IS THE RISK WORTH THE REWARD FOR TOP FEMALE EXECUTIVES?

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Abstract

Why do few women hold the top executive jobs? In this paper I examine whether female executives face the same reward-risk tradeoff in their annual compensation as their male colleagues. I compare the pay-to-performance relationship for male and female executives who rank in the top five earners in S&P publicly traded companies, during increases and decreases in firm market value. I find that women have similar proportional pay-to-performance sensitivity as men when firm market value increases, but twice the sensitivity when market value decreases. This is not consistent with female executives selecting less risky pay contracts than their male colleagues. It is consistent with boards exhibiting an attribution bias that presents more strongly during negative firm outcomes. I also find that men's pay, especially bonus pay, is more responsive than women's pay to "lucky" firm performance, which is driven by external market factors, not executive ability. Moreover, I find that those lower in the pay ranks exhibit similar gender differences in performance pay and pay for luck as top performers. These additional results support an attribution bias by boards, and not alternative explanations such as higher male ability or greater managerial power for men.

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I. INTRODUCTION

A body of evidence suggests that women tend to be more risk averse and less competitive than men (Croson and Gneezy, 2009; Niederle and Vesterlund, 2007). This could be an explanation for the absence of women in the high risk, high reward jobs and their lower share of pay at risk. Women make up only 7% of the top five jobs in the S&P 1500 public companies – jobs with a significant portion of pay tied to performance, or pay at risk. The women who do hold these top jobs receive about 25% lower pay than their male colleagues and have a smaller portion of their pay tied to performance in the form of bonuses. Another explanation is that women have less incentive to take on the risk because the reward-risk calculus in these jobs comes out worse for women than for men. If women were systematically punished more severely for bad firm performance than their male colleagues while they received comparable or less reward for good firm performance, women would have less incentive to pursue these positions. Furthermore, such a pay practice could indicate inefficiency in the pay-setting process, which may be the result of a gender bias in attribution when boards set performance pay.

In this paper I examine whether female executives face the same reward-risk tradeoff as their male colleagues in their annual compensation. Using Execucomp and Compustat data for the largest S&P's companies, I compare the pay-to-performance relationship between 1998 and 2008 for male and female executives who rank as the top five earners. I estimate the response of men's and women's pay to positive and negative changes in firm market value. Since female executives have a lower mean compensation than men, I take into account initial differences in executives' compensation by using a log-linear specification, expressing the coefficients in elasticities.

I find that the reward-risk calculus is indeed worse for women than for men in the top executive ranks. Female executives show a similar proportional increase to men in total compensation when firm market value increases, .21 versus .35 and not significantly different. However, women's total compensation is about twice as sensitive as men's to negative changes in firm value .25 versus .12, significant at 95%. The asymmetry is especially apparent in equity pay, where boards have the discretion to re-price existing equity or issue new equity to compensate for declines in the value of pre-committed options. These differences are robust to a variety of specifications, and sample periods, controlling for attrition and limiting the sample to firms with at least one female executive.

The results are inconsistent with women revealing stronger risk-aversion with respect to pay. Stronger risk aversion for women than men would be consistent with an overall weaker pay-to-performance response, which is not the case, and not with a stronger response to a downturn than upturn in performance, which is the case. I present an alternative explanation: boards have biases in attribution when they set performance pay. Boards make annual pay-to-performance decisions by accrediting changes in firm performance to individual executives on the management team and to situational factors, or "luck". The ways in which men's and women's pay responds to increases and decreases in firm's market value and to luck are suggestive of how boards assign credit and blame to the men and women on their executive team. Biases in attribution occur if one group systematically receives less credit or more blame than it deserves relative to the majority of employees.

A finding of relatively stronger pay sensitivity to decreases in firm value for women does not point solely to biases in attribution. Other explanations include: (1) the "thin tails" argument, where men are more likely than women to be in the high end of the talent distribution and thus more likely to have attractive pay incentives, or (2) the managerial power theory, where the top, well connected executives, who are more likely to be male, skim rents for themselves (Bebchuk, Fried and Walker, 2002). I present two pieces of evidence consistent with attribution bias and not with the "thin tails" or managerial power arguments. First, one would expect that those with the very highest ability or with the most managerial power would be the ones who earned more credit during increases in firm performance and less blame for decreases in firm performance. When I stratify the sample by rank, I find all five pay ranks show a greater sensitivity of women's pay to decreases in market value, so the asymmetry is not due to high ranked (and high ability or managerial power) men being compared to lower ranked women. Second, in the top rank where the differences in ability or managerial power should be most apparent, rank I, men and women have similar sensitivity to increases in market value, which is inconsistent with women having lower ability or less managerial power.

To further distinguish attribution bias from differences in ability and managerial power, I test whether men are rewarded more for "lucky" firm outcomes than women. I use instrumental variables to estimate the luck component of pay for men and women (Bertrand and Mullainathan, 2001). Using the Fama French industry classifications to calculate industry averages as proxies for "luck," I find executives overall are rewarded for luck, especially in bonuses, but women significantly less than men. Bonuses are the main component of pay not tied contractually to changing market prices and therefore not automatically changing with luck. The difference in men and women's response to luck resembles the difference in the response of their pay to overall firm performance, a .015 lower elasticity. In other words, boards attribute the same performance differential to men and women even when the determinants of their firms' performance have nothing to do with executives' effort or ability. Differences in managerial power between men and women are also ruled out insofar as the pay for luck sensitivity is no greater in the topmost income quantiles where the greatest market power would reside.

One limitation to this study is that there are so few women, especially women CEOs, in the sample. For instance, it is not possible to control for attrition over the entire sample: only two percent of female executives who are in the top five for at least one year remain in the sample for the entire eleven years. To address this, I control for attrition over subsets of the sample and estimate directly the relationship between attrition and the pay gap to ensure that attrition is not the source of changes in the pay gap.

An important implication of this paper is that since women's rewards are lower than men's in good times but their punishments greater to men's in bad times, women likely have less incentive than men to undertake risky projects. Women would also have an incentive to choose occupations associated with less risk, more objective measures of performance, and more explicit compensation packages, which, in fact, they do.

Section II presents the theoretical background of attribution bias in an agency framework. The data and stylized facts follow in Section III. Section IV presents the results of gender differences in pay asymmetry and pay for luck and a discussion of their robustness. Section V discusses the results by placing attribution bias in a broader context and Section VI concludes with a discussion of policy implications.

II. Theoretical Background

In the standard agency model, firm performance p is the result of the efforts of the executive team, $\sum_{j=1}^{N} a_j$, with N executives, each with actions a_j, and a vector of observable exogenous market factors l.

$$p = \sum_{j=1}^{N} a_j + \delta\, l + u \tag{1}$$

where δ is the contribution of l to firm performance and u is the unobserved random factor.

Boards, acting on behalf of their shareholders, set executive j's sharing rule s_j so as to incentivize an executive to maximize firm performance. Under certain assumptions about agents' preferences and production technology (Holmstrom and Milgrom, 1987), namely that executives have CARA preferences, which are absent wealth effects, and a production process in which they take small, frequent actions over time, represented as a constant drift in a Brownian process, the optimal sharing rule for an executive will be linear in firm performance net of exogenous factors that determine performance, or "luck" (Bertrand and Mullainathan, 2001). The linearity result also allows the optimal sharing rule to hold for multiple independent agents allocating effort to independent activities.

$$\sum_{j=1}^{N} s_j = \gamma + \beta(p - \delta\, l) = \sum_{j=1}^{N}(\gamma_j + \beta_j'(a_j + u_j)) \tag{2}$$

For an individual executive:

$$s_j = \gamma_j + \beta_j'(a_j + u_j) = \gamma_j + \beta_j(p - \delta\, l) \tag{3}$$

The coefficient γ_j represents the share of pay that is independent of firm performance. The coefficient β_j represents the pay sensitivity of executive j for observed performance of the firm.

Consider the sharing rules of two representative executives, i and o taking actions a_i and a_o.

With this simple incentive scheme in place, the standard agency model predicts that:

- If the risk aversion of executive i is less than the risk aversion of executive o, then all else equal, $\beta_i > \beta_o$.
- If the return on a_i is more than the return on a_o, then all else equal, $\beta_i > \beta_o$.

In other words, executives who have pay that is less sensitive to firm performance may have lower ability or higher risk aversion.

Consider how attribution bias might affect the standard agency model. Attribution bias occurs when people make cognitive mistakes in weighting the influence of an observed person's actions relative to exogenous factors when determining a performance outcome (Ross and Anderson, 2008). When a feature of the environment is "salient" or noticeable to the observer, it can take on undue prominence in attribution (Tversky and Kahneman, 1973). There is a tendency to exaggerate similarities of members within a group and differences of members outside a group. Especially salient are minorities or solo members on the outskirts of a group, and the negative events attributed to these minorities. (Krieger, 1995). Attribution bias manifests as stereotyping, or the tendency of observers to over-attribute successes to the actions of insiders and failures to the actions of outsiders (Allport, 1958; Bigelow and Maclean Parks, 2007; Brescoll, 2007). A documented behavioral characteristic of this type of discrimination is that it is more pronounced in bad times than in good: minority groups, often viewed as outsiders, tend to be targeted in economic downturns (Oster, 2004; Friedman, 2005; Miguel, 2005).

Stereotyping would distort the standard agency model in an identifiable way. Suppose that executive i is an insider and executive o is an outsider. Boards that stereotype would assign responsibility for increases and decreases in firm performance differently to insider executives, i, and outsider executives, o. Equation 3 can be re-expressed in terms of changes in firm performance from one year to the next[1]:

$$\Delta s_o = \Delta \tilde{\gamma}_o + \tilde{\beta}_o \Delta p - \tilde{\beta}_o \delta \Delta l \quad (4)$$

There is an equivalent expression for insiders.

I divide the change in firm performance into increases in performance and decreases in performance. Stereotyping skews the $\tilde{\beta}_o$ coefficient upward on decreasing firm performance and/or downward on increasing firm performance for outsider groups relative to insiders.

Prediction 1: If there is a stereotyping attribution bias, $\tilde{\beta}_{o-}/\tilde{\beta}_{o+} > \tilde{\beta}_{i-}/\tilde{\beta}_{i+}$, all else equal.

If an executive's pay has more downside risk for a given upside gain compared to another executive, it is inconsistent with her having lower risk aversion. Lower risk aversion would instead present as a lower pay-to-performance sensitivity for both increasing and decreasing firm values.

Observing differences in asymmetry of pay cannot rule out differences in ability or managerial power. If boards recognized that the highest ability executives provided both a greater contribution to increases in firm performance, and/or a smaller contribution to negative firm performance, greater negative shielding would reflect this. Executives with greater managerial power would be able to campaign for excessive increases in pay during increases in performance which would also lead to differences in pay asymmetry.

To distinguish between attribution biases and differences in ability or managerial power, I consider another manifestation of attribution bias: fundamental attribution error. Fundamental attribution error is the tendency of observers to overrate the more salient role of peoples' personal traits relative to the less salient role of situations in causing an event. Fundamental attribution error is most apparent when evaluating the actions of people who are role-advantaged such as insider groups (Weber, Camerer, Rottenstreich, and Knez, 2001; Ross and Anderson, 2008). Fundamental

[1] The introduction of a constant in the rate of change equation allows for the presence of time trends.

attribution error introduces "lucky" pay into the sharing rule, more so for executives considered to be insiders. Lucky pay-to-performance is analogous to boards unduly attributing the cause of an event to the individual executive's actions instead of the situation.

Prediction 2: Fundamental attribution error predicts that boards will reward insiders more for "lucky" firm performance than outsiders: $\beta_o \delta_o > \beta_i \delta_i$.

Differences in pay for luck sensitivity would not be related to differences in men's and women's ability: if pay for luck is proportionately greater for men than for women, then that portion of the pay gap would not be related to ability.

Differences in pay for luck between men and women might be related to differences in managerial power for men than women, inasmuch as male managers have more influence over boards to award them large pay packages. However, it is only the managers in the topmost income tiers that would have the power to co-opt boards. If differences in pay for luck sensitivity between men and women are not skewed towards the top income ranks, then the managerial power hypothesis does not explain the pay for luck differential.

In summary, observing the sensitivity of changes in pay to changes in firm performance during times of increasing and decreasing firm value allows us to make predictions about attribution biases. A group whose pay decreases relatively more in times of decreasing firm value for a given increase in pay during increasing firm value could be experiencing attribution bias by boards that punish outsider groups more harshly for poor firm performance. However, it could also be that the insider group is more likely to be in the highest ability tail or have more managerial power. Boards rewarding outsider groups less for "lucky" firm outcomes across all pay ranks does not point to boards efficiently incentivizing executives who have lower ability, or rewarding executives with greater managerial power.

III. DATA AND STYLIZED FACTS

Data

The data are selected from Standard and Poor's annual Execucomp database of the S&P 500, S&P MidCap 400 and S&P SmallCap 600 companies available from 1992 to 2008. Execucomp collects data from the company's SEC annual proxy filing DEF14A. The database has the benefit of a large sample size and level of detail in pay components. Since each component typically reflects different pay-setting practices (Murphy, 1999) disaggregating pay into the components helps to identify how corporate boards attribute performance to individual executives. The data form an unbalanced panel. The analysis focuses on the years 1998 to 2008, a time when both major downswings and upswings in market values occurred. I excluded 1992 to 1997 when the sample of female executives was exceedingly small and the sample of firms with female executives skewed towards smaller companies.[2]

I merge Execucomp with Compustat data. The sample of firms includes the S&P 1500 plus companies that are trading but have been removed from the index, an average of 1651 each year. I drop observations with missing data for total compensation (TDC1), executives with total compensation equal to zero, salary equal to zero, and negative values for any category of compensation. My estimation sample contains a total of 48,057 observations from 1998 to 2008. Twenty-four percent of executives work in firms with at least one woman who is a top-five executive. The companies with women have on average 1.2 women in the top five.

The raw S&P database includes the pay series for as many as the top nine executives. My sample includes the top five, the standard reporting for most companies. The top five are a good match to the executives most likely to have their pay set by boards of directors. Moreover, the top nine have a larger representation of women than the top five and average pay that is weighted more towards salary and less towards incentive pay, which would bias downward the pay-to-performance

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[2] In the 1998 to 2008 sample, female executives are not more likely than men to work in smaller companies (Yurtoglu and Zulehner, 2007).

sensitivities of women compared to men. The sample includes 23,759 unique male executives and 1,746 unique female executives or 7% of the total. After rising gradually from 4% in 1998 to 7% in 2004, the share has plateaued at 7% to 8% from 2004 to 2008.

The total compensation term (TDC1 in Execucomp)[3] captures the flow of new compensation. As such, it includes the new options granted each year and not the change in wealth that occurs with the changing value of options granted in previous years. Thus the impact of wealth effects on executives' incentives is not taken into account (Hall and Liebman, 1998). Men's share of equity pay is insignificantly different from women's share, and so it is reasonable to assume that capital gains or losses do not have a significantly differential effect on men's and women's pay incentives. There are two good reasons to use a flow concept to represent pay. First, the flows are more representative of the pay decisions made by the boards each year because they involve actual payments to executives. Second, stock options are not indexed to remove the influence of changes in overall market prices, and so stock prices would move automatically with luck. Including the wealth effect of stock options after they were granted would bias upward the estimate of pay for luck because it would include passive movements in the options that were unrelated to pay-to-performance decisions.

I flag executives by key occupations in which there is a significant overrepresentation of men or women compared to the average: CEOs, in which men are over-represented and Legal Counsels, Chief Financial Officers, and Human Resource Managers, in which women are overrepresented.

The concept of female attrition differs in Execucomp than what is usually understood. A person can enter the executive ranks of a firm through hiring or by moving up the pay ladder, and leave through voluntary exit, firing or moving down the pay ladder. Thus attrition captures the net number of women moving down the pay ladder and out of the top five ranks as well as the net number of women leaving the firm.

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[3] In the 1992 format TDC1 = Salary + Bonus + Other Annual + Total Value Restricted Stocks Granted + Total Value Stock Options Granted + Long Term Incentive Payouts + All Other total. In the 2006 format TDC1 = Salary + Bonus + Non-equity Incentive Plan Compensation + Grant Date Fair Value Stock Awards + Grant Date Fair Value of Option Awards + Deferred Compensation + Other Compensation

Standard and Poor's recalibrated the 1992 based compensation data in 2006, when the Financial Accounting Standards Board introduced FAS 123r "Share-Based Payments," a major change to accounting rules to make compensation disclosures more transparent.[4] Companies were required for the first time to report in their income statements the expenses incurred from employee stock options, when they were granted, and their fair market value. Standard and Poor's constructed entirely new compensation series available only from 2006 on and adjusted the 1992 based compensation series TDC1 to reflect the new disclosure rules. Before 2006 Execucomp had included explicitly in the 1992-based TDC1 series the fair value of stock options granted using the Black Scholes method, estimated from information in the proxy footnotes.[5] Thus the original TDC1 accounting resembles that for the new TDC1 series. There is evidence of changes in the compensation decisions after the rule change, however.

Pay setting practices

One of the principal tasks of boards of directors is to set pay for top executives. Boards do not typically determine pay packages at arm's length. They talk to their executives about their expectations and preferences regarding how, and how much, they are paid. They also rely on compensation consultants to benchmark their executives' pay to other executives pay in similar occupations and firms. As a result, boards might sometimes be in league with powerful managers to overpay them, as Bebchuk, Fried and Walker (2001) argue. Or they might be making good faith efforts to pay executive what they think they are worth (Holmstrom, 2005).

It is customary (Murphy, 1999; Bebchuk and Fried, 2003, Holmstrom, 2005) for executives to have formal multi-year contracts, which might stipulate salary levels, performance increases, and stock option and retirement plans. These components of pay differ systematically with respect to their sensitivity to changes in performance and the amount of discretion that boards have to override pay-

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[4] Before FAS 123r, companies had to record the expense only if the grant had intrinsic value (meaning the strike price was lower than the current market price) and so could avoid reporting the expense by setting the strike price equal to the current price and simply disclosing the fair value of the options in the footnotes of their proxy statements.
[5] Because stock options granted at fair value had already been included in the 1992-based TDC1, the 2006-based TDC1 resembles conceptually the 1992-based TDC1, as well as the new 2006 total compensation series TOTAL_ALT1. TOTAL_ALT1 is about 2% higher than TDC1 in 2006.

to-performance relationships. Attribution bias, if it were present, would manifest in the most discretionary pay components.

Salary makes up the fixed component of executive pay. Boards have the discretion to adjust salaries when performance is good but usually they calibrate salaries to benchmarks determined by general industry surveys, taking into account firm size (measured in terms of assets or sales) and sometimes factoring in information from within-industry surveys. The fixed nature of salaries and link to external benchmarks suggest that they should not respond significantly to increases and decreases in firm performance. Insofar as salary is tied to industry benchmarks, it should respond automatically and with a lag to the luck component of performance.

The bonus is typically linked to the current year's performance, measured as a rate of return for the firm. Individual executives typically receive a share of the bonus pool based on a performance ranking. Boards have leeway in deciding where individual executives fit in the ranking.

Equity pay consists of granted stock options and stock awards. Stock option contracts grant the executive the right to buy stock at a predetermined exercise price, once the options are vested. The contracts are typically multi-year commitments to granting a certain number of options at future dates.

To the extent that value of pre-committed options change from the time they were contracted to the time they were granted, stock options granted move automatically. To mitigate a decline in the value of options from the time they were contracted to the time they were granted, and a decline in existing options, boards engage in re-pricing (Hall, 1998). Boards also replace options that expire out of the money with new ones. In both cases, boards' decisions to mitigate the downward effects of a slump in firm performance create an asymmetric pay-to-performance response for equity pay, appearing as negative shielding. Also, managers typically are free to choose when to unwind their shares after vesting (Bebchuk and Fried, 2003). A profitable time would be just before bad news was announced to the public. A symmetric pay-to-performance relationship would arise if boards did not make these compensating adjustments. In fact, equity pay for the top five executives shows significant negative shielding.

Stylized facts

The average gender pay gap ranges from 20% to 30% between 1998 and 2008, with no apparent downward trend. The gap appears to widen when average market value of firms is decreasing. This is most apparent in the first year of declining firm value (Figure I).

Regression estimates of the gender pay gap for each of the income components show a wider gap for the pay-at-risk components - bonus (32%) and equity pay (35%) – than salary (18%). Three-fifths of the pay gap comes from the equity component because it makes up the largest share of pay – over 40% for both men and women (Table I). Women have a lower share of pay at risk than men, mainly because they have a significantly higher share of salary pay and a significantly lower share of bonus pay. The share of equity pay and other pay are not significantly different for men and women.

Even so, women's pay is as sensitive to performance as men's when controlling for the gender pay gap in the pay-to-performance specification. The pay-to-performance sensitivity when measured in rates of change shows no significant difference for men and women: 0.23 for both. Thus, women's pay-to-performance sensitivity relative to men's does not provide evidence of greater risk aversion or lower return on effort of women compared to men (Table AI).

Quantile regression estimates show that when controlling for executive positions, there is virtually no difference in the pay gap between the 10^{th} percentile and the 90^{th} percentile of executive pay. One would expect the executives working in the highest income quantiles to have the highest ability. The comparability of the pay gap at the highest income quantile and the lowest income quantile is not suggestive of an ability gap that widens in the very upper tails (Figure II).

In the top five pay ranks, 1,746 unique female executives (23,759 males) presided between 1998 and 2008, but only 28 female executives (891 males) have remained over the entire sample. Thus it is not possible to control for attrition over the entire sample (Table AII). I control for attrition over subsets of the sample while examining changes in the pay ranks to see if there is evidence that the appearance of attrition is more likely to be movements up and down the pay ladder. Both women's leave rates and join rates exceed those of men, but the ratio of leaving to joining is the same for men and women at 0.96. Total pay in the first and last years that executives were in the top five falls short of average pay for men and women both, suggestive that men and women tend to enter and leave the top pay ranks at the lower end (Table AIII). For a given rank, women are more likely than men to fall in rank. Thus it appears that some of the attrition on the part of women is really women being passed over or demoted to relatively lower paying jobs out of the top five (Table AIV).

The introduction of the FAS 123r appears to have coincided with changes in pay setting behavior. Welch T-statistics show a significant change total pay in each of the pay components between 1998-2005 and 2006-2008: a 7% decline overall and a shift away from bonuses and equity pay and towards the "other" component, which includes non-equity compensation, deferred compensation and other miscellaneous items. Accordingly, I introduce dummy variables for 2006 in my estimation, interacted with the pertinent independent variables in the regression estimation to factor out the effect of the FAS 123r regulation event (Table AV). To ensure that the results are robust after FAS 123r, I compare the results over the entire sample with those in the sample before and after FAS 123r came into effect.

IV. Results

Consider the log linear pay-to-performance specification in rates of change (Murphy, 1986; Hall and Liebman, 1998; Hallock, Madalozzo, and Reck, 2010).

$$\Delta \ln(pay)_{jt} = \beta_m (1-w) \Delta \ln(firm\ value)_t + \beta_w\, w\, \Delta \ln(firm\ value)_t + \gamma_j + \Delta\varepsilon_{jt} \qquad (5)$$

If male and female executives do not differ significantly in risk preferences, marginal cost of effort and the variance in performance, then $\beta_w = \beta_m$. If women have lower risk preferences or a higher marginal cost of effort then $\beta_w < \beta_m$. If stereotyping of women is true, then $\beta_{w-}/\beta_{w+} > \beta_{m-}/\beta_{m+}$.

The first-difference log-linear specification expresses the coefficients in elasticities, which is appropriate given the wide cross-sectional variation in incomes and constant, unmeasured differences in pay for men and women. The goal is to determine whether women's and men's pay show the same proportional response to increases and decreases in firm performance (Murphy, 1999; Hallock, Madalozzo and Reck, 2010). The sample includes only executives present for at least three years, which helps to control for attrition.

Regressions use as dependent variables the differenced logs of total compensation, cash pay or equity pay, to help identify the source of differences in pay-to-performance sensitivities. Cash pay consists of Salary and Bonus. Equity pay consists of Grant Date Fair Value Stock Awards, plus Grant Date Fair Value of Option Awards. The main performance variable is firm market value, defined in Execucomp as the close price for the year multiplied by the company's common shares outstanding. I include lagged assets and sales terms to control for firm size. All values are in $2004. A 2006 dummy variable interacted with the market value term controls for the change in SEC rules for reporting equity income. I include interactions between the firm variables and gender to control for the possibility that firms with women differ in kind from firms with men only, as well as interactions between gender and year dummies to account for trends in the gender pay gap. Regressions include year fixed effects and firm fixed effects. Standard errors are clustered at the firm level.

Table II reports estimates of the pay-to-performance sensitivities for men and women when performance is increasing or decreasing. Column (1) estimates that in the entire sample of firms, men's compensation presents significant negative shielding: a 1% increase in market value relates to a .36% increase in men's pay, while a 1% decrease in market value relates to a .12% decrease in men's pay. Men's pay-to-performance coefficients are significant at the 1% level and significantly different from each other at the 1% level.[6] Female executives do not receive negative shielding: their pay increases by .21% for a 1% increase in market value, and decreases by .25% for a 1% decrease in market value. Women's pay-to-performance coefficients are significant at the 1% level but not

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[6] Significance determined by 2-sided Welch t-tests.

significantly different from each other. When market value is increasing, women's pay-to-performance sensitivity is not significantly different from men's (.36 versus .21) at the 20% level. When market value is decreasing, women's pay sensitivity is twice that of men's (.25 and .12) and is significantly different at the 5% level. In other words, women and men show a similar response to upturns in performance, but women are penalized significantly more during downturns in performance.

The same pattern in pay-to-performance sensitivities appears when the sample includes only firms with at least one female executive, significant negative shielding for men but not for women, and much larger pay-to-performance coefficients for women than for men when performance worsens (Column 2). The differences between men's and women's pay-to-performance sensitivities are less significant because the estimates for men's pay-to-performance sensitivity are less precise when the sample of men is about one-quarter the size of the entire sample.

Column (3) runs the same regression as (1) but with cash pay as the dependent variable. Men's cash pay-to-performance sensitivity shows only mild negative shielding, significant at the 1% level. Women's cash pay also shows mild negative shielding, but not significantly different positive and negative sensitivity coefficients. The equality of pay-to-performance coefficients for men and women during increases or decreases in performance cannot be rejected at the 20% level.

Column (4) estimates the same regression using equity pay. Men's equity pay shows very pronounced negative shielding, with pay-to-performance coefficients .345 on the upside and .098 on the downside. The coefficients are significantly different at the 1% level. The sensitivity of women's equity pay-to-performance relationship is the reverse: equity pay responds very weakly to improvements in performance, .082 and not significant at the 20% level, but strongly to deteriorations, 0.237, significant at the 1% level. The difference in pay-to-performance coefficients for women and men when the market value declines, .237 versus .098, is significant at the 10% level. All regressions control for executive positions with different shares of equity pay than the mean: CEO, CFO, legal counsel and human resource managers.

In summary, men are rewarded with equity pay when performance improves but not punished when performance worsens. Boards seem to use their discretion either to issue new equity or re-price equity commitments to offset declines in the value of equity granted for men. Women, on the other hand, are awarded equity, but not necessarily when firm performance is improving. However, when firm performance deteriorates, boards do not appear to use their discretion to temper the decline in the value of options to be granted. The near symmetry in women's pay-to-performance relationship is suggestive of boards neglecting to make any adjustments to women's pay to temper the effect on the value of their equity when firm performance declines.

The results are consistent with attribution bias favoring male executives (Prediction 1). They are not consistent with differences in risk aversion since more risk averse women would not choose to accept both a similar increase in stock grants when market value increased and a larger decrease in stock grants when market value decreased. Risk averse female executives might trade off lower than average stock grants for higher than average salaries. But, as the stylized facts show, that is not the case. Women receive lower average salaries too.

There are alternative explanations for these findings. It could be that men are more likely to be in the top tails of performance and out-perform women in good and bad times. Or, the top male executives might have more managerial power, which they use to shield their pay from bad firm performance. When I compare the response of total compensation to positive and negative changes in a firm's market value by executive rank (Table III), I find that women in all ranks have stronger responses to negative changes in market value than men. Notably in the highest rank, women's pay is equally sensitive to positive changes in market value, but more sensitive to negative changes in market value, which is not consistent with the ability or managerial power hypotheses, but is consistent with the attribution bias hypothesis.

Column (5) in Table II tests whether the asymmetry in pay-to-performance between genders holds for the most recent downturn, by limiting the sample to 2007 and 2008. Men and women's pay show somewhat weaker responses both to positive and negative changes in market value than in the entire period (men's pay increases by 0.30% and decreases by 0.10% and women's pay increases by

0.24% and decreases by 0.18% for a 1% increase and 1% decrease in firm market value. It appears that both men and women have been shielded somewhat from the recent recession with a reduced pay-to-performance sensitivity.

Pay for Luck

To further distinguish the attribution bias hypothesis from the ability hypothesis, I estimate the differences in men and women's sensitivity to pay for luck. I employ a two-stage least squares methodology to estimate the impact of exogenous factors, or "luck" on pay (Bertrand and Mullainathan, 2001). I compare the coefficients on the pay for luck terms for all executives and those for women, to the mirror coefficients in a simple pay-to-performance estimation equation.

The exogenous factor used in the first stage is defined as the firm's mean industry market value excluding the firm's own market value and divided by the number of observations minus one. Each firm is assigned to an industry according to the Fama-French 48 industry classifications (French, 2010). The firm value of luck is obtained from the predictor of a regression of a firm performance variable on the exogenous factor and $\gamma_j t$, which represents firm fixed effects and other firm performance variables. I use firm market value and firm net income as the performance variables in the first stage regressions.

$$\ln(firm\ value\ luck)_t = predict\ (\omega + \delta \ln(exogenous\ factors)_t + \gamma_j t) \quad (6)$$

The total pay for luck coefficient β_L and women's differential coefficient β_{Lw} are estimated by separating the impact of the instrument for performance on total pay and women's pay, where w is a dummy variable equal to one when the executive is a woman:

$$\ln(pay)_{jt} = \alpha_j + \beta_L \ln(firm\ value\ luck)_{jt} + \beta_{Lw}\, w \ln(firm\ value\ luck)_{jt} + \gamma_j t + \varepsilon_{jt} \quad (7)$$

The pay-to-performance and pay for luck regressions include firm and time fixed effects, lagged assets and sales terms, a 2006 dummy interacted with market value to capture the 2006 change in the

SEC's FAS 123r rules for expensing equity and interactions between time fixed effects and gender to account for trends in the gender pay gap.

Separate regressions use as dependent variables total compensation and cash compensation, which is the sum of salary and bonus. If equity contracts are written in terms of the number of shares granted in the future, a good part of their value when granted will move in tandem with industry performance, and therefore with luck. The reason for the response of equity pay to lucky performance may come down to formulaic changes in prices and not subjective decisions by the board. Therefore it cannot be said that the sensitivity of equity pay to lucky performance is discretionary when it originates in non-indexed stocks. Board decisions to change cash pay, particularly bonuses, on the other hand, are more clearly identifiable as discretionary. If cash pay is sensitive to luck as well as equity pay, then a more compelling argument can be made that boards decide to pay executives for luck (Bertrand and Mullainathan, 2001).

Table IV presents the comparative estimates of pay for luck and pay-to-performance. Columns (1) and (2) estimate the sensitivities when the performance variable is market value. As Bertrand and Mullainathan found for CEOs, the top five executives are rewarded at least as generously for luck as they are for firm performance. The pay for luck sensitivity in the range of .3 to .4, which matches the results that Bertrand and Mullainathan obtained for all of their luck estimates: energy prices, exchange rates, and industry market value. The estimates are significant at the 1% level. The luck coefficient exceeds the performance coefficient (.397 versus .307) with significance at the 10% level.

Row (2) of Columns (1) and (2) estimate the differential sensitivities for women. The performance sensitivity coefficient for women, significant at the 1% level, skews downward by the same amount regardless of whether the performance term is firm performance or luck. This is to say that the differential in the pay-to-performance sensitivity presents even when it has nothing to do with differential risk aversion or ability. This is consistent with Prediction 2.

Columns (3) and (4) repeat the same exercise when the performance variable is net income and the compensation variable is cash pay. In this instance, the pay for luck sensitivity is about one-half the pay-to-performance sensitivity. However, the gender coefficients are significant, and not significantly different from the gender coefficients when market value is the performance variable. This is suggestive that much of the differential in pay for luck comes from cash pay. It cannot be ascribed to male executives benefitting more from mechanistic changes in equity pay.

Noteworthy is the symmetry in pay sensitivities to increasing and decreasing luck (Table AVI). The symmetry is consistent with pay for luck being for the most part contractual and thus moving in tandem with increases and decreases in market value. The bonus, which is the main component of pay for luck, is not contractual but nevertheless shows a symmetrical response because of the strong pay-to-performance sensitivity. The symmetry in pay for luck and the pay for luck gap is not consistent with stereotyping but may be consistent with fundamental attribution error. Experimental research has shown that people in role-advantaged positions are both rewarded and punished for luck (Weber et. al, 2001).

Another explanation for the differences in pay for luck for men and women might be that high-powered and well-connected executives, mainly CEOs, can skim lucky pay by co-opting their boards and that men are more effective at this than women. But quantile regressions show that pay for luck sensitivity, and the difference in sensitivity for men and women, are no greater for the highest income deciles than for the lower income deciles (Table AVII).

V. Discussion

Why do boards attribute blame to women during decreases in firm market value and less credit for "luck"? Attribution bias is absent intent and therefore not triggered by self-serving motivations such as prejudice, favoritism or opportunism. Rather, it occurs when observers take cognitive shortcuts to evaluate the actions of those they observe (Bertrand, Chugh and Mullainathan, 2005). When boards set pay for top executives, they follow a process that might be sensitive to these cognitive shortcuts. Boards often negotiate pay packages with senior executives rather than setting pay at arm's length according to objective financial measures. Often there is no yardstick to measure the impact of an individual executive's decisions or actions. Boards often rely on industry norms to identify common pay practices and social norms (Camerer and Malmendier, 2008) such as "leadership" and "charisma" (Khurana, 2002), "conflict resolution" and "ability to handle a crisis" (Bigelow and Maclean Parks, 2007, Brescoll, 2007) that determine individual executives' contributions. Boards listen to executives' stories about their contributions to firm's success, which may resonate more than the numbers that boards see in financial statements (Wong and Weiner, 1091; Bettman and Weitz, 1983). Boards meet infrequently and must attend to complex agendas in a short time frame, risking cognitive overload when evaluating executive performance. They have little day-to-day contact with the executives they are evaluating. Finally, boards have a high degree of discretion in setting pay, which could augment the effect of mistakes in attribution.

An abundance of psychological and business research has suggested the presence of stereotyping. For instance, the positive qualities that are considered to make a strong corporate leader – confidence, charisma and aggression (Khurana, 2002) – are often viewed negatively when women display them (Brescoll, 2007). The qualities that people tend to value in women such as mentoring and compassion are not considered as important for corporate success, even if they really are. This perception creates a "role incongruity" for women (Eagly, 2004) in which they are relatively less successful both when they act as the strong corporate leader and when they act the stereotypical; woman. When things aren't going well and boards look for reasons why, the difference in women's characteristics might become more salient.

Experimental evidence on stereotyping shows that even when subjects observe that men and women present equal credentials, women are perceived as having less ability. Business finance students were shown almost identical prospectuses and CEO biographies for a pretend initial public offering – almost identical, except one CEO was assigned the name Robert and the other Roberta. The finance students, who were well trained in reading a prospectus, were prepared to invest three times as much with the "Roberts" as they were with the "Robertas". They scored "Roberta" with less leadership experience and ability to handle a crisis and more likelihood to create conflict with her management teams (Bigelow and McLean Parks, 2005). Thus even when men and women present the same performance indicators, different abilities often are attributed to men and women.

In another experiment, female CEO candidates were ranked as the least competent and deserving of the lowest salary and male CEO candidates were ranked as the most competent when each expressed anger after losing a sales account through no fault of his or her own. Anger expressed by men was interpreted as righteous indignation, dominance and control, whereas anger expressed by women was interpreted as loss of emotional control (Brescoll, 2007).

In another experiment, subjects undertook a short term task in which there were no gender differences in performance. The brevity of the task and the lack of future interaction among subjects controlled for statistical and taste-based discrimination. Women were ranked as less competent, but the competency gap moderated when observers were given a chance to update their views. When the players were given the opportunity to make claims about their future performance, men began to boast about their performance. The boasts were believed, however, and the pay gap widened further (Reuben, Sapienza and Zingales, 2010).

Experiments have also suggested the presence of fundamental attribution bias. Weber et. al. (2001) studied subjects playing a coordination game in which small groups invariably succeeded in coordinating an efficient outcome and large groups invariably failed. Thus the size of the group was an exogenous factor determining the performance outcome. A randomly assigned "group leader" tasked to encourage his group to do their best to take an efficient action effectively had no influence on the outcome. Even so, leaders were credited for the efficient outcome when groups were small and succeeded in coordinating, and blamed when groups were large and failed in coordinating.

Stereotyping in the form of greater pay-to-performance symmetry for women and fundamental attribution error in the form of less pay for luck differ substantially from obvious forms of scapegoating. The greater pay-to-performance symmetry that women experience might actually align incentives better with the firm's best interest than the more pronounced negative shielding does for men. Boards might not be doing women any favors by not protecting them during downturns but they might be doing the firm a disservice by overly protecting male executives. Indeed, this is a central theme in an abundance of recent literature on the rise in executive compensation (Bebchuk and Grinstein, 2005).

VI. CONCLUSION

Is the risk worth the reward for top female executives? In dollar terms, the median male executive is paid marginally over twice as much as the median female executive when firm performance is improving and loses slightly more when performance is deteriorating (Figure III). If women were paid the same on average as men but faced the same reward-risk payoff as they do now, they would gain about three-fifths as much as men when firm performance was increasing and would lose over twice as much when firm performance was decreasing. Furthermore, women's pay responds less to "lucky" firm outcomes than men's pay, notably in bonus pay, comparable to their weaker response in bonus pay to overall performance. These results are consistent with attribution bias, not with women having higher risk aversion. Nor are they consistent with women having lower ability or men having greater managerial power.

One implication of misattribution bias that favors men is that men have more incentives to take on risk than women since men are punished less for their firm's poor performance. If this is the case, then the appropriate corporate policy response would be to rid men's compensation of negative shielding rather than introduce more negative shielding for women.

To correct attribution biases, novel policy approaches are in order. Because attribution biases are cognitive, employers may be unaware of them. Implicit Association Tests, which reliably identify implicit discrimination, could be adapted to employers' hiring and evaluation situations so that they become aware of their biases and have the incentive self-correct their behavior. Evaluation and performance tools could be developed to avoid the pitfalls of attribution bias: performance measures that are ambiguous and reflect social norms (such as "leadership"); cognitive overload of the employers; and lack of familiarity with employees' performance.

REFERENCES

Allport, G., 1954, *The nature of prejudice*, Reading, MA: Addison-Wesley.

Barber, Brad M. and Terrance Odean, 2001, Boys Will be Boys: Gender, Overconfidence, and Common Stock Investment, *Quarterly Journal of Economics,* February 2001, Vol. 116, No. 1, Pages 261-292: 261-292.

Barker, V.L., and P.W. Patterson, 1996, Top management team tenure and top manager causal attribution at declining firms attempting turnarounds, *Group and Organization Management*, 21(3), 304-36.

Bebchuk, Lucian Arye, Jesse M. Fried, and David I. Walker, 2002, Managerial power and rent extraction in the design of executive compensation, *University of Chicago Law Review* 69, 751-846.

Bebchuk Lucian, and Yaniv Grinstein, 2005, The growth of executive pay, *Oxford Review of Economic Policy*, 21(2), 283-303.

Bebchuk, Lucian Arye, and Assaf Hamdani, 2006, Federal corporate law: lessons from history, *Columbia Law Review 106*, 1793-1839.

Bell, Linda A., 2005, Women-led firms and the gender gap in top executive jobs, *IZA Discussion Paper No. 1689*.

Bertrand, Marianne, Dolly Chugh, and Sendhil Mullainathan, 2005, Implicit discrimination, *American Economic Review,* American Economic Association*,* 95(2), 94-98.

Bertrand, Marianne, and Kevin F. Hallock, 2001, The gender gap in top corporate jobs, *Industrial and Labor Relations Review*, 55(1), 3-21.

Bertrand, Marianne, and Sendhil Mullainathan, 2001, Are CEOs rewarded for luck? The ones without principals are, *The Quarterly Journal of Economics*, 116(3), 901-932.

Bettman, James R. and Barton A. Weitz, 1983, Attribution in the board room: causal reasoning in corporate annual reports, *Administrative Science Quarterly*, 28(2), 165-183.

Boeker, Warren, 1992, Power and Managerial Dismissal: Scapegoating at the top, *Administrative Science Quarterly*, 37(3), 400-421.

Bowles, Hannah Riley, Linda Babcock, and Lei Lai, 2007, Social incentives for gender differences in the propensity to initiate negotiations: sometimes it does hurt to ask, *Organizational Behavior and Human Decision Processes*, 103(1), 84-103.

Brescoll, Victoria, 2007, How to walk the tightrope of 'nice' and 'able': overcoming workplace challenges for female bosses, *Psychology of Women Quarterly,* 31(2), 217-218.

Camerer, Colin and Ulrike Malmendier, 2008, Behavioural economics of organizations, *Economics Institutions and Behavioural Economics,* Yrjö Jahnsson Foundation.

Cappelli, Peter and Monika Hamori, 2004, The path to the top: changes in the attributes and careers of corporate executives, 1980-2001, *NBER Working Paper No. W10507*.

Catalyst, 2005, Women 'take care,' men 'take charge:' stereotyping of U.S. business leaders exposed, October release.

Croson, Rachel, and Uri Gneezy. 2009. "Gender Differences in Preferences." *Journal of Economic Literature*, 47(2): 448–74.

Deaux, Kay, and Tim Emswiller, 1974, Explanations of successful performance on sex-linked tasks: what is skill for the male is luck for the female, *Journal of Personality and Social Psychology,* 29(1), 80-85.

Eagly, Alice H., 2003, Few women at the top: how role incongruity produces prejudice and the glass ceiling, in Daan van Knippenberg and Michael A. Hogg, Eds.: *Leadership and Power: Identity Processes in Groups and Organizations*. London: Sage Publications.

French, Kenneth R., 2010, *Details for 48 Industry Portfolios*, available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html

Friedman, Benjamin, 2005, *The moral consequences of economic growth*, Knopf.

Green, Donald P., Jack Glaser, and Andrew Rick, 1998, From lynching to gay bashing: the elusive connection between economic conditions and hate crime, *Journal of Personality and Social Psychology,* 75(1), 82-92.

Gumbel. Alexander, 2006, Managerial Power and Executive Pay, *Oxford Journal of Legal Studies*, 26(1), 219-233.

Hall, Brian J., 1998, The pay-to-performance incentives of executive stock options, *NBER Working Paper*, No. 6674.

Hall, Brian J., and Jeffrey B. Liebman, 1998, Are CEOs really paid like bureaucrats? *The Quarterly Journal of Economics* 113(3), 653-691.

Hallock, Kevin F., Regina Madalozzo and Clayton G. Reck, 2010, CEO pay-for-performance heterogeneity using quantile regression, *The Financial Review* 45(2010), 1-19.

Heider, Fritz, 1958, *The Psychology of Interpersonal Relations*, New York: Wiley.

Heywood, John S. and Daniel Parent, 2009, Performance pay and the white-black wage gap, (CRI 2010-017). Retrieved October 20 from Cornell University, ILR School, Compensation Research Initiative site: http://digitalcommons.ilr.cornell.edu/cri/17

Hewlett, Sylvia Anne, and Carolyn Buck Luce, 2005, Off-ramps and on-ramps: keeping talented women on the road to success, *Harvard Business Review*, 83(3), 43-58.

Holmstrom, Bengt, 2005, "*Pay without Performance* and the Managerial Power Hypothesis: A Comment," 30 *Journal of Corporation Law* 703-713

Holmstrom, Bengt and Paul Milgrom, 1987, Aggregation and linearity in the provision of intertemporal incentives, *Econometrica,* 55(2), 303-328.

Khurana, Rakesh, 2002, Crowning Napoleon: the making of the charismatic candidate, *Harvard Business School Working Knowledge* http://hbswk.hbs.edu/item/3095/html.

Kluegel, James R. and Eliot R. Smith (1986) *Beliefs about inequality*. New York: Aldine de Gruyter.

Malmendier, Ulrike, and Geoffrey A. Tate, 2005, CEO overconfidence and corporate investment, *Journal of Finance*, 60(6), 2661-2700.

Miguel, Edward, 2005, Poverty and witch killing, *Review of Economic Studies*, 72(4), 1153-1172.

Miller, D.T, and M. Ross, 1975, Self-serving biases in the attribution of causality: fact or fiction? *Psychological Bulletin*, 82, 213-225.

Monks, Robert A.G., and Nell Minow, 2006. *Corporate Governance: Third Edition.* Blackwell Publishing, Malden, MA.

Murphy, Kevin J., 1998, Executive compensation, Available at SSRN: http://ssrn.com/abstract=163914 or DOI: 10.2139/ssrn.163914

Niederle, Muriel and Lise Vesterlund , 2007, "Do Women Shy Away from Competition? Do Men Compete Too Much?" Quarterly Journal of Economics August 2007, Vol. 122, No. 3, Pages 1067-1101: 1067-1101.

Oster, Emily F., 2004, Witchcraft, weather and economic growth in Renaissance Europe, *Journal of Economic Perspectives*, Available at SSRN: http://ssrn.com/abstract=522403

Pettigrew, Thomas F., 1998, Reaction toward the new minorities of Western Europe, *Annual Review of Sociology*, 24, 77-103.

Ross, L., 1977, The intuitive psychologist and his shortcomings: distortions in the attribution process, in L. Berkowitz (Ed.): *Advances in Experimental Social Psychology*, *10*, 173-220. New York: Academic Press.

Weber, Roberto, Colin F. Camerer, Yuval Rottenstreich, and Marc Knez. 2001. "The Illusion of Leadership: Misattributions of Cause in Coordination Games." Organizational Science, 12, 582-98.

Wong, Paul T.P. and Bernard Weiner, 1981, When people ask 'why' questions, and the heuristics of attributional search, *Journal of Personality and Social Psychology*, 40, 650-663.

Yurtoglu, B. Burcin and Christine Zulehner, 2007, The gender wage gap in top corporate jobs is still there, *Vienna Economics Papers*, 0701.

TABLES

Table I
The Gender Pay Gap for Top Five Executives
In S&P 1500 firms, 1998-2008

Compensation component	Mean Pay					Pay gap
	Men	Women	T-statistic (p-value)	Difference	% of gap	
Total pay	2783	1934	15.3	849	100	-.267
	(25)	(50)	(.000)	(55)		(.019)
Salary	435	364	23.0	71	8.4	-.182
	(1)	(3)	(.000)	(3)		(.013)
Bonus	385	233	18.4	152	17.9	-.324
	(4)	(7)	(.000)	(8)		(.028)
Equity pay	1499	1015	11.4	516	60.8	-.352
	(21)	(41)	(.000)	(46)		(.028)
All other	421	308	5.4	113	13.3	-.223
	(10)	(18)	(.000)	(21)		(.049)

Notes: 2004$ thousands; equity pay comprised of stock and option grants; all other compensation. Standard errors in reported parentheses. T-statistic testing difference in means, Welch, % gap determined by regressing the natural log of compensation on a female dummy.

TABLE II

Pay-to-performance Sensitivities for Good and Bad Firm Performance

Top 5 executives in S&P 1500 firms, 1998-2008

Dependent variable: $\ln(pay_t/pay_{t-1})$

		(1)	(2)	(3)	(4)	(5)
Dependent variable:		Total pay	Total pay	Cash pay	Equity pay	Total pay 2007-2008
Positive returns in firm value	Male	.357	.285	.237	.345	.298
		(.043)***	(.095)***	(.020)***	(.065)***	(.142)**
	Female	.213	.214	.263	.082	.240
		(.107)**	(.112)*	(.044)***	(.215)	(.312)
Negative returns in firm value	Male	.121	.139	.156	.098	.095
		(.039)***	(.065)**	(.019)***	(.050)**	(.056)*
	Female	.253	.253	.202	.237	.184
		(.062)***	(.069)***	(.045)***	(.072)***	(.079)**
Only firms with female executives		No	Yes	No	No	No
Observations		34296	8114	34296	26225	6599
Adj. R-squared		.037	.060	.117	.056	.159

Notes: Positive and negative returns in firm value = $\ln(mktval_t/mktval_{t-1})$. Market value, assets, sales and compensation are in $2004 thousands. All regressions include firm fixed effects, year dummies, lagged firm variables including market value, assets and number of employees and interactions between female and firm variables and female and year dummies. Standard errors are clustered at the firm level reported in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

TABLE III
Pay-to-performance Sensitivities for Good and Bad Firm Performance by Rank
Top 5 executives in S&P 1500 firms, 1998-2008

Dependent variable: $\ln(\text{total pay}_t/\text{total pay}_{t-1})$

		(1)	(2)	(3)	(4)	(5)
Rank:		I	II	III	IV	V
Positive returns in firm value	Male	.378	.330	.379	.381	.392
		(.067)***	(.059)***	(.061)***	(.058)***	(.103)***
	Female	.400	.129	.472	.234	.025
		(.410)	(.216)	(.211)**	(.315)	(.293)
Negative returns in firm value	Male	.091	.060	.166	.084	.186
		(.053)*	(.046)	(.056)**	(.061)	(.084)**
	Female	.207	.087	.238	.091	.352
		(.148)	(.190)	(.135)*	(.179)	(.150)**
Observations		9132	8010	7222	5833	4099
Adjusted R-squared		.027	.022	.009	.012	.009

Notes: Rank designates the relative pay position within the firm. Rank=I indicates the highest paid executive in the firm, Rank=V indicates the 5th highest paid executives. Positive and negative changes in market value = $\ln(\text{mktval}_t/\text{mktval}_{t-1})$. Market value, assets, sales and compensation are in $2004 thousands. All regressions include firm fixed effects, year dummies, lagged firm variables including market value, assets and number of employees and interactions between female and firm variables and female and year dummies. Standard errors are clustered at the firm level reported in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

TABLE IV
Gender Differences in Pay for Luck
Top 5 executives in S&P 1500, 1998-2008
Luck measure is mean industry performance

Dependent variable:	ln(total pay)		ln(cash pay)	
	(1)	(2)	(3)	(4)
Specification:	Luck	General	Luck	General
ln(market value)	.397	.307	-	-
	(.050)***	(.015)***		
ln(market value)*female	-.015	-.015	-	-
	(.002)***	(.002)***		
ln(income)	-	-	.043	.102
			(.014)***	(.007)***
ln(income)*female	-	-	-.016	-.019
			(.003)***	(.003)***
Firm fixed effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	47187	48170	45250	42791
Adjusted R^2	.71	.72	.67	.67

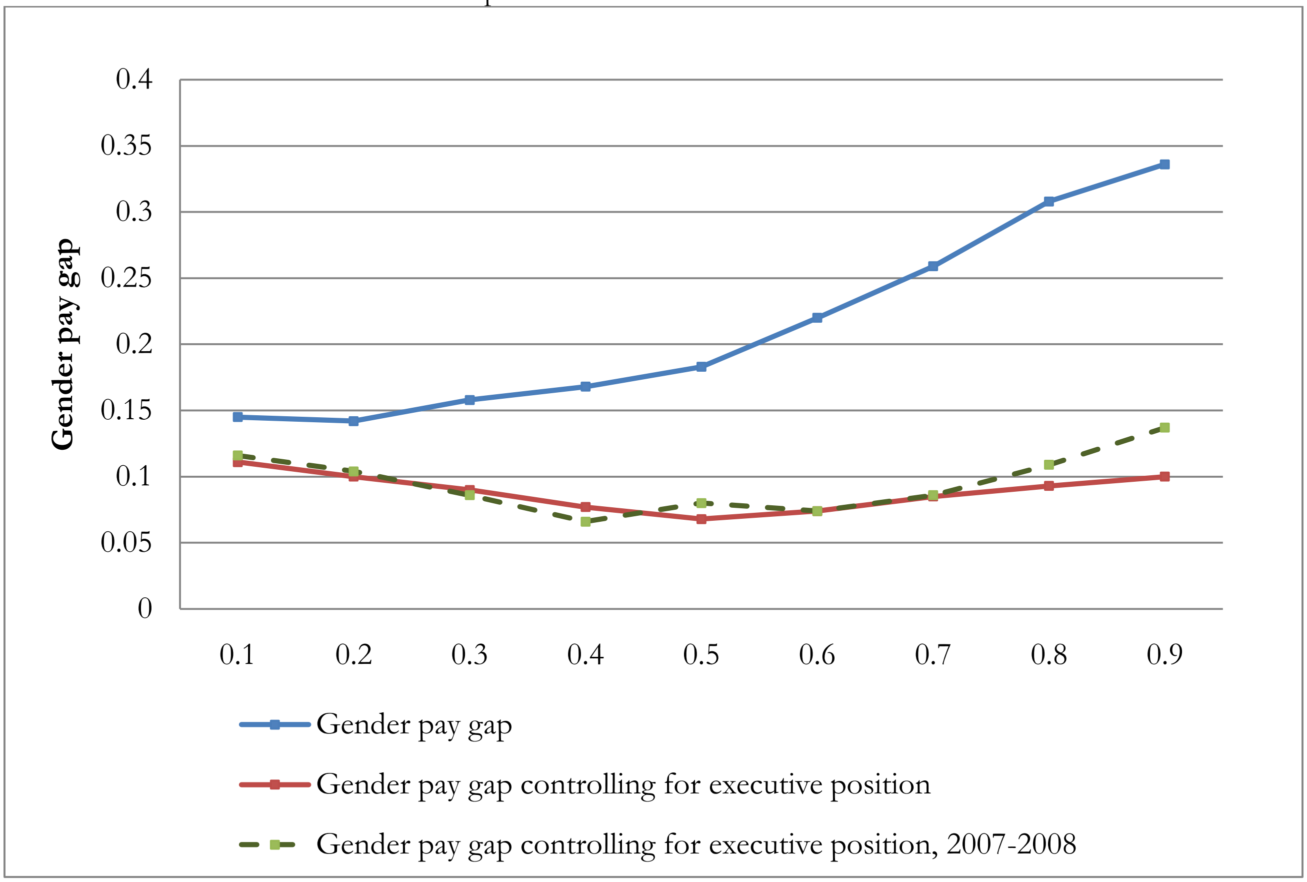
Notes: All regressions include lagged assets and sales, and executive positions including CEO, Legal Counsel and CFO,, and a dummy for 2006 interacted with market value to capture the 2006 change in the SEC's FAS 123r rules for expensing equity. Two-stage least squares methodology to estimate the impact of firm performance (market value, income) predicted from industry mean performance, on executive pay. Standard errors are clustered at the industry level for luck regressions, at the firm level for general regressions. *significant at 10%; **significant at 5%; ***significant at 1%

FIGURES

FIGURE I
The Gender Pay Gap, 1998-2008
Top 5 executives in S&P firms

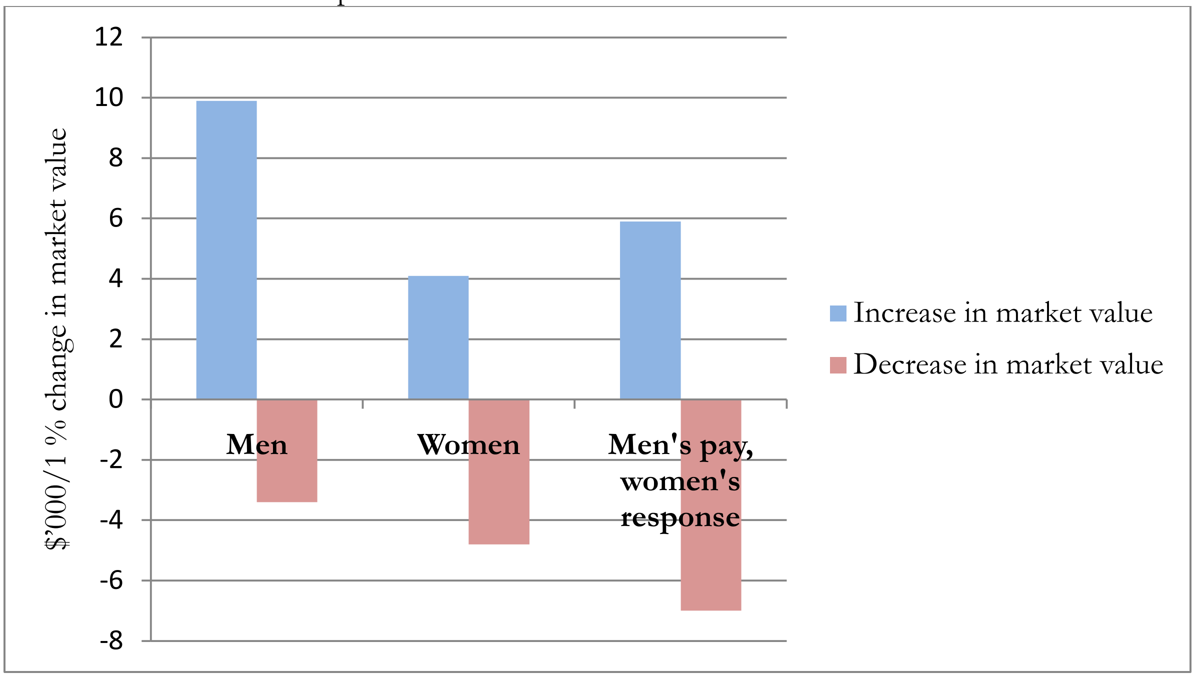
Notes: % gap determined by regressing the natural log of compensation on a female dummy. Average market value of firms with at least one female executive in the sample, in 2004$ millions.

FIGURE II
The Gender Pay Gap by Quantile, 1998-2008
Top 5 executives in S&P firms



Notes: Quantile regressions include firm variables including lagged market value, assets and sales. Executive positions including CEO, CFO and Legal Counsel.

FIGURE III
Pay-to-performance sensitivities scaled by executive pay, 1998-2008
Top 5 Executives in S&P 1500 firms



Notes: Mean compensation for men and women taken from Table I. Pay-to-performance sensitivities taken from Table II.

APPENDIX A: DATA AND SUMMARY STATISTICS

TABLE AI
Pay-to-performance sensitivities
In S&P 1500 public firms, 1998-2008

Dependent variable:	(1) ln(pay)	(2) ln(pay)	(3) ln(pay)	(4) ln(pay/l.pay)	(5) ln(pay/l.pay)
ln(market value)	.310 (.015)***	.308 (.015)***	.308 (.015)***	-	-
Female*ln(market value)	-.038 (.003)***	-.016 (.002)***	-.012 (.010)	-	-
ln(market value/l..market value)	-	-		.231 (.017)***	.231 (.018)***
Female* ln(market value/l..market value)	-	-		-.002 (.031)	.003 (.037)
Executive position	No	Yes	Yes	Yes	Yes
Female*year dummies	No	No	Yes	No	Yes
Constant	4.548 (.215)***	4.440 (.244)***	4.442 (.245)***	.716 (.135)***	.712 (.135)***
Adjusted R^2	.588	.718	.718	.039	.039
Observations	48057	48057	48057	47707	47707

Notes**:** Changes in market value = $\ln(mktval_t/mktval_{t-1})$. Pay is total compensation (TDC1). Market value, assets, sales and compensation are in $2004 thousands. All regressions include firm fixed effects, year dummies, lagged firm variables including sales and assets. Standard errors, reported in parentheses, are clustered at the firm level.

Table AII
Top 5 Executives in S&P 1500 public firms, 1998-2008
Number of years in the sample

	Men		Women	
Number of years in sample	# of executives (% of male sample)	Mean total pay (std. dev)	# of executives (% female sample)	Mean total pay (std. dev)
≥1	23,759 (100%)	2,782.8 (7,381.1)	1,746 (100%)	1,934.7 (3,631.8)
≥2	18,066 (76%)	2,835.7 (7,512.3)	1,212 (69%)	1,967.0 (3,708.3)
≥3	12,324 (52%)	2,906.4 (7,431.2)	823 (47%)	2,009.9 (3,768.9)
≥4	9,188 (39%)	3,005.0 (7,090.6)	532 (30%)	2,085.1 (3,989.1)
≥5	7,166 (30%)	3,066.1 (7,280.9)	384 (22%)	2,059.4 (3,744.1)
≥6	5,472 (23%)	3,104.8 (7,159.3)	271 (16%)	2,155.9 (4,095.3)
≥7	4,028 (17%)	3,222.8 (7,113.6)	180 (10%)	2,176.1 (4,147.9)
≥8	2,777 (12%)	3,391.7 (7,714.1)	107 (6%)	2,058.1 (2,751.7)
≥9	1,966 (8%)	3,567.9 (8,159.5)	67 (4%)	2,124.4 (2,758.7)
≥10	1,365 (6%)	3,683.1 (8,659.1)	48 (3%)	2,171.9 (2,889.2)
=11	891 (4%)	3,705.4 (6,593.5)	28 (2%)	1,994.7 (2,622.3)

Notes: 2004$; change in total compensation=ln(tdc1/l.tdc1); change in market value=ln(market value/l.market value). Standard errors, reported in parentheses, are clustered at the firm level.

TABLE AIII
Gender and Attrition
Top 5 Executives in S&P 1500 public firms, 1998-2008

Mean	Men	Women	T-statistic
Years in sample	3.372	2.927	14.7
Leave rate per year	.281	.339	8.7
Join rate per year	.270	.324	8.2
Total pay	2782.8	1935.0	15.3
Total pay in last year in sample	2484.2	1804.2	8.2
Total pay in first year in sample	2464.7	1840.8	5.2

Notes: Compensation in 2004$. Leave rates include executives who leave the firm and executives who drop out of the top five ranks. Join rates include executives who join the firm and executives who graduate into the top five ranks. Welch t-test on the equality of means.

TABLE AIV
Gender Differences in change in rank
Top 5 Executives in S&P 1500 public firms, 1998-2008

Dependent variable: Change in executive rank (last year's rank-today's rank)

	(1)	(2)
Female	.054	-.073
	(.023)**	(.029)***
Previous year's rank	-	.477
	-	(.007)***
Market value	-.026	-.025
	(.014)	(.012)**
Executive position	Yes	Yes
Firm fixed effects	Yes	Yes
Year dummies	Yes	Yes
Firm variables	Yes	Yes
Constant	-.031	-1.350
	(.177)	(.163)***
Observations	38456	38456
Adj. R-squared	.015	.234

Note**s:** Top five ranks, where rank 1 is the highest paid executive. An upward movement in rank is a positive value and a downward movement in rank is a negative value. Regressions include firm fixed effects, year dummies, and firm performance variables including lagged market value, assets, and number of employees. Standard errors are clustered at the firm level reported in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

TABLE AV

Executive Compensation and its Components

Top 5 Executives in S&P 1500 public firms, 1998-2005, 2006-2008

Annual compensation component	Mean pay			Proportion of total pay	
	1998-2005	2006-2008	T-statistic	1998-2005	2006-2008
Total pay	2783.0 (30.8)	2602.6 (27.6)	4.4	-	-
Salary	429.8 (1.1)	423.6 (1.8)	2.3	.154	.163
Bonus	452.1 (4.8)	174.7 (6.6)	34.0	.162	..067
Equity pay	1631.4 (26.6)	1180.0 (15.7)	14.6	.586	.453
All other	269.8 (11.0)	837.7 (18.9)	26.0	.097	.322

Notes: 2004$ thousands; equity pay comprised of stock and option grants; all other compensation includes non-equity incentive compensation, deferred compensation and other compensation. Standard deviation in parentheses. Welch T -statistic testing difference in means.

TABLE AVI
Gender Differences in Pay for Luck
Luck Measure is Mean Industry Performance
Top 5 executives in S&P 1500, 1998-2008

Dependent variable:		ln(total pay)	
Specification:		Luck	General
Positive returns in firm value	ln(market value)	.351	.309
		(.037)***	(.015)***
	ln(market value)*female	-.013	-.014
		(.003)***	(.003)***
Negative returns in firm value	ln(market value)	.341	.309
		(.037)	(.016)
	ln(market value)*female	-.017	-.017
		(.003)***	(.003)***
	Constant	2.848	4.461
		(.418)***	(.225)***
	Observations	48170	48170
	Adjusted R^2	.71	.72

Notes: All regressions include firm fixed effects, year dummies firm variables including lagged assets and sales, and executive positions including CEO and CFO. Standard errors are clustered at the industry level for luck regressions, at the firm level for general regressions. *significant at 10%; **significant at 5%; ***significant at 1%

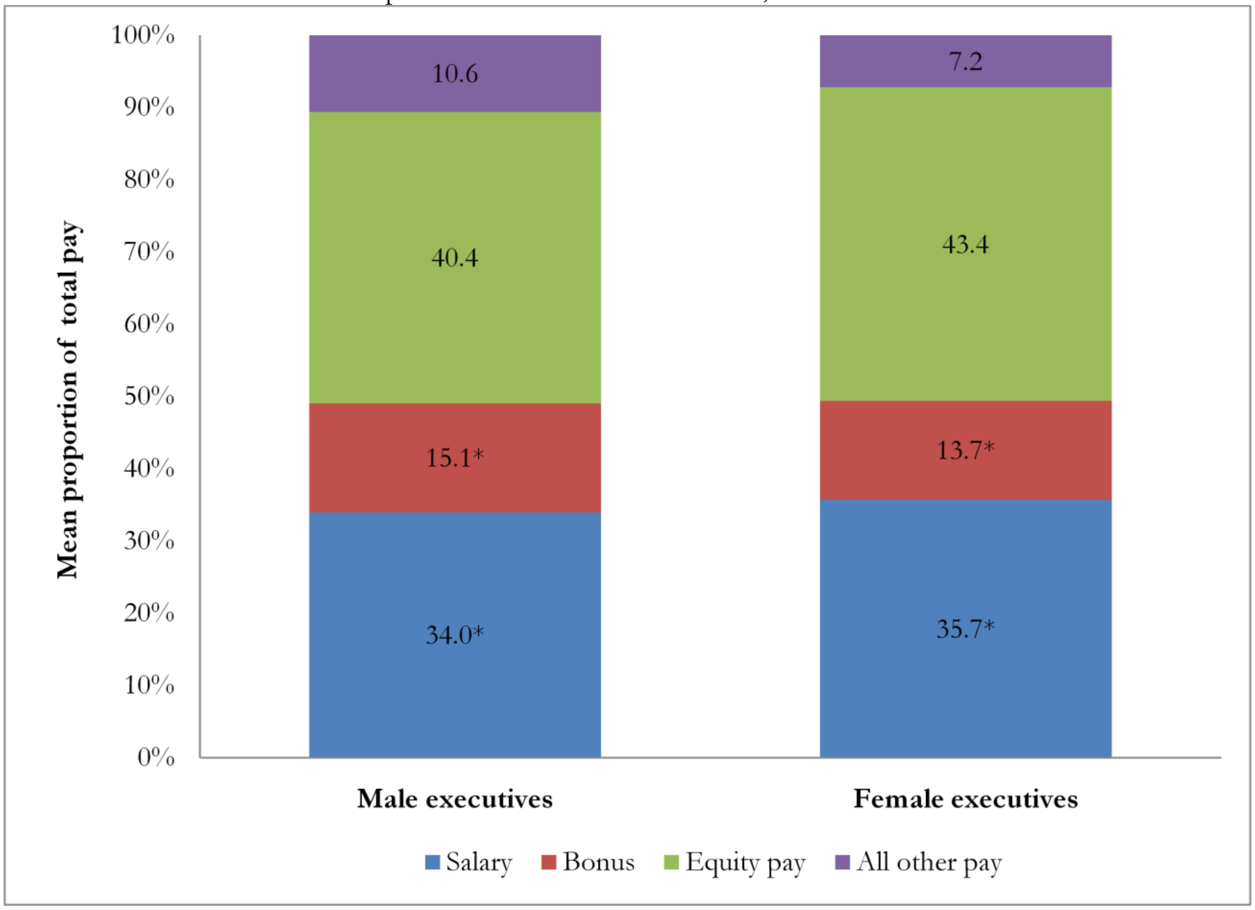
Table AVII
Pay-to-performance quantile regressions

Dependent variable: ln(total pay)

Quantile		1998-2008 (1) Luck	1998-2008 (2) General
0.1	ln(market value)	.123	.205
		(.009)	(.005)
	Female*ln(market value)	-.012	-.012
		(.002)	(.002)
0.2	ln(market value)	.161	.258
		(.007)	(.004)
	Female*ln(market value)	-.012	-.010
		(.002)	(.002)
0.3	ln(market value)	.176	.277
		(.006)	(.003)
	Female*ln(market value)	-.013	-.010
		(.002)	(.001)
0.4	ln(market value)	.183	.289
		(.006)	(.004)
	Female*ln(market value)	-.010	-.008
		(.002)	(.001)
0.5	ln(market value)	.193	.292
		(.005)	(.003)
	Female*ln(market value)	-.010	-.008
		(.002)	(.001)
0.6	ln(market value)	.189	.295
		(.007)	(.004)
	Female*ln(market value)	-.009	-.009
		(.002)	(.001)
0.7	ln(market value)	.186	.299
		(.008)	(.004)
	Female*ln(market value)	-.009	-.010
		(.002)	(.001)
0.8	ln(market value)	.167	.302
		(.010)	(.005)
	Female*ln(market value)	-.010	-.012
		(.002)	(.002)
0.9	ln(market value)	.158	.302
		(.016)	(.005)
	Female*ln(market value)	-.011	-.012
		(.005)	(.002)
Observations		90870	90870

Notes: Quantile regressions include lagged market value, assets and sales, controlling for executive position. Standard errors reported in parentheses.

FIGURE AI
Mean Pay Composition, By Gender
Top 5 executives in S&P 1500 firms, 1998-2008



Notes: Mean proportion of total pay (TDC1). Total pay includes salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total (TDC1 in Execucomp). Equity pay includes annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes) * indicates male and female means are significantly (at 99% level) different, using Welch t-statistic testing difference in means.