in dollar terms respectively, monthly calendar time returns (expressed in basis points) of Male-Female insider trading portfolios where all individuals are in Group 1. The portfolios are constructed by allocating insider trades according to gender. The trades stay in their respective portfolios for fifty trading days (about seventy five calendar days) after the trading date of the insider. In the event of no trading by an insider or less than thirty insider trades over the preceding fifty trading days, we invest in T-bills using the daily risk free rate. If more than one insider is trading a particular stock on a given date, then that stock will appear multiple times in the portfolio on that date, once for each insider purchase. Specifications three and four (and five and six) are analogous to specifications one and two except that are results for Group 2 (Group 3). The regression model is given below:

$$R_{males,t} - R_{females,t} = \alpha_p + b_p(R_{mt} - R_{ft}) + s_p(SMB_t) + h_p(HML_t) + u_p(UMD_t) + \epsilon_t,$$

where the right hand side variables are the Fama French 3 factor model variables augmented with a momentum factor. Standard errors for the firm fixed effects specifications are clustered by each firm. Clustering at the executive level produces similar results. (*** Significant at one percent level, ** Significant at five percent level ,* Significant at 10 percent level)

	Group 1		**Group 2**		**Group 3**	
Males-Females portfolio	(EW)	(VW)	(EW)	(VW)	(EW)	(VW)
Const.	5.25***	7.15***	9.71***	9.38***	10.80***	15.42***
	(1.49)	(1.24)	(.92)	(.93)	(.91)	(3.92)
MKT-RF	.05***	.05***	.15***	.16***	.23***	.26***
	(.02)	(.01)	(.01)	(.01)	(.01)	(.05)
SMB	.05*	.08***	.11***	.10***	.05***	-.04
	(.03)	(.02)	(.02)	(.02)	(.02)	(.08)
HML	-.03	.004	.03*	.04*	-.004	.01
	(.03)	(.03)	(.02)	(.02)	(.02)	(.09)
UMD	-.02	.01	-.02	-.02	.05***	.26***
	(.02)	(.02)	(.01)	(.01)	(.01)	(.06)
Obs.	8532	8532	8532	8532	8532	8532
$R^2(\%)$	0.20	0.30	3	3	7	0.80

Table 9 - Regression analysis of the determinants of propensity to trade before information rich events and the effects of position. The dependent variable is Exploit, the fraction of times an executive traded 45 days before an information rich event in the database. Information rich events include dividend announcements, stock splits announcements, and earnings announcements obtained from CRSP. For each executive in each firm in the database we construct a set of information events in which she could have traded and record the number of times, she actually did trade. The fixed effects specification includes firm fixed effects. The GLM specifications explicitly recognize the fact that exploit is a proportion between 0 and 1 using the method of Papke and Woolridge (1996). Specifications 5 through 8 are identical to specifications 1 through 4, expect that we condition only on those information events where the 2-day market adjusted abnormal return is greater than the 75th percentile of the distribution, which equals 2.6%. Thus, we condition only on those events likely to attract scrutiny from the regulators and examine the propensity to trade by the executives in the database. Standard errors for all the specifications are clustered by each firm. We report the standard errors below the coefficients. (*** Significant at one percent level, ** Significant at five percent level ,* Significant at 10 percent level)

Exploit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FE	GLM	FE	GLM	FE	GLM	FE	GLM
Const.	.14***	-1.66***	.14***	-1.66***	.11***	-1.91***	.11***	-1.91***
	(.003)	(.02)	(.003)	(.02)	(.003)	(.03)	(.003)	(.03)
Female	.02***	.11***			.01**	.08**		
	(.004)	(.03)			(.004)	(.04)		
Directors	.002	.03			-.001	-.02		
	(.002)	(.02)			(.002)	(.03)		
Top Execs	-.02***	-.25***			-.009***	-.18***		
	(.002)	(.02)			(.002)	(.03)		
Female * Officers			.02***	.13**			.007	.09
			(.006)	(.05)			(.007)	(.07)
Male * Directors			.002	.03			-.002	-.02
			(.002)	(.02)			(.002)	(.03)
Female * Directors			.02***	.14***			.009	.08
			(.006)	(.05)			(.007)	(.07)
Male * Top Execs			-.02***	-.25***			-.009***	-.18***
			(.002)	(.02)			(.002)	(.03)
Female * Top Execs			-.01	-.21**			.003	-.16
			(.008)	(.08)			(.01)	(.11)
$50 -$250 million	-.003	-.20***	-.003	-.20***	-.002	-.17***	-.002	-.17***
	(.003)	(.02)	(.003)	(.02)	(.004)	(.03)	(.004)	(.03)
$250-$1000 million	-.006	-.34***	-.006	-.34***	-.008*	-.38***	-.008*	-.38***
	(.004)	(.03)	(.004)	(.03)	(.005)	(.04)	(.005)	(.04)
> $1000 million	-.01**	-.39***	-.01**	-.39***	-.02***	-.43***	-.02***	-.44***
	(.006)	(.04)	(.006)	(.04)	(.006)	(.06)	(.006)	(.06)
Obs.	91233	91233	91233	91233	76901	76901	76901	76901
Test of (Male-Female)			F	F			F	F
coefficient differences			(p-value)	(p-value)			(p-value)	(p-value)
Directors			5.93	5.29			2.70	2.29
			(0.015)	(0.021)			(0.100)	(0.130)
Top Execs			0.94	0.25			1.61	0.02
			(0.333)	(0.619)			(0.205)	(0.888)

Fig. 1. Returns from Insider Trades

This figure displays the cross sectional averages of the market- adjusted CAR in event time where the event is defined as an insider purchase.