Gender Differences in Executives' Access to Information*

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Abstract

We provide the first evidence on gender differences in trading behavior and profitability of senior corporate executives. On average, both female and male executives make positive profits from insider trading. Males, however, earn significantly more than females in equivalent positions and also trade more than females. These gender differences disappear when we limit the sample to firms in which female trading is relatively high. Collectively these results suggest that female executives have a disadvantage relative to males in access to inside information even if they have equal formal status and informal networks may play an important role attenuating this disadvantage.

1. Introduction

We provide the first investigation of gender differences in insider trading behavior by top executives. Increasing presence of females in executive suites has heightened interest in understanding potential gender differences in access to material, asymmetric information through formal and informal channels.[1] It is well known that senior executives earn positive abnormal returns on their trades in their own company stock (Seyhun (1986, 1992, 1998)), which is evidence of access to material non-public information obtained through formal or informal means. By investigating the gender differences in profitability of insider trades we can therefore assess whether female executives in similar positions have access to the same networks that generate valuable asymmetric information as their male counterparts.[2] Thus, understanding whether female executives can and do trade profitably helps us better understand the environment in which top female executives operate.

We use an insider trading data from 1975 to 2011 to analyze gender differences in trading and profits. We examine both purchases and sales, although we focus on insiders' purchases to a greater extent since purchases tend to be correlated with more valuable insider information. In our database, females make up 4.4% of the purchases in terms of the number of transactions and 3.8% by dollar value. We find that both male and female insiders (top executives, board members, and other senior officers) make significant average positive excess returns from their insider purchases. Figure 1 shows the equally-weighted average 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 equally-weighted average market-adjusted return after purchase is positive for both genders: about 3.2% for male

[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 17.7% in 2010 (Catalyst, 2011). According to Catalyst (2011), the proportion of female CEOs in Fortune 500 firms has increased from 0.4% in 1998 to 3% in 2010.

[2] It has been suggested that female executives do not have the same access to information as their male counterparts especially in organizations where they are underrepresented (see Moore (1988) and Lyness and Thompson (2000) for evidence) because they are excluded from informal networks..

executives and 1.6% for female executives, a significant difference.[3] We also find that on average male executives trade more in their firm's shares than females whether the quantity of trade is measured in number of shares traded, dollar value of trades, or the number of trades. It appears that the gender differences in insider trading activity are similar to that of uninformed customers of an online retail broker documented by Barber and Odean (2001); that is, males trade more frequently than females. The gender difference in the profitability of trading of top executives, however, is opposite from that of uninformed investors.

The finding that there are significant gender differences in the extent and profitability of insider trading suggests that the environment in which female executives operate may in fact be different than that of their male counterparts, which then generate these differences in insider trading patterns. On the other hand, the literature on gender differences suggests that there are systematic dispositional differences between males and females: males are more overconfident and less risk-averse than females.[4] Thus our results could be the outcome of differences in dispositional factors such as overconfidence or risk-aversion, and/or differences in access to information.

In order to explore the reasons for gender differences in insider trading behavior, we use a straightforward extension of the Grossman and Stiglitz (1980) model, introducing insiders who may be overconfident. The model implies that the more overconfident, the less risk-averse, and the better informed insiders are, the more they will trade and the greater will be their expected profits. Using the model we then address the following questions: Do male executives trade more than female executives because of differences in dispositional factors? Does the greater trading activity result in greater profits for male executives because of the presence of insider information which is equally available to both genders? Or do male executives' greater trading

[3] As a comparison, insiders' abnormal returns are 3.1% after 50 days for all purchases between 1975 and 2011. We report results from more formal tests which confirm the gender difference in profitability, with the male executives earning 100 basis points or more of abnormal returns than female executives over a 50-day window.

[4] Previous research suggests that males in general are more overconfident than females (Barber and Odean (2001), Niederle and Vesterlund (2007) and less risk-averse (Byrnes, Miller and Schafer (1999), Eckel and Grossman (2003) Niessen and Ruenzi (2007), and Charness and Gneezy (2010)).

and profits arise also from the additional advantage of possessing better information?

Male executives' potential informational advantage may simply arise from the well-documented fact that they hold on average more senior positions (Bertrand and Hallock (2001), Catalyst (2011)) which is also consistent with our own data presented later in the paper. To control for this possibility, we investigate gender differences in trading behavior within similar ranks. We group insiders into three categories based on their titles: Top Executives, Directors, and Officers. We find that within each category, males trade more than females and also earn greater profits. If we assume that members within each group have the same access to information regardless of gender the implication is that gender differences in trading and profits are due to dispositional differences rather than informational differences.

The assumption that ranks or titles accurately proxy access to information, however, is debatable. The large body of literature that argues that female executives do not have the same access to information, especially in firms where they are underrepresented (see Kanter (1977a, 1977b) and Lyness and Thompson (2000), for example), claims that titles and ranks do not fully capture the informational disadvantage faced by female executives. We conduct the following test to investigate if female executives are at an informational disadvantage. We divide each of the three insider categories (Top Executives, Directors, and Officers) into three groups based on trade size, measured as trade value in real dollar terms. We find that, controlling for trade size, male executives within each category earn greater returns than female executives. This result is inconsistent with the implication that gender differences in profitability of insider trades are driven only by differences in dispositional factors such as overconfidence and risk-aversion. If male executives are more overconfident and/or less risk-averse, they should be trading on inferior private information than female executives for their trades to be of similar size as that of female executives. This in turn should result in male executive trades earning a lower return. Since empirically the opposite is true, the implication is that male executives likely possess superior information on average than female executives with the same titles.

We then ask the following question: What are the additional channels through which

male executives obtain material asymmetric information than female executives with equivalent titles? Gender literature (Davies-Netzley (1988), Moore (1988)) suggests that females are excluded from informal networks of their male peers. Kanter (1977b) finds that in work environments dominated in numbers by males, males tend to emphasize their differences from the females who form a small minority, and exclude them from informational networks. As we pointed out earlier, females account for less than 5% of the total trades regardless of the metric used making our setting a male-dominated one in general. If informal networks are the channels through which male executives gain an informational advantage, then we should see the advantage reduced in firms in which males as are not as dominant in numbers. In our database, the best proxy available for gender dominance is the proportion of trades by a given gender. In order to investigate if male executives' informational advantage is attenuated in situations where such male dominance is not present, we test if gender differences in trading and profits persist in firms in which the proportion of female trading is relatively higher. When we limit the sample to firms in which the proportion of female trades is at the 90th percentile or above of the distribution of proportion of female trades in all firms, gender differences in both trading and return are not significant. This result is consistent with the notion that females suffer an informational disadvantage despite their titles in firms where they form a small minority, but that disadvantage is attenuated when their representation increases.

The rest of the paper is organized as follows. Section 2 describes the data and provides the summary statistics. Section 3 presents the main results regarding gender differences in insider trading behavior and returns. Section 4 explores if the results are due to informational differences between the genders. Section 5 concludes.

2. 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 December 2011.[5] 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 December 2011 in firms for which stock return data are available in CRSP. The final sample is limited to firms for which stock return data are 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. Finally, in order to deal with potential misreports and incorrect outliers, three filters are used: On the insider transaction date, (1) the insider transaction price will be less than twice the closing price of the stock; (2) the number of shares of the insider transaction will be less than the daily volume of trade of the stock; and (3) the number of shares of the insider transaction will be less than the outstanding number of shares for the stock.[6]

In order to identify the insider's gender, we tried to match the names in our data set[7] to the database of all male and female baby names for every decade from 1900 till 2010, recorded by the U.S. Census Bureau.[8] The matching process produced three categories – clear male names, 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 2011 and cross-checked it with the gender as

[5] 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.

[6] Qualitative results do not change if these filters were not enforced. Results are available upon request.

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

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

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.[9]

We separate insider trades by purchases and sales. While we discuss the sales results, 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 sub- sample cleaner. Panel A of Table 1 provides the summary statistics of insider purchases by both genders. There are 18,031 firms in the sample with trading reported by males in 17,946 firms and by females in 5,351 firms. The total value of the transactions during the sample period is $28.64 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 3.8%. There are 720,871 transactions, with the females' share being 4.4%. 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 $39.97 ($34.35) thousand in constant dollars.

We group the insiders into three categories based on their titles, namely, Top Executives, Directors, and Officers. We classify as Top Executives those who are designated as CEO, CFO, Chairman of the Board, COO, Executive (or Senior) 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. All other executives are classified as Officers. Females make up 5.9% of all the insiders in our sample, 7.1% of the Officers, 5.2% of the Directors, and 3.6% 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

[9] We repeated the name matching process using Google's database to analyze common patterns related to the first names of the insiders. The popular usage on the web corroborated whether a name is more commonly used for a male or a female.

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 except for the smallest, ranging from about 1.2 to 2.1 times with firm size.

Table 2 provides the distribution of insider trading activity of males and females over three sub-periods. The value of the transactions (in constant 1984 dollars) shows more than a three-fold increase between the earliest and the most recent sub-periods. In fact, more than half 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 2.7 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 2.6% to 4.9%. 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. Among the three categories, Directors and Top Executives make up the bulk of the value of male trades (55% and 37%, respectively) while Officers account for 8%. The figures are not very different for females: Directors account for 62% of the value of the trades while Top Executives account for 27%. 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 roughly 1.2 times than that of females overall.

3. Results

In this section, we provide the main results of our paper regarding gender differences in

profitability and intensity of insider trades.

3.1. Profitability of insider trading transactions

We measure profitability of trades by the cumulative market-adjusted abnormal daily stock re turns (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 equally-weighted 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.[10] As reported in Panel A, the mean return of male purchases over the following 50-day period is 346 basis points while that of females is 240 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 of 106 basis points over 50 days from the purchase date and this difference is

[10] 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.

statistically significant at the 1% level. The median excess return of males is 147 basis points while that of females is 60 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 returns earned by males are economically and statistically greater than that of females. The results also show considerable skewness in insider returns as the mean is much greater than the median.

Panel B of Table 4 also provides the profitability of males and females for each position. 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.[11] Also, Top Executives earn more than Officers and Directors regardless of gender.

We have used cumulative abnormal returns (CAR) in the univariate analysis presented in Table 4. It has been noted (Barber and Lyon (1997) and Kothari and Warner (1997)), however, that common estimation procedures such as CAR and buy and hold returns produce biased test statistics. In addition, these methodologies ignore 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 different firms trade during similar time windows) and are likely to produce biased test statistics. 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.[12]

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

[12] All results reported in this paper are qualitatively identical when we estimate regressions with buy and hold returns as the dependent variable.

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

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

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

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

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 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 (six 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 presents the average daily abnormal returns to the portfolios of the male and female executives. As reported in 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 10.72, 9.35, and 10.03 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 8.26, 6.86, and 7.47 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 is long on male executives' purchases and short on female executives' purchases. This portfolio earns an abnormal return of 2.46 – 2.57 basis points per day depending on the benchmark model. For example, using the four-factor model, the abnormal return differential of 2.57 basis points per day represents an annualized return differential between male and female executives of about 6.5%, a number that is statistically significant and economically large. Overall, we conclude that male executives trade more profitably on their insider information relative to their female counterparts.

The above results are based on a subsample of insider purchases only. Since insiders may sell stock for motives other than to 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 about $152,260 ($160,900). It appears that females make substantially smaller purchases but comparable (slightly higher) sales per trade to males. The mean 50-day excess return of males' sales is –193 bps while that of females is –173 bps. Both are significantly different from zero, implying that both male and female executives profit from insider sales. The difference in return from sales between males and females is economically small 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 *D*-statistic is 0.00784 and *p*-value is 0.517. The *t*-test statistic is 0.90 with the corresponding *p*-value is 0.369). The results indicate that while both males and females earn positive returns from insider sales on average, 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.

3.2. Intensity of Trading Activity of Insiders

In this section, we investigate the differences in the trading intensity between males and females. 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 her/his 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 her/his tenure. Therefore, for each insider in a firm who has purchased shares there will be one observation.

Table 6, Panel A provides the univariate statistics of the purchasing activity measured using the three metrics. It can be seen that females in general purchase less frequently than males

overall, although this pattern does not hold for every position. Panel B shows the results of a Fama-McBeth regression with the dependent variable being a function of trading activity. As discussed in the case of returns, using the trading measures described in the summary statistics ignores cross- sectional dependence of event-firm abnormal returns that are overlapping in calendar time. 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. 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. 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 6 Panel B, the female dummy is negative and statistically significant at the 1% level regardless of the metric of trading activity. Furthermore, Top Executives purchase more and more often than Officers or Directors and the difference is economically and statistically significant. In summary, our results show that females trade less than males.

4. Analysis of the Results

Our results collectively indicate that female executives trade less than males and earn lower returns. The observed differences between the female and male executives' behavior can be 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). In order to further explore these results, we use a straightforward extension of the Grossman and Stiglitz (1980) model that incorporates overconfident insiders who overweight their information when updating their prior (see Appendix). The predictions from this model are that the intensity of insider trading as well as the resulting expected profit increases with overconfidence, decreases with risk aversion, and

increases with the precision of the private information. These results are consistent with predictions of earlier theoretical work.[13]

The empirical evidence is mixed on whether there are gender differences in dispositional factors such as overconfidence and risk aversion, and whether they result in differences in trading behavior and resultant profits. Barber and Odean (2001) find that among trades of online broker investors, 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. 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 better-than-average 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.[14] In summary, we can conclude from the empirical evidence that females are no more overconfident than males. There is consensus that overconfident investors trade more; there is, however, disagreement whether overconfidence results in increases or decreases in profits. It must be noted, however, that none of these papers deal with informed traders.

[13] See Benos (1998), Caballé and Sákovics (2003), Daniel, Hirshleifer and Subrahmanyam (1998, 2001), Gervais and Odean (2001), Kyle and Wang (1997), Odean (1998), and Wang (1998, 2001 for predictions relating to overconfidence. Predictions relating to risk-aversion and precision of information are the same as in Grossman and Stiglitz (1980).

[14] 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.

Eckel and Grossman (2003) survey the economics literature on gender differences in risk aversion, 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.[15] While most of the empirical work on risk-aversion in financial decision 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) than males.

On the basis of the extant literature, if we assume that males are no less overconfident and no more risk-averse than females, our model implies that the results from the previous section (that male executives trade more and earn greater returns) can be due to gender differences in these dispositional factors. Another potential explanation (not mutually exclusive)

[15] 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 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.

for the gender difference in trading profits in insider purchases is that males possess more information about their firm's prospects purely 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 (2011) reports that while 17.7% of the top officers in Fortune 500 firms are females, only 7.6% are top-5 earners and 3.0% are CEOs. Our data is consistent with these findings: the proportion of male executives increases with the importance of the title as reported in Panel A of Table 1 or because male executives have better information. More importantly, Table 3 reports that of the 31,377 purchases made by female Officers, Directors, and Top Executives in our sample, only 7,167 (22.8%) are made by female Top Executives.

4.1. Profitability of Trades within the Same Positions

In order to address the possibility that lower profits of female executives are purely due to their under-representation in top-most positions, we report in Table 7 the results of a four-factor model regression similar to the one reported in Table 5, but separately for Officers, Directors and Top Executives. We compare the gender-wise returns of each insider position from the intercepts of the regression specifications 1 and 2 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. All the intercepts in the regression specifications are positive and statistically different from zero at the 1% level.

It can be seen from Panel A of Table 7 that the males-females difference portfolio (specification 3) earns a statistically significant abnormal return of 1.90 basis points per day (significant at the 10% level). Both male and female officers earn positive returns from insider trading as can be seen from the intercepts in regression specifications 1 and 2, respectively. This result implies that female officers earn lower positive returns than male officers.

Panels B and C help us draw similar conclusions for Directors and Top Executives. Panel B reveals that the male-female directors difference portfolio (specification 3) earns a statistically

significant abnormal return of 3.15 basis points per day (significant at the 1% level). Panel C shows that the male-female top executives difference portfolio (specification 3) earns a statistically significant abnormal return of 3.18 basis points per day (significant at the 10% level).

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. These results imply that if the lower female returns are not merely due their underrepresentation in senior positions.

4.2. Intensity of Trades within the Same Positions

In order to address the possibility that lower trading intensity of female executives is due to their under-representation in top-most positions, we report in Table 8 the results of a Fama-Macbeth regression similar to the one reported in Table 6. In these tables, the trading activity, as defined earlier with reference to Table 6, is the dependent variable with independent variables including dummies for firm-size groups and for cross products of gender with position. Table 8 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. The fact that the coefficient on the Females*Officers variable is negative and significant at the 1% level in all specifications indicates that female Officers trade less than male Officers. Similarly, females Directors and Top Executives trade less than their male counterparts and the difference is significant at the 1% level in all but one of the specifications and significant at the 5% level in the remaining specification (see bottom of table for the significance of the differences).

The results in sections 4.1 and 4.2 imply that the lower intensity of trading and lower returns of female executives are not merely due to the information disadvantage arising from their underrepresentation in senior positions. That leaves two non-mutually-exclusive explanations for the results. The results could imply either that the gender differences in trading

intensity and profitability are purely due to dispositional factors, or that the formal rank or title of the executive is not a good proxy for access to information. The next section offers a test to distinguish between these two hypotheses.

4.3. Gender Differences in Profitability Conditional on Trading Size

We use the following reasoning to develop a test to investigate if dispositional factors alone can explain the gender differences in trading and profitability. As discussed earlier, there is strong empirical evidence that males are no less overconfident and no more risk-averse than females. If this is so, the implication of the model is that the insider trading volume of male and female executives can be the same only if male executives have no better information than female executives. If male executives have no better information, the profitability of their trades conditional on a given trade size, can be no better than that of female executives.

To test if there are gender differences in profits controlling for trade size, 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. Panel A of Table 9 provides a regression analysis of the determinants of insider profits from purchases (males-females) for each trade-size group for the entire sample. In all the trade-size groups, we find that males earn greater returns (the abnormal return after controlling for the factors) than females and the results are significant at the 1% level for Groups 1 and 2 and at the 5% level for Group 3. These results by themselves are not strong enough evidence to rule out dispositional factors as the sole explanation for the gender differences. This is because we know that males dominate more senior executive positions which grant them an informational advantage over females. In order to address this issue, in Panels B-D we repeat the test in Panel A for different executive positions (Officers, Directors, and Top Executives). We also report in Panel E the results for a sub-group of Top Executives, namely, CEOs, CFOs, and COOs.

It can be seen that for every position males earn greater returns than females in every trade size group and the results are significant at least at the 5% level. The results are also economically significant: male executives earn anywhere from 2.51 basis points per day more than their female counterparts (Panel C, Group 1) to 7.96 basis points per day (Panel D, Group 3).

Thus, the results suggest that the dispositional factors alone cannot explain our results. The implication, therefore, is that the executive's rank is an imperfect proxy for access to information. If information is not being solely accessed through formal channels, the question that arises is whether information is being accessed through informal gender networks. We offer a measure of gender network strength using our database to provide some suggestive answers to this question.

4.4. Gender differences when Female Trading is Relatively High

There is considerable research suggesting that formal position or title does not truly reflect female executives' access to information. 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). 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. While several reasons have been suggested as to why females may be viewed as less desirable network contacts, the relevant reason in our setting is the systemic barriers perspective (Morrison and Von Glinow, 1990) which suggests that gender differences in network access reflect the expectations and biases of organizational members. Furthermore, there is considerable evidence in the social psychology literature that there are gender differences in their tendency to form same-gender network relationships and in rates of return from networks. Ibarra (1992) finds that males are more likely to form same-gender ties across multiple networks

and to have stronger same-gender ties. Males also reap greater returns from their investment in networks.

Kanter (1977a) argues that when senior executive positions are held disproportionately by males it affects interactions between the dominant group of males and the “token” group of females. Male executives exaggerate differences between themselves and the “token” female executives. This behavior has several undesirable consequences for female executives, one of them being exclusion from informal interactions with male counterparts. There is broad support for Kanter's predictions (Yoder, (1991), Lyness and Thompson (2000), Moore (1988) and Zimmer, (1988)) in various professional settings and in particular when females are in traditionally male-held positions such as senior executive jobs. As stated earlier, finding of Catalyst (2011) and our own data confirm that gender ratio among senior executives is skewed in favor of males.

Finally gender differences in access to information can arise from not only differences in intra-firm networks, but also inter-firm networks. Westphal and Milton (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.

As the proportion of female executives increases, one might expect to see some attenuation of the tokenism behavior and stronger female networks. Therefore, if lack of access to information is the primary cause of lower trade sizes and profits of female executives, the gender difference in these two variables should be reduced in firms where female executive proportions are higher. We do not have a direct way of measuring the proportion of female insiders. We can, however, use the proportion of trades by female insiders in a firm as a proxy of the proportion of female insiders. Furthermore, because of the low levels of female representation among insiders, we expect to see any mitigation of gender differences only in firms with the highest percentiles of female trades.

We report in Table 10 the gender differences in profits in the subsample of firms that represent female trades in the 90% percentile of all female trades. The table is similar to Table 7.

For each firm in our sample, we calculate the proportion of the number of female executive trades to the total number of trades by female and male executives. Using this distribution of the female executive trade proportions we construct a subsample of firms in which female trade proportion is in the 90th percentile and above.[16] The firms in this subsample have relatively higher ratios of the number of female executive transactions to the number of all transactions.

There are 2127 unique firms in this subsample. The trade proportion of female executives to all transactions is 14.29% or higher in these firms. There are 81,340 transactions, of which 29,027 are Top Executive trades, 17,076 are Officer trades, and 35,237 are Director trades. The number of female executive transactions is 13,826 and the remaining 66,164 are male executive transactions. As expected, the proportion of female insider transactions is considerably higher than in the complete sample (17% compared to 4.4%).

When the sample is limited to firms in which the proportion of female trading falls in the 90th percentile, gender differences in return are not significant.[17] It can be seen from Panel A of Table 10 that the return males-females difference portfolio (specification 3) is not significantly different for both EW and VW portfolios for trades by all executive titles. This result holds for the subsample of CEOs, CFOs, and COOs as well. Consistent with the hypothesis that tokenism is likely to be attenuated when male dominance is relatively low, we see that the male advantage in profitability is eliminated when females trade "more." This result is consistent with the notion that females suffer an informational disadvantage despite their titles in firms where they form a small minority, but that disadvantage is attenuated when their numbers increase.

As an additional robustness check, we limit our attention only to those firms where at least one female executive with a particular title has traded. This approach is similar to firm-fixed effects and enables us to avoid any potential biases from differences between males and females due to industry effects, firm-size effects, differences in authority and access for a given

[16] We obtained similar results when we used a cutoff of 95th percentile.

[17] We also checked the gender differences in trading intensity in this subsample. Results are similar to what is reported for the entire sample in tables 6 and 8. The only difference is that in this subsample, there are no gender differences in the intensity of trading of Top Executives.

title and other likely differences between male and female firms. These results are shown in Table 11. It can be seen from that table that male executives earn greater abnormal returns than female executives in every position even in this subsample and the differences are statistically significant.

In summary, the results and analysis of this section enable us to rule out the possibility that gender differences in dispositional factors such as overconfidence and risk-aversion are the sole explanations for the gender differences in trading intensity and profits. Our results also rule out differences in industry effect, firm-size effects, different authority and access associated with a given title in different firms. This, in combination with additional results in Table 10 and Table 11, leads us to conclude that male executives possess an informational advantage over their female colleagues and this advantage is likely due to their informal information networks.

5. Conclusion

This paper is the first to report gender differences in insider trading activity and profitability. We find that there are significant gender differences in insider trading outcomes. The implication of our finding is that the environment in which top females executives operate is different than that of their male counterparts. 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 value-weighted return of males is 346 basis points over a 50-day window after insider purchase compared to 240 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 among all ranks: officers, board directors, top executives, and surprisingly, even CEOs and CFOs.

There can be two types of explanations, not mutually exclusive, for these results: dispositional or situational. The evidence from psychology and sociology literature overwhelmingly supports the notion that females are no more overconfident and no less risk-averse than males. Taking these results as given, information-based trading models such as the

one we have provided suggest that the results may be due to these dispositional factors alone, or in combination with males' informational advantage. Given that the male executives make more profits regardless of rank, any informational advantage possibly derives from informal networks.

We rule out gender differences in dispositional factors as the sole explanation of our results as follows. The prediction from information-based trading models is that, for a given trade size, the less the overconfidence and the greater the risk-aversion the greater the information quality. Taking females are no more overconfident and no less risk-averse than males, we should find females' information, and hence profits, to be superior when adjusted for trade size if these dispositional factors were the sole explanation. We find just the opposite.

The implication that follows is that male executives possess informational advantage over their female counterparts possibly from informal networks. Since the informational disadvantage of female executives might be attenuated in settings where the proportion of female executives is relatively high, we should expect to find the gender differences we observe to be reduced or eliminated is such settings. We find that in settings where the proportion of female trading is very high, proxying for increased presence of females, the gender differences indeed do disappear. Our results seem to suggest that male executives and female executives have non-overlapping networks, giving the top males executives an edge in gathering asymmetric information.

Appendix

The model uses the Grossman & Stiglitz (1980) framework and is a straightforward extension of the model presented in Hirshleifer and Luo (2001). In our model, there are three types of traders: rational, informed or insiders, and noise traders. There are two assets: a risk-free asset (payoff of 1) and a risky asset (payoff of θ); θ has mean of $\overline{\theta}$ and volatility of σ_θ. All distributions are normal. The risk-free rate is zero. The price of the risky asset is determined by rational and noise traders who trade often. Insiders trade occasionally, as price takers (i.e., their trade volume is very small compared to rational investors' trading volume).

Rational traders & insiders know the distribution of θ. Insider i receives a signal $s_i = \theta + \varepsilon_i$, where ε_i has zero mean and volatility of σ_i. Both rational traders and insiders maximize expected exponential utility of end-of-period wealth, based on their information:

$$U_j(w_j) = -e^{\alpha_j w_j},$$

where w_j is the end of period wealth $\alpha_j > 0$ is the coefficient of absolute risk aversion of trader j. All rational investors are assumed to have the same risk aversion coefficient of α.

Insiders could be overconfident. As in Gervais and Odean (2001), we assume that overconfident insiders put more than rational weight on their signal. In particular, they update the expected value of θ upon receiving the signal using the following rule:

$$E\{\theta | s_i\} = \overline{\theta} + k_i \gamma_i (s_i - \overline{\theta});\ Var\{\theta | s_i\} = \varphi_i, \text{ where} \tag{A1}$$

$$\gamma_i = \frac{\sigma_\theta^2}{\sigma_\theta^2 + \sigma_i^2} \text{ and } \varphi_i = \frac{\sigma_\theta^2 \sigma_i^2}{\sigma_\theta^2 + \sigma_i^2} = \gamma_i \sigma_i^2 .$$

The insider's overconfidence is represented by the factor k_i. If it is greater than one, the insider is overconfident about the quality of the signal. If $k_i = 1$, the insider is rational.

The total demand by liquidity traders is x where $E(x) = 0$ and $Var(x) = \sigma_x^2$. Each rational trader's demand for the risky asset is then given by

$$\frac{\hat{\theta} - p}{\alpha \sigma_\theta^2},$$

where p is the price of the risky asset. With N rational traders, the price is given by

$$p = \bar{\theta} + \frac{\alpha \sigma_\theta^2 x}{N}.$$

The demand for the risky asset by insider i is given by

$$X_i = \frac{\bar{\theta} + k_i \gamma_i \left(\theta_i - \bar{\theta} + \varepsilon_i\right) - p}{\alpha_i \phi_i} \tag{A2}$$

It follows from Equation (A2) that conditional on a good signal, the expected trade size increases with insider's overconfidence level and the signal precision and decreases with risk aversion.

Let $\hat{\theta}$ represent the rational investor's posterior expectation of θ given signal s_i. The value of $\hat{\theta}$ is obtained by setting $k = 1$ in Equation (A1). Then insider i's expected profit from a rational investor's (or researcher's) perspective is given by Equation (A3), where expectations are taken over the distributions of θ and ε_i.

$$\pi_i = E\left\{X_i(\hat{\theta} - p)\right\}. \tag{A3}$$

Substituting for X_i from Equation (A2), it can be shown that

$$\pi_i = \frac{1}{\alpha_i \phi_i}\left[(\bar{\theta} - p)^2 + k_i \gamma_i \sigma_\theta^2\right]. \tag{A4}$$

It follows from Equation (A4) that

$$\frac{\partial \pi_i}{\partial k_i} > 0, \ \frac{\partial \pi_i}{\partial \alpha_i} < 0.$$

Since $\frac{\partial \phi_i}{\partial \sigma_i^2} > 0$ and $\frac{\partial \gamma_i}{\partial \sigma_i^2} < 0$, it also follows that $\frac{\partial \pi_i}{\partial \sigma_i^2} < 0$.

Since the comparative statics hold for every value of p, and hence every value of x, they hold when expectations are taken over the distribution of x as well. Therefore, expected profits increase with insider's overconfidence level and the precision of the signal and decrease with risk aversion.

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Table 1. Insider Trading Statistics

The table presents the insider trading statistics of male and female executives (Officers, Directors and Top Executives) for the period 1975-2011. Monetary amounts are measured in 1984 constant dollars. Panel A reports the summary statistics, with the number of unique executives in the database and also the number of executives by title. The last column of Panel A reports statistics for females as a percentage of the total. 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. Panel B reports insider trading statistics 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.

Panel A: Summary Statistics

	Total	Male	Female	Female (%)
Number of Firms	18,031	17,946	5,351	29.7%
Value of Purchases ($ mn)	28,636	27,558	1,078	3.8%
No. of Purchases	720,871	689,494	31,377	4.4%
Number of Executives	123,457	116,136	7,321	5.9%
Officers	53,010	49,259	3,751	7.1%
Directors	58,865	55,809	3,056	5.2%
Top Executives	38,406	37,007	1,399	3.6%

Panel B: Stratified by Firm Size

Value of purchase transactions ($ mn)			
Firm Size	Total	Male	Female
< $50	4,696.25	4,362.40	333.86
		(92.9%)	(7.1%)
$50 - $250	7,855.19	7,592.07	263.12
		(96.7%)	(3.3%)
$250 - $1000	7,097.43	6,939.64	157.79
		(97.8%)	(2.2%)
> $1000	8,986.68	8,663.69	322.99
		(96.4%)	(3.6%)
Total	28,635.55	27,557.79	1,077.76
		(96.2%)	(3.8%)
No. of purchase transactions			
Firm Size	Total	Male	Female
< $50	282,609	271,831	10,778
		(96.2%)	(3.8%)
$50 - $250	239,467	229,542	9,925
		(95.9%)	(4.1%)
$250 - $1000	122,759	117,132	5,627
		(95.4%)	(4.6%)
> $1000	76,036	70,989	5,047
		(93.4%)	(6.6%)
Total	720,871	689,494	31,377
		(95.6%)	(4.4%)
Average value of purchases ($ thousands)			
Firm Size	Total	Male	Female
< $50	16.617	16.048	30.976
$50 - $250	32.803	33.075	26.511
$250 - $1000	57.816	59.246	28.042
> $1000	118.190	122.043	63.997
Total	39.724	39.968	34.349

Table 2. Insider Trading Activity of Male and Female Executives in Different Time Periods

The table presents the insider trading statistics of male and female executives (Officers, Directors and Top Executives) for different sub-periods. 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 ($ mn)			
Period	Total	Male	Female
1975-1985	5,225	5,150	75
		(98.6%)	(1.4%)
1986-1996	7,6386	7,302	335
		(95.6%)	(4.4%)
1997-2011	15,774	15,106	668
		(95.8%)	(4.2%)
Total	28,636	27,558	1,078
		(96.2%)	(3.8%)
No. of purchase transactions			
Period	Total	Male	Female
1975-1985	142,006	138,356	3,650
		(97.4%)	(2.6%)
1986-1996	197,194	188,239	8,955
		(95.5%)	(4.5%)
1997-2011	381,671	362,899	18,772
		(95.1%)	(4.9%)
Total	720,871	689,494	31,377
		(95.6%)	(4.4%)
Average value of purchases ($ thousands)			
Period	Total	Male	Female
1975-1985	36.79	37.22	20.49
1986-1996	38.73	38.79	37.38
1997-2011	41.33	41.63	35.60
Total	39.72	39.97	34.35

Table 3. Insider Trading Statistics Based on the Position of the Insiders

The table presents the insider trading statistics of male and female executives stratified by the insiders' titles in the firms. 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 ($ mn)			
Position	Total	Male	Female
Officers	2,268	2,154	114
		(95.0%)	(5.0%)
Directors	15,853	15,180	673
		(95.8%)	(4.2%)
Top Execs	10,514	10,223	291
		(97.2%)	(2.8%)
Total	28,636	27,558	1,078
		(96.2%)	(3.8%)
No. of purchase transactions			
Position	Total	Male	Female
Officers	148,585	138,674	9,911
		(93.3%)	(6.7%)
Directors	342,168	327,869	14,299
		(95.8%)	(4.2%)
Top Execs	230,118	222,951	7,167
		(96.9%)	(3.1%)
Total	720,871	689,494	31,377
		(95.6%)	(4.4%)
Average value of purchases ($ thousands)			
Position	Total	Male	Female
Officers	15.266	15.535	11.512
Directors	46.331	46.299	47.068
Top Execs	45.690	45.855	40.550
Total	39.724	39.968	34.349

Table 4. Gender Differences in Profitability of Insider Transactions: Univariate Analysis

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.

Panel A

Purchases	N	Mean	Std.Dev	1st Percentile	Median	99th Percentile
Males	156,816	346	2160	-4736	147	7306
Females	8,574	240	2273	-4983	60	7548

Kolmogorov Smirnov Test for equality of distributions

	D-stat	p-value	t-stat	p-value
Males Vs. Females	0.03277	0.000	4.41	0.000

Panel B

Officers	N	Mean	Std.Dev	1st Percentile	Median	99th Percentile
Males	47,871	378	2154	-4676	182	7263
Females	3,424	305	2573	-5387	93	9015
Directors	**N**	**Mean**	**Std.Dev**	**1st Percentile**	**Median**	**99th Percentile**
Males	72,104	246	1946	-4356	83	6452
Females	3,809	99	1774	-4298	17	5307
Top Execs	**N**	**Mean**	**Std.Dev**	**1st Percentile**	**Median**	**99th Percentile**
Males	36,841	502	2524	-5525	261	8722
Females	1,341	476	2657	-5930	191	9832

Kolmogorov Smirnov Test for equality of distributions

	D-Value	p - value	t-stat	p-value
Officers: Males Vs Females	0.04117	0.000	2.63	0.009
Directors: Males Vs Females	0.04884	0.000	4.56	0.000
Top Execs: Males Vs Females	0.05313	0.001	1.98	0.048

Table 5. Gender Differences in Insider Trading Profitability: Regression Analysis

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 over the preceding fifty trading days, it is invested in the stock market earning the daily market return. 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. The regression model is given below:

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

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)

Independent Variable	Males	Females	Males	Females	Males	Females	**Males - Females**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Const.	10.72***	8.26***	9.35***	6.86***	10.03***	7.47***	2.46***	2.49***	2.57***
	(0.57)	(1.01)	(0.43)	(0.94)	(0.41)	(0.94)	(0.94)	(0.94)	(0.94)
MKT-RF	0.78***	0.77***	0.88***	0.87***	0.85***	0.85***	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SMB			0.64***	0.62***	0.64***	0.63***		0.01	0.01
			(0.01)	(0.02)	(0.01)	(0.02)		(0.02)	(0.02)
HML			0.31***	0.33***	0.23***	0.26***		-0.02	-0.03
			(0.01)	(0.02)	(0.01)	(0.02)		(0.02)	(0.02)
UMD					-0.17***	-0.15***			-0.02
					(0.01)	(0.01)			(0.01)
Obs.	9338	9338	9338	9338	9338	9338	9338	9338	9338
R^2 (%)	70	41	83	49	84	50	0.02	0.04	0.07

Table 6. Analysis of Intensity of Insider Trading by Position

Panel A: Summary Statistics

We use three variables to capture the intensity of trading of the insiders. The first variable is the value of trade in thousands 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	24.1	24.4	19.8	3,477	3,499	3,192	1.41	1.41	1.48
Directors	84.0	83.1	101.1	10,008	10,262	5,162	1.71	1.72	1.53
Top Executives	106.3	106.2	110.1	19,019	18,918	21,638	2.28	2.28	2.19
Total	70.4	70.4	69.5	9,923	10,099	6,809	1.74	1.74	1.61

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, along with Newey-West adjusted standard errors. (*** Significant at one percent level, ** Significant at five percent level,* Significant at ten percent level).

	Fama-McBeth		
Trading per year	log(Value)	log(Shares)	log(Trades)
Const.	8.57***	6.96***	0.50***
	(0.15)	(0.18)	(0.03)
Female	-0.54***	-0.60***	-0.07***
	(0.02)	(0.02)	(0.01)
Directors	0.82***	0.70***	0.08***
	(0.05)	(0.05)	(0.02)
Top Execs	0.99***	1.10***	0.23***
	(0.02)	(0.03)	(0.02)
$50-$250 million	0.50***	-0.38***	-0.05***
	(0.07)	(0.09)	(0.01)
$250-$1000 million	0.80***	-0.52***	-0.13***
	(0.13)	(0.13)	(0.02)
> $1000 million	1.05***	-0.73***	-0.18***
	(0.16)	(0.15)	(0.02)

Table 7. Gender Differences in Insider Trading Profitability: 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 over the preceding fifty trading days, the portfolio is assumed to earn the daily market return. 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, 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:

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

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
	(1)	(2)	(3)
Const.	10.39***	8.48***	1.90*
	(0.43)	(1.06)	(1.07)
MKT-RF	0.91***	0.85***	0.07***
	(0.01)	(0.01)	(0.01)
SMB	0.68***	0.66***	0.02
	(0.01)	(0.02)	(0.02)
HML	0.25***	0.11	0.14***
	(0.01)	(0.02)	(0.02)
UMD	-0.23***	-0.22***	-0.01***
	(0.01)	(0.01)	(0.01)
Obs.	9338	9338	9338
R^2 (%)	85	45	0.7

Panel B – Directors

	Males	Females	Males - Females
	(1)	(2)	(3)
Const.	8.92***	5.76***	3.15***
	(0.36)	(0.93)	(0.91)
MKT-RF	0.86***	0.91***	-0.05***
	(0.01)	(0.01)	(0.01)
SMB	0.61***	0.56***	0.05***
	(0.01)	(0.02)	(0.02)
HML	0.24***	0.40***	-0.16***
	(0.01)	(0.02)	(0.02)
UMD	-0.17***	-0.16***	-0.01
	(0.01)	(0.01)	(0.01)
Obs.	9338	9338	9338
R^2 (%)	87	53	1

Panel C – Top Executives

	Males	Females	Males - Females
	(1)	(2)	(3)
Const.	13.37***	10.19***	3.18*
	(0.59)	(1.76)	(1.79)
MKT-RF	0.83***	0.77***	0.07***
	(0.01)	(0.02)	(0.02)
SMB	0.70***	0.62***	0.07**
	(0.01)	(0.03)	(0.03)
HML	0.24***	0.17***	0.07**
	(0.01)	(0.04)	(0.04)
UMD	-0.17***	-0.09***	-0.08***
	(0.01)	(0.02)	(0.02)
Obs.	9338	9338	9338
R^2 (%)	71	19	0.3

Table 8. Determinants of Intensity of Insider Trading Activity by Position.

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, along with Newey-West adjusted standard errors. (*** Significant at one percent level, ** Significant at five percent level,* Significant at ten percent level).

		Fama-McBeth	
Trading per year	log(Value)	log(Shares)	log(Trades)
Const.	8.57***	6.96***	0.50***
	(0.15)	(0.18)	(0.03)
Female * Officers	-0.53***	-0.60***	-0.03***
	(0.05)	(0.06)	(0.01)
Male * Directors	0.82***	0.71***	0.08***
	(0.05)	(0.05)	(0.02)
Female * Directors	0.21***	0.02	-0.01
	(0.05)	(0.06)	(0.02)
Male * Top Execs	0.99***	1.09***	0.24***
	(0.03)	(0.03)	(0.02)
Female * Top Execs	0.72***	0.84***	0.18***
	(0.06)	(0.07)	(0.03)
$50-$250 million	0.50***	-0.38***	-0.05***
	(0.07)	(0.09)	(0.01)
$250-$1000 million	0.80***	-0.52***	-0.13***
	(0.13)	(0.13)	(0.02)
> $1000 million	1.06***	-0.72***	-0.18***
	(0.16)	(0.15)	(0.02)
Test of (Male-Female) coefficient differences	F (p-value)	F (p-value)	F (p-value)
Directors	453.89	587.81	140.03
	(0.000)	(0.000)	(0.000)
Top Execs	20.28	14.99	5.13
	(0.000)	(0.000)	(0.030)

Table 9. Regression Analysis of the Determinants of Insider Trading Profits 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 within each group we fix trade size to be approximately the same for all executives. 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, calendar time returns (expressed in basis points) of Male-Female insider trading portfolios where all individuals are in the same group. 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 over the preceding fifty trading days, the portfolio is assumed to be invested in the stock market earning the daily market return. 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. The regression model is given below:

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

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 ten percent level).

Panel A: Males – Females Portfolio: Entire Sample

	Group 1	Group 2	Group 3
Const.	2.92***	3.26***	2.21**
	(1.04)	(0.92)	(1.11)
MKT-RF	-0.02**	-0.04***	-0.03**
	(0.01)	(0.01)	(0.01)
SMB	0.02	0.05***	0.04**
	(0.02)	(0.02)	(0.02)
HML	-0.05**	-0.01	-0.03
	(0.02)	(0.02)	(0.02)
UMD	0.03*	-0.01	-0.07***
	(0.01)	(0.01)	(0.02)
Obs.	9338	9338	9338
R^2 (%)	0.2	0.3	0.3

Panel B: Males – Females Portfolio: Officers

	Group 1	Group 2	Group 3
Const.	4.29***	4.06***	5.15***
	(1.14)	(1.38)	(1.22)
MKT-RF	0.40***	0.12***	0.21***
	(0.01)	(0.01)	(0.01)
SMB	0.35***	0.06**	0.11***
	(0.02)	(0.03)	(0.02)
HML	0.34***	0.21***	0.23***
	(0.02)	(0.03)	(0.03)
UMD	0.04***	0.08***	-0.04**
	(0.02)	(0.02)	(0.02)
Obs.	9338	9338	9338
R^2 (%)	12.7	1.0	3.7

Panel C: Males – Females Portfolio: Directors

	Group 1	Group 2	Group 3
Const.	2.51*	3.06***	6.00***
	(1.37)	(1.07)	(1.06)
MKT-RF	-0.07***	-0.06***	0.13***
	(0.01)	(0.01)	(0.01)
SMB	0.04*	0.04*	0.14***
	(0.03)	(0.02)	(0.02)
HML	-0.18***	-0.11***	-0.13***
	(0.03)	(0.02)	(0.02)
UMD	0.02	-0.04***	0.03**
	(0.02)	(0.01)	(0.01)
Obs.	9338	9338	9338
R^2 (%)	0.7	0.6	2.9

Panel D: Males – Females Portfolio: Top Executives

	Group 1	Group 2	Group 3
Const.	6.06**	6.24***	7.96***
	(2.42)	(2.04)	(1.62)
MKT-RF	0.16***	0.09***	0.44***
	(0.02)	(0.02)	(0.02)
SMB	0.07*	0.17***	0.32***
	(0.04)	(0.04)	(0.03)
HML	0.02	0.05	0.17***
	(0.05)	(0.04)	(0.03)
UMD	-0.07**	0.01	0.06**
	(0.03)	(0.03)	(0.02)
Obs.	9338	9338	9338
R^2 (%)	0.6	0.4	7.8

Panel E: Males – Females Portfolio: CEOs, CFOs, COOs

	Group 1	Group 2	Group 3
Const.	5.19**	3.11**	3.46***
	(2.35)	(1.69)	(1.19)
MKT-RF	0.14***	0.14***	0.59***
	(0.02)	(0.02)	(0.01)
SMB	0.07	0.12***	0.49***
	(0.04)	(0.03)	(0.02)
HML	0.05	0.16***	0.35***
	(0.05)	(0.03)	(0.02)
UMD	-0.02	0.08***	-0.13***
	(0.03)	(0.02)	(0.02)
Obs.	9338	9338	9338
R^2 (%)	0.4	0.9	1.6

Table 10. Gender Differences in Insider Trading Profitability when Females Trading is High

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 over the preceding fifty trading days, the portfolio is assumed to be invested in the stock market earning the daily market return. 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 the entire sample and Panel B, reports the results for CEOs, CFOs, and COOs. The regression model is given below:

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

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 – All Positions

	Males	Females	Males – Females
	(1)	(2)	(3)
Const.	10.29***	10.20***	0.09
	(0.70)	(1.26)	(1.23)
MKT-RF	0.79***	0.80***	-0.02
	(0.01)	(0.01)	(0.01)
SMB	0.63***	0.66***	-0.03
	(0.01)	(0.02)	(0.02)
HML	0.23***	0.13***	0.10***
	(0.01)	(0.03)	(0.03)
UMD	-0.16***	-0.20***	0.04**
	(0.01)	(0.02)	(0.02)
Obs.	9388	9388	9388
R^2 (%)	62	35	3

Panel B – CEOs, CFOs, COOs

	Males	Females	Males – Females
	(1)	(2)	(3)
Const.	5.13***	4.52***	0.61
	(1.11)	(1.37)	(1.61)
MKT-RF	0.54***	0.50***	0.05***
	(0.01)	(0.01)	(0.02)
SMB	0.56***	0.53***	0.03
	(0.02)	(0.03)	(0.03)
HML	0.25***	0.18***	0.07**
	(0.02)	(0.03)	(0.03)
UMD	-0.37***	-0.29***	-0.08***
	(0.02)	(0.02)	(0.02)
Obs.	9388	9388	9388
R^2 (%)	29	18	0.3

Table 11. Gender Differences in Profitability of Insider Transactions in firms with female trades

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 in firms with female trades in each position. Thus the Officers subsample is limited to firms in which there is trading by female Officers, Directors subsample is limited to firms in which there is trading by female Directors, and so on. 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.

Officers	N	Mean	Std.Dev	1st Percentile	Median	99th Percentile
Males	15524	305	2573	-4488	127	6510
Females	3424	291	2008	-5387	93	9015
Directors	**N**	**Mean**	**Std.Dev**	**1st Percentile**	**Median**	**99th Percentile**
Males	24682	123	1578	-4298	17	5307
Females	3809	99	1774	-3588	11	5171
Top Execs	**N**	**Mean**	**Std.Dev**	**1st Percentile**	**Median**	**99th Percentile**
Males	4094	558	2614	-5019	249	9885
Females	1341	476	2657	-5930	191	9832
CEO-CFO-COO	**N**	**Mean**	**Std.Dev**	**1st Percentile**	**Median**	**99th Percentile**
Males	956	790	2937	-5038	418	1066
Females	599	562	2750	-6328	297	9885

Kolmogorov Smirnov Test for equality of distributions

	D-Value	p - value
Officers: Males Vs Females	0.04302	0.000
Directors: Males Vs Females	0.02752	0.014
Top Execs: Males Vs Females	0.05605	0.004
CEO-CFO-COO: Males Vs Females	0.04723	0.038

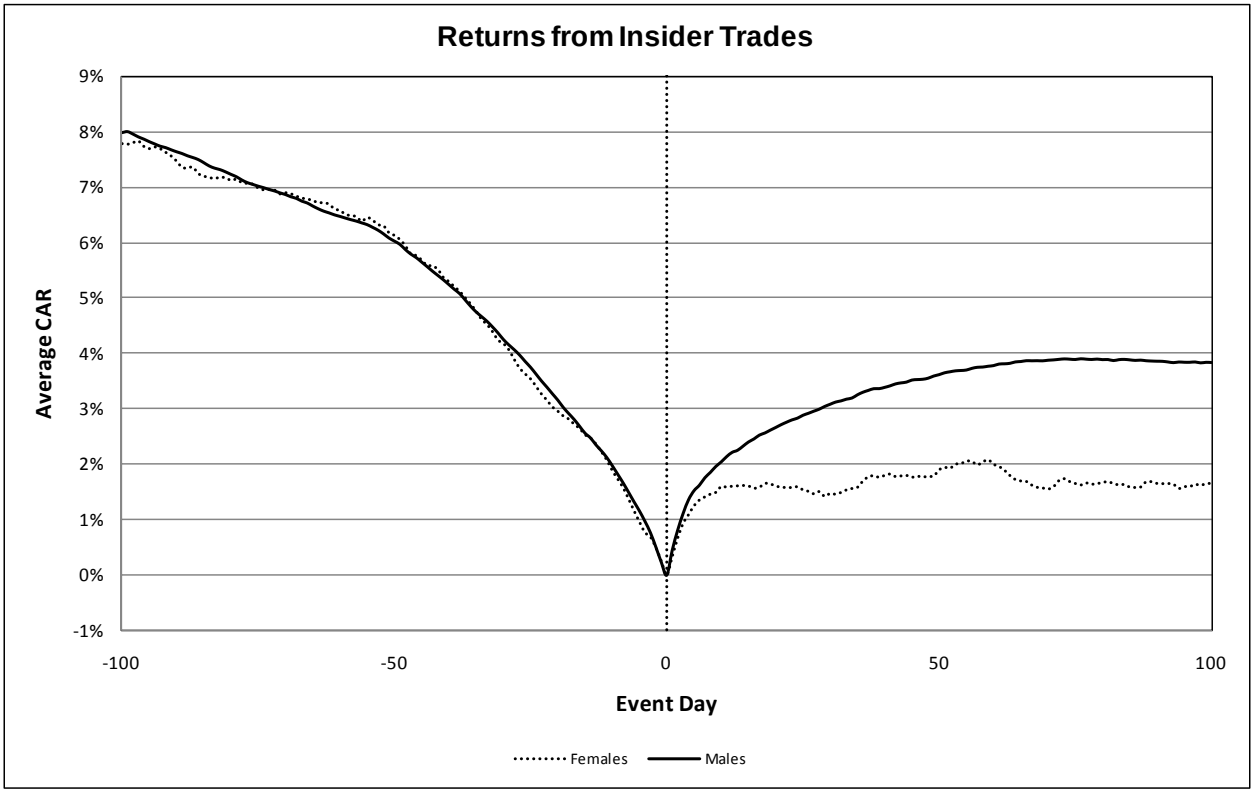

Figure 1. Returns from Insider Trades

This figure displays the cross sectional equally-weighted averages of the market- adjusted Cumulative Abnormal Returns of male and female insider purchases in event time where the event is defined as an insider purchase.