

BOARD INDEPENDENCE AND THE GENDER PAY GAP FOR TOP EXECUTIVES

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October, 2010

Abstract

Since the early 1990s, a 25%-45% gender pay gap has persisted for the top five executives in U.S. publicly traded companies. I present a novel empirical approach to determine the relative importance of two possible explanations for the gender pay gap: taste-based discrimination, and mistake-based discrimination. I use the 2003 SEC regulation event that required boards to become more independent and disallowed insiders to serve on the compensation committee to distinguish between these two possible causes of discrimination. Independent board members do not work alongside executives and so would be less inclined than insiders to indulge in taste-based discrimination. Independent board members, on the other hand, have less information about executives' performance and are thus more likely to rely on their prior, potentially biased beliefs about women's performance when they set pay. I find that the gender pay gap became *19% larger* in firms that were required to convert to more independent boards compared to firms that were not, which is not consistent with taste-based discrimination. An increase in the pay gap is consistent with downward-biased beliefs about women's performance, but also with reverse taste-based discrimination. I distinguish between these two hypotheses by examining whether the increase in the pay gap is persistent and uniform across positions. I find the increase in the pay gap reverted as independent board members had time to learn about individual performance. And, the gap did not widen in occupations where accreditation provided an easy-to-interpret signal of ability. These results are consistent with board members having downward-biased beliefs about women's performance and making systematic mistakes when setting compensation.

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I would like to thank Ulrike Malmendier, Stefano DellaVigna, Terrance Odean, Kevin Hallock, Marianne Bertrand, Enrico Moretti, Bryan Graham and Emmanuel Saez for their very helpful comments and suggestions. This paper has benefited from the feedback from participants at Berkeley's Psychology and Economics and Labor Lunches, and the Universities' Research Conference held by the National Bureau of Economic Research.

I gratefully acknowledge financial support from the *Berkeley Center for Equitable Growth*.

I. INTRODUCTION

The gender gap has been a persistent feature of executive compensation, ranging between 25% and 45%¹ since the early 1990s for the top five executives in U.S. publicly traded companies. The cause of the gap has been difficult to pinpoint. Studies have identified observable differences in the characteristics of executives that can proximately explain some of the gender pay gap, such as the rare occurrence of women CEOs (Bertrand and Hallock, 2001; Bell, 2005; Yurtoglu and Zulehner, 2007). Still, observable characteristics of executives do not go very far to explain the underlying causes of the gender pay gap.

I use an original empirical approach to investigate the underlying causes of the gender pay gap. I focus on the characteristics of compensation setters - members of the board of directors - to test the relative importance of two explanations of the pay gap on the employer side: (1) gender taste-based discrimination, which is a preference for working in all-male groups, and (2) biased beliefs about women's performance, which are systematic mistakes in estimating women's performance in the face of incomplete information. Boards of directors have two types of compensation setters: independent board members, who are neither employed by nor have business ties with the company, and insiders, who are typically executives who sit on the board. Independents should be less willing than insiders to allow a preference to work in all-male groups to influence their compensation decisions because they do not work alongside the executives whose pay they set, and so they would be less likely to let their tastes interfere with their obligation to obtain a competitive return for shareholders. Thus increased board independence should reduce a pay gap stemming from taste-based discrimination. However, independent board members do not have as much information available to them as insiders do and so may rely on their potentially biased beliefs about women's performance to set pay. Thus increased board independence would increase a pay gap stemming from downward-biased beliefs about women's performance. To distinguish empirically between these two types discrimination, I exploit a regulation event, the 2003 SEC rules, which

¹Based on Total Compensation (TDC1 from the Execucomp database) of the top five executives in Standard and Poor's (S&P) LargeCap 500, MidCap 400 and SmallCap 600 companies, or the S&P 1500, 1992-2005. The S&P 1500 cover about 85% of the U.S. equities market.

required corporate boards to become more independent and disallowed insiders to serve on the compensation committee.

I develop a simple dynamic model with empirical predictions to distinguish between mistake-based discrimination (biased beliefs) and preference-based discrimination (taste-based or reverse taste-based discrimination). The model has features of employer learning to capture the relationship between biased beliefs about women's performance and the gender pay gap (Altonji and Pierret, 2001; Ichino and Moretti, 2006). A Becker-type wedge (1971) between performance and pay captures the effect of taste-based discrimination. The model predicts that if a newly independent board corrects for taste-based or reverse discrimination, the gender pay gap will show a constant decrease or increase over time and a uniform decrease or increase across occupations. In contrast, if newly independent boards have downward-biased beliefs about women's performance, the gender pay gap will initially become larger and then revert to previous levels as newly independent boards learn more about individual performance. Also, when executives possess additional signals of ability, for instance accreditation, newly independent boards will rely less on potentially biased beliefs about women's performance and the initial increase in the pay gap will be less pronounced than for non-accredited executives.

I build a panel of annual data merged from the Execucomp database and the RiskMetrics database over the sample range 1998 to 2005. The Execucomp data consist of the universe of firms in the S&P 1500 and their top five (most highly paid) executives. The RiskMetrics database contains the information about members of the boards of directors that I use to construct a measure of board independence consistent with the policy event.

I test the effect of board independence on the gender gap in executive compensation by using the introduction of the 2003 NYSE/NASD Corporate Governance Listing Standards as the event that changes board independence.² This regulation required boards to have a majority of independent directors, and entirely independent nominating, compensation and audit committees. The control group consists of firms that had already complied with the regulation in 2002, and the treatment

²Wintoki, 2007 and Chhaochharia and Grinstein, 2008 used this event to test its impact on CEO pay and firm performance.

group consists of firms that did not comply with the required degree of board independence in 2002 but subsequently complied in 2003 or 2004. The event window spans 2002, before the event, and 2004, after the event, when most firms were required to comply. Using a difference-in-difference-in-differences research design, I compare the pay of men and women executives in the treatment and control firms, before and after the event.

This research methodology has some caveats. The firms in the control and treatment groups are not assigned randomly, which may result in systematic differences between the groups and confound the interpretation of the results. I confirm that the characteristics of the firms, executives and boards in the comparison groups are not significantly different across a wide array of observable characteristics (for instance, market value, number of female top executives in firms, and gender composition of the board). Also, the difference-in-difference-in-differences specification isolates the change in the pay gap between control and treatment firms so any systematic differences between comparison firms is a concern only if it affects men's and women's compensation differently.

I find the gender pay gap became 19% larger in firms that converted to more independent boards compared to firms that did not. This finding is not consistent with independent boards driving out gender taste-based discrimination. I consider two alternative explanations: (1) the widening gap is consistent with downward-biased beliefs about women's performance in the face of incomplete information, and (2) the widening gap is consistent with the new boards correcting for reverse taste-based discrimination. I test these hypotheses by estimating whether the increase in the gender pay gap reverts over time, and whether the increase in the pay gap is less pronounced in occupations that require credentials. I find the increase in the gender pay gap does revert in the years following the event and the pay gap does not widen at the time of the event in the Chief Financial Officer and Legal Counsel occupations, both of which require accreditation. These results comport with a model of employer learning with biased prior beliefs.

The results complement psychological and economic research showing that when assessing the ability of female senior executives, boards are informed by a smaller and shorter sample for women than for men, a pronounced and recent change in skills and labor force attachment for women,

more heterogeneous and ambiguous performance measures for women than men, and the tendency to attribute inferior performance more to women than men in downturns.³ Thus, if boards look to gender as a signal of ability, their prior beliefs, which are evolving in the face of changing and uncertain information, might lead them initially to pay women less than their performance would merit.

In another study, (Selody, 2010), I present additional evidence of gender biases in setting executive pay. I find that negative shielding – pay that increases proportionately more in times of increasing market value that it decreases in times of decreasing market value – presents for executives overall, but women’s pay is significantly more sensitive than men’s to downswings in firms’ value. I also find that women's pay is less responsive to "lucky" firm outcomes than men's pay. These results are not consistent with inherent gender differences in risk preferences or men's superior ability. They are consistent with gender biases when boards set executive pay.

The next section lays out a model and empirical predictions. Section III discusses the data and stylized facts and Section IV explains the event. Sections V and VI present and discuss the results. Section VII offers some conclusions.

II. MODEL AND EMPIRICAL PREDICTIONS

To distinguish the two potential channels for discrimination, mistake-based and preference-based, I present a simple dynamic model where employers can learn about the performance of their employees over time (Farber and Gibbons, 1996; Altonji and Pierret, 2001; Ichino and Moretti, 2006), and also may have persistent preferences for working in all-male groups.⁴

³ Nieva and Gutek, 1980; Bertrand and Hallock, 2001; Goldin, 2002; Khurana, 2002; Blau and Kahn, 2003; Goldin, 2004; Bell, 2005; Hewlett and Luce, 2005; Bertrand, Chugh, and Mullainathan, 2005; Bigelow and Parks, 2005; Lee and Hayes, 2007; Brescoll, 2007; Goldin and Katz, 2008; Bertrand, Goldin and Katz, 2009; Selody, 2010

⁴ Typically an incentive pay model, where boards set contracts to reward performance and executives choose their effort level, depicts the pay setting process for executives. Because the focus of this paper is a change in employers that is independent of executive characteristics and executive effort, a model that describes the relationship between employer learning and employee pay is more appropriate.

An employer learning model of the gender pay gap

Boards act as employers on behalf of shareholders to set compensation f_{it} for a top executive i at time t . Boards set executive pay so as to maximize shareholder value by paying executives an estimate of their marginal product. However, the boards never really know how much an individual executive contributes to a company's performance. Boards estimate the individual contribution an executive makes to company performance by relying on: (i) \tilde{g}_i , their prior beliefs of how easy-to-observe indicators such as executive position, education, credentials, gender or race are related to his productivity, and (ii) p_i , their beliefs about how observed measures of individual executive performance, such as a project's performance, accumulated over the learning period \sum_{τ} are related to his productivity. Individual i 's productivity is a linear function of \tilde{g}_i and $\sum_{\tau} p_{i,t-\tau}$. At each point in time, t , boards weigh \tilde{g}_i by a_{gt} and p_i by $\sum_{\tau} a_{p,t-\tau}$, where τ is the time units in the board's learning period.

$$f_{it} = a_{gt}\tilde{g}_i + \sum_{\tau} a_{p,t-\tau}p_{i,t-\tau} \quad (1)$$

When boards are not familiar with an executive's performance, for example if the executive is new to the firm, a_{gt} is relatively large because boards estimate performance by relying more heavily on what they believe to be the distribution of f given their beliefs of \tilde{g} . For executives who are in the minority, such as women, boards might take into account in their initial assessment of their beliefs about the performance of women as a group (\tilde{g}_w) – in other words, discriminate statistically. If boards believe that women executives as a group perform worse than men ($\tilde{g}_w < \tilde{g}_m$) and boards statistically discriminate, then, all else equal, there will be a gender pay gap ($f_w < f_m$).

Allow for the possibility of a bias h in the board's beliefs about women executives' performance. This bias could stem from the fact that when assessing women's ability, boards are informed by a smaller and shorter sample than for men, and women have a pronounced and recent change in skills and labor force attachment (Goldin, 2002, 2004). Then,

$$\tilde{g}_w = g_w + h \quad (2)$$

If $h < 0$, then before learning, boards' beliefs mistakenly underestimate an individual woman's productivity.

Over time, repeated observations of individual's performance would increase the weight a_{pt} on the individual performance measure p insofar as p added new information about the individual's productivity (Farber and Gibbons, 1996). Thus, as boards learn, the coefficient a_{gt} weakly decreases ($\frac{\delta a_{gt}}{\delta t} \leq 0$), and the coefficients $\sum_{\tau} a_{p,t-\tau}$ weakly increase ($\frac{\delta \sum_{\tau} a_{p,t-\tau}}{\delta t} \geq 0$).

The experience path depends on the correlation θ between g and p (Altonji and Pierret, 2001).

$$\frac{\delta a_{gt}}{\delta t} = -\theta \times \frac{\delta \sum_{\tau} a_{p,t-\tau}}{\delta t}, \quad (3)$$

where $\theta > 0$ if g is positively correlated with p .

Compensation f changes with experience as employers learn that they have erred in their initial judgment. If there is a bias in the beliefs about an individual's performance, then experience will diminish the importance of this bias.

The employer learning model re-expressed in terms of employer characteristics

One difficulty in identifying the source of gender pay gaps is that unobserved (by the economist) differences between men and women employees, such as ambition and competitive drive, can be confounded with other sources of the pay gap. Examining pay during a period of discrete change in employer characteristics helps to control for unobserved differences in men and women executives since these differences will be invariant to the change in employer characteristics. The employer learning model is re-expressed in terms of the response of the pay gap to a discrete change in how much the board has learned about its executives' performance. The tenure of independent board members characterizes the amount of information that the board has about executives' performance indicators. Assume that when a board D becomes independent, either it does not have access to the full performance history of executives that the insider board members had or, if it does, it does not trust the insiders' reporting of the history. In this instance, a newly independent board knows less

about the performance of executives than the insider board. Thus switching to a newly independent board is analogous to shrinking the learning period from $\tau = j$ to $\tau = k$, where $j \geq k$.

Assign independent board members a value of one ($d = 1$) and insider board members a value of zero ($d = 0$) and assume that when independent board members take charge, the board has unlearned $j - k$ years of performance information. Thus the pay equation for the insider board translates to⁵:

$$f_{tj} = a_{gtj}\tilde{g} + \sum_{\tau=0}^j a_{p,t-\tau}p_{t-\tau} = b_j|_{d=0} \quad . \quad (4)$$

The pay equation for the *independent board* translates to

$$f_{tk} = a_{gtk}\tilde{g} + \sum_{\tau=0}^k a_{p,t-\tau}p_{t-\tau} = b_k|_{d=1}. \quad (5)$$

If $\tilde{g}_w < g_w$, the gap will widen with a change to a more independent board because the weight on the \tilde{g} term has increased.

$$\Delta(f_{wt} - f_{mt})_{jk,d0d1} = (b_{wk} - b_{mk})|_{d=1} - (b_{wj} - b_{mj})|_{d=0} < 0 \quad (6)$$

Empirical prediction 1: Employer learning with biased beliefs hypothesis predicts the pay gap will widen if a newly independent board is put in place.

When employers can base their initial estimates of performance on characteristics in addition to gender, a bias related to gender will take on relatively less importance. Other performance characteristics might include credentials such as professional degrees or professional certification: a law degree held by the firm's Legal Counsel, or a Chartered Public Accountant certificate held by the firm's Chief Financial Officer, for example.

⁵ For simplicity of exposition, I suppress subscript i in equations (4) and (5)

Empirical prediction 2: Employer learning with biased beliefs hypothesis predicts that when an independent board is put in place, the increase in the gender pay gap will be less pronounced in occupations that require accreditation.

If newly independent boards use gender and initially underestimate women's productivity ($h < 0$), then as they learn more about a woman's performance and accord relatively more weight to p , the estimate of productivity will increase and the pay gap between men and women will narrow.

Empirical prediction 3: Employer learning with biased beliefs hypothesis predicts the gap that widened initially with the introduction of a new board will revert to previous levels over time.

Nesting the taste-based discrimination model in the employer learning model

Now consider the hypothesis that executives discriminate on the basis of taste. Executives have preferences for skimming perquisites φ , which are awards given in excess of performance. Taste-based discrimination can be rendered in the model as a constant wedge between pay and performance (Becker, 1971) in the form of a perquisite paid to male executives who dislike working with women executives. Executives who are insiders on the board can try to influence the board to pay favored executives a premium and/or impose on disfavored executives a penalty.

If $\varphi > 0$, insider board members prefer to work with men executives (taste-based discrimination). If $\varphi < 0$, insider board members prefer to work with women executives (reverse taste-based discrimination).

The gap in compensation can be re-expressed as

$$f'_{wt} - f'_{mt} = (b_{wt} - b_{mt})|_{d=0} - \varphi \quad . \quad (7)$$

Assume that independent board members do not indulge in taste-based or reverse discrimination since they do not work directly with women executives. Thus the executives who had practiced taste-based or reverse discrimination before the arrival of a more independent board would be constrained from the practice after the arrival. Boards would correct for the presence of taste-based or reverse discrimination on the part of insider board members by adjusting the pay gap.

The change in the pay gap after the change from an insider board to an independent board would be:

$$\Delta(f'_{wt} - f'_{mt})_{jk,d0d1} = (b_{wk} - b_{mk})|_{d=1} - (b_{wj} - b_{mj})|_{d=0} + \varphi \quad (8)$$

Empirical prediction 1': Taste-based (reverse) discrimination hypothesis predicts the pay gap will narrow (widen) if a newly independent board is put in place.

Empirical prediction 2': Taste-based (reverse) discrimination hypothesis predicts that if a newly independent board is put in place, the narrowing (widening) will be the same for all occupations, regardless of accreditation.

Empirical prediction 3': Taste-based (reverse) discrimination hypothesis predicts that the change in the pay gap will be constant (constant) in the years following the event.

III. DATA AND STYLIZED FACTS

Data

The data form a panel that merges by CUSIP identifier the annual Execucomp database provided by Standard and Poor's, and the annual RiskMetrics provided by the RiskMetrics Group. The merged data set extends from 1998 to 2005. I drop the firms whose CUSIP identifiers differ in Execucomp and RiskMetrics because of inconsistent updating practices (Table A.1 in Appendix A). I limit my sample to firms that are present from 2000 to 2005 inclusively. The degree of board independence in my sample tracks closely the entire RiskMetrics sample.

Execucomp data include total compensation (TDC1) and its components, which consist of salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total

compensation. Firm size and performance variables consist of market value, assets, and sales in thousands of \$2004, and the number of employees.

The director's data from RiskMetrics provide the names of directors who sit on the board of each firm, whether a director is independent, linked (affiliated), or an employee⁶ of the firm, and the committees where he or she presides (i.e. the nominating, compensation, or audit committees). I construct measures of compliance to the SEC rules with the data.

To clean the data, I drop all observations with missing data for total compensation of the executive (9,289 observations), and all observations with zero values for total compensation (26 observations) or salary (45 observations). I drop all executives who were ranked 6 or lower (20,649 observations).

My sample has 899 firms and their top five or fewer executives ranked by compensation, which totals an average of 4,405 observations per year, 20,751 observations all told. Women comprise 5.7% of the executives, or 1,172 observations.

Stylized facts

In 1992, when Execucomp began to report the executives in the S&P 1500 by gender, women made up 1.3% of the top five (Bertrand and Hallock, 2001). Their representation increased to 3.4% in 1997 and then to 6.0% by 2005. As more women gradually entered the executive ranks, the gender gap in executive compensation slowly narrowed from 44% on average between 1992 and 1997 (Bertrand and Hallock, 2001) to 33% on average between 1998 and 2005 (Table I).

In the first systematic study of the gender pay gap using Execucomp data, Bertrand and Hallock (2001) find that the gender pay gap between 1992 and 1997 can be explained proximately by the lower likelihood of women holding top-paying occupations such as CEO and the lower likelihood of women working in larger firms. I re-estimate the gender gap for top five executives between

⁶ As defined by RiskMetrics, an independent director "has no significant connection with the firm." An affiliated director "provide(s) (or whose employer provides) professional services to the company or is a major customer. [Affiliated directors] also include directors who were former employees; recipients of charitable funds; interlocks; and family members of a director or executive." Directors who are employees of the firm are those who are currently employed (such as the current CEO). (RiskMetrics Director's Data Manual)

1998 and 2005, and find that firm size no longer has an important effect on the pay gap as women's presence in larger firms increases.⁷ Occupational segregation continues to account for a large portion of the gender gap.

The pay gap mirrors women's representation by rank and occupation. The top ranks, especially rank 1, show by far the widest gap and the bottom three ranks show a smaller gap. In other words, the more scarcely women are represented, the larger is the pay gap. In the CFO and Legal Counsel occupations⁸, which require specific credentials and tend to have more objective performance measures than other occupations such as CEO, the gender pay gap is 9.8%, much smaller than it is for other occupations (31.7%)⁹ (Appendix B).

IV. THE EVENT: THE SEC CORPORATE GOVERNANCE LISTING STANDARDS

The event

It is a convention that in large public companies, the Boards of Directors have the authority to decide compensation for the CEO and other senior executives.¹⁰ State corporate law allows the boards virtual *carte blanche* in setting compensation; only rarely will directors' approved compensation packages be overturned (Bebchuk and Hamdani, 2005).¹¹ Most boards delegate the responsibility for setting compensation to a committee, usually comprising three or four directors. The committee typically adopts a multi-year compensation plan for an executive that lays out the parameters for salary, bonus, and stock grants. Each year the board has the discretion to adjust the pay components within the terms of reference of the multi-year plans. Arguably independent directors can act as objective monitors of performance and avoid potential conflicts between duty

⁷ Consistent with Yurtoglu and Zulehner's estimates (2006)

⁸ Of women top five executives, 32.1% are CFOs or Legal Counsels. Only 20.7% of men executives hold these positions. Women CFOs outnumber women Legal Counsels by a ratio of 60:40.

⁹ Found by regressing the natural log of total compensation in \$2004 on gender with time dummies and firm fixed effects, using Execucomp data of the top five executives in S&P 1500 companies.

¹⁰ Bebchuk, Fried and Walker (2002), explain in detail the process of setting executive compensation and the typical issues that boards face.

¹¹ In most jurisdictions in the U.S., the legal duties of directors are expressed only in general terms: the duty of loyalty to the company's shareholders and the duty of care, that is, due diligence in making decisions. If a director can demonstrate that he has acted within these duties, the state courts will not challenge his business judgment regarding compensation.

and self-interest that insider board members face (Meckling and Jensen, 1976; Fama, 1980; Fama and Jensen, 1983). But independent board members may not have access to the details of firms' operations and instead may rely on "heuristic forms of thought tied to readily observable data" (Langevoort, in *Harvard Law Review*, 2006) when they set pay. Thus greater board independence may control managers' abilities to extract rents, but may also allow the biases of independent directors to influence pay decisions.

In the spirit of the Sarbanes-Oxley reforms, the SEC chairman announced in February 2002 that he had tasked the New York Stock Exchange (NYSE) and the National Association of Securities Dealers (NASD) to review corporate governance listing standards with the intent to mandate to boards greater independence to act as objective monitors of management's performance (U.S. Securities and Exchange Commission, 2003). The exchanges filed a series of proposals during 2003 with the SEC for public review and the SEC approved the amended proposals for both of the exchanges on November 2003. Listed companies in both exchanges had to comply with the new standards by their first annual meeting by January 15, 2004 or October 31, 2004, whichever was earlier. The rules required that all companies listing common equity shares on their respective exchanges¹² have a majority of independent directors, and entirely independent nominating, compensation, and audit committees. Those who failed to comply faced suspension or delisting.¹³ (Appendix C)

For the most part, boards did not undergo a wholesale change in members. Even so, the increase in board independence was widely characterized as a "regime change," giving newly independent boards the mandate to correct incidences of excessive pay. Even though the broad parameters of executive pay are laid out in compensation plans, boards have discretion to trim or increase pay from year to year. Discretion can be wide: the average absolute variation in top executive pay from one year to the next is over 40%. Moreover, newly independent board members would not be

¹² Classified boards had until December 31, 2005 to comply. Exceptions were made for controlled companies (those who had individuals or entities holding more than 50% voting power), limited partnerships and companies in bankruptcy, management investment companies, trusts and derivatives are exempt from most of the rules except for the auditing provisions.

¹³ The new NYSE rules relating to board independence are broadly similar to the Nasdaq rules except that the Nasdaq rules tend to be slightly more lenient.

familiar with the day-to-day workings of the company and so might be skeptical of the performance assessments of executives proffered by their managers. Thus, newly independent boards could exercise their discretion to set pay reflecting their beliefs about executives' ability and performance.

Empirical analysis of the event

Compliance is defined as having all of: a majority of independent directors, an entirely independent nominating committee and an entirely independent compensation committee. Noncompliance is defined as not satisfying these conditions of compliance.

I omit the independent audit committee condition from the definition of compliance because required changes to the auditing procedures of firms were set in motion earlier than the other requirements through Sarbanes-Oxley. To ensure the results are robust, I vary the compliance condition when estimating the impact of the event.

The control group consists of the firms that had complied by 2002. The treatment group consists of the firms that had not complied in 2002 but subsequently complied in 2003 or 2004. A structural break in compliance occurs between 2002 and 2003 when the percent of compliers jumped from 45% to 57%, making 2002 a reasonable "before" date (Figure I). Although the formal date for compliance was not until 2004, the SEC widely circulated drafts of the new rules in 2003, which explains the significant increase in compliance. Given that the window for compliance is large, I test the robustness of the results by staggering the compliance dates.

In 2002 control firms had an average of two insiders and treatment firms an average of four insiders. Between 2002 and 2004, the number of insiders in the treatment firms fell to an average of between two and three, while the average number of insiders in control firms remained the same. The average number of board members in control firms is 9.6 and in treatment firms is 9.7, statistically indistinguishable. The proportion of women on the board does not differ significantly between comparison groups before or after the event.

One caveat related to the methodology of this study is that the control and treatment groups are not assigned randomly. If the comparison groups are systematically different then events not related to

the treatment could affect comparison groups differently and confound the interpretation of the results. This caveat is mitigated because I employ a difference-in-difference-in-differences design and look at the difference between men's and women's compensation as well as between control and treatment firms, so any systematic differences between control and treatment firms is a concern only if it affects men's and women's compensation differently. To examine this possibility I compare the observable characteristics of the control and treatment groups. The non-complying firms have slightly lower market value, sales, employees, and total compensation, and slightly higher assets than the complying firms in 2002. I cannot reject the null hypothesis of equality of means (Table A.2 in the Appendix A). The distribution of industries in the control and treatment firms is also similar. I correct for time-unvarying unobserved differences in control and treatment firms by introducing firm fixed effects in estimation.

The executives in the control and treatment firms are also comparable. The percentage of women in the control firms is 5.5% and in treatment firms is 5.2%, statistically indistinguishable. The percentage of women CEOs in control firms is 1.3%, a statistically insignificant difference from 1.9% in treatment firms. And, the percentage of women CFOs and Legal Counsel in control firms (8.9%) is insignificantly different from the percentage (7.2%) in treatment firms. The gender pay gaps in the control and treatment groups track within two percent of each other in the two years before the event (Figure II).

Boards with a strong representation of women tend to pay women executives more than boards with a weak representation (Bell, 2005). I confirm that the change between treatment and control of the number of women directors and the proportion of women directors is not statistically or economically significant.

During the time that the SEC regulations for board independence took effect, other regulatory reforms were taking place that might also have had an effect on executive compensation, most notably, Sarbanes-Oxley (SOX). SOX required that CEOs and CFOs attest to the company's financial reports and that Legal Counsels report violations in securities regulations. This increased emphasis on proper accounting and legal practices might have increased the demand for qualified CFOs and Legal Counsels, and thus their compensation. However, there is no evidence of a shift in

the total number or proportion of CFOs and Legal Counsels in the control or treatment groups before or after the event.¹⁴

Another concern is that compliance with the SEC regulations is not a large enough change to have an economically significant effect on compensation decisions. To see whether the compliance of the treatment group has an effect on the pay-setting process not directly related to the gender gap, I test whether newly independent boards tied pay to performance differently after compliance than before by estimating the sensitivity of executives' pay to changes in market value. Using a difference-in-differences specification and controlling for firm size and firm fixed effects, I find that the response of executive compensation to changes in market value is stronger after compliance than before in treatment firms compared with control firms. This result is consistent with either the hypothesis that newly independent boards adopt a more efficient pay-setting process to control for taste-based (or reverse) discrimination, or the hypothesis that newly independent boards initially lack information about executives' individual performance and rely more on firm performance measures to set pay as they would in an employer learning model. Thus there is a change in pay setting behavior and that could be consistent with either hypothetical response of newly independent boards.

V. RESULTS

Empirical specification

Recall that Equation 8 expresses the change in the gender pay gap as the difference in the gap before and after a board becomes more independent. This relationship can be estimated as the cross-term in a difference-in-difference-in-differences equation specification (Meyer, 1995) that compares

¹⁴ SOX also required that option grants be reported within two days, which might reduce the incidence of backdating. However, the rule was weak; under SOX the SEC had no explicit sanctions for backdating and the practice continued to be widespread. Another accounting change made to the Financial Accounting Standards 123R requires that companies must record stock option grants as an expense, which would likely change the incentives for granting options by making the reporting more transparent. However, this rule did not come into effect until the first accounting period after June 15, 2005.

compensation for executives in treatment firms (that did not comply in 2002) and control firms (that had already complied in 2002), before and after the regulation event:

$$\ln(\text{total pay}) = \alpha + \beta_1(\text{Post-reg}_t * \text{Treatment}_i) + \beta_2(\text{Female}_i * \text{Treatment}_i) + \beta_3(\text{Female}_i * \text{Post-reg}_t + \text{Treatment}_i) + \text{year dummies} \Gamma_Y + (\text{Female}_i * \text{year dummies}) \Gamma_{FY} + (\text{Female}_i * X_{it}) \Gamma_{FX} + X_{it} \Gamma_X + \text{firm fixed effects}$$

where $\ln(\text{total pay})$ is the natural log of total compensation (TDC1) in \$2004 for each executive.

The expression $(\text{Post-reg}_t * \text{Treatment}_i)$ equals 1 after 2003 for firms that did not comply in 2002, but complied after the announcement of the change in regulation in 2003 or 2004. X is a vector of lagged control variables that account for firm performance, such as the natural log of: market value, assets, sales (all in 2004\$) and the number of employees. $(\text{Female}_i * \text{Treatment}_i)$ equals 1 for women in firms in the treatment group. Men's and women's compensation might not be equally sensitive to the market value, assets, sales, or number of employees of the firm, so for that reason, I interact gender with these firm performance variables. The regression includes year dummies and firm fixed effects, and the standard errors are clustered by firm. The year dummies control for trends in compensation over time. Men's and women's compensation may be following a different time trend, so for that reason, I include the interaction between gender and year dummies. Firm fixed effects account for whether firms are complying or not complying in 2002, so Treatment does not need to be included in the regression separately. Similarly, since there are year fixed effects the Post-reg term need not be included separately. The coefficients of interest are β_1 , the effect on pay for all executives of complying with board independence regulations, and β_3 , the effect on the gender gap in pay of complying with board independence regulations. Equations are estimated for the years 2000-2005. I end the sample in 2005 because in 2006 the Financial Accounting Standards Board introduced FAS 123r "Share-Based Payments," a major change to accounting rules to make compensation disclosures more transparent. 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. The accounting change could increase the disclosure of stock options but might also cut back on their use as they came under greater scrutiny, creating a change

in the composition of pay. Since this change could affect firms, and male and female executives differently, results in 2006 onward would be difficult to interpret.

The effect of greater board independence on the gender pay gap

The results are presented in Table II. Column (1) shows the effect of firm size and performance variables as well as gender on compensation without taking the event into account. The average gender gap in executive compensation is 30.6%. Predictably, the market value of the firm significantly influences the compensation of the firm's executives. In columns (2) – (5) Female is interacted with year dummies to allow for different trends in compensation for men and women, so gender is not included in the regression separately.

Column (2) estimates the effect of adopting a more independent board in compliance with the NYSE/NASD regulations on all executives' compensation. The effect is essentially zero, which is consistent with newly independent boards not correcting for "skimming."¹⁵ The lack of evidence of a correction for skimming does not support the hypothesis that managers are skimming to indulge in taste-based or reverse discrimination. If insiders had the managerial power to skim firm value to create discriminatory pay gaps, why wouldn't they skim purely for their own benefit too?

Column (3) estimates the effect of compliance on all executives, as well as on women executives in relation to all executives. The coefficient Female*Treatment is not economically or statistically significant, suggesting that women's pay in the treatment and control groups are insignificantly different before the event. The coefficient on Female*Post-reg*Treatment is significant at the 95% level and negative, indicating that women executives in firms that comply have lower pay after compliance than those in the control group. The effect is also economically significant – women in the treatment group do 19.2% worse than women in the control group and so the pay gap widens. This result contradicts the hypothesis of taste-based discrimination by male executives who were entrenched on the board before the regulation. It is consistent with either reverse discrimination

¹⁵ Estimates on the impact of director independence on executive compensation vary, from negative (Chhaochharia and Grinstein, 2006), to conditional on other board features (Bertrand and Mullainathan, 2001; Bebchuk and Grinstein, 2005) to positive (Hall and Murphy, 2003; Hermalin, 2005).

among executives and employer learning with downward-biased beliefs about women's performance (Empirical predictions 1 and 1').

There is a more negative and more significant coefficient on Female*Post-reg*Treatment for salary plus bonus than for total compensation (-20.9%, significant at the 99% level), indicating women in treatment firms experience a hit to their core component of pay (Table II; column (4)). This is also the component that boards have considerable discretion over changing in the short term.

To determine how much of the decline in compensation came from women leaving and entering, I restrict the sample to include only executives who were present from 2002 to 2005 (Table II; column (5)). The sample size drops from 20,751 to 12,297. The gender pay gap for salary plus bonus widens, but by slightly less than in the entire sample (-18.3%), and is statistically significant at the 95% level. Thus the widening gap does not appear to be the result of turnover.

What if male executives were practicing taste-based discrimination by not hiring women in the first place? If taste-based discrimination manifested before compliance as a constraint on hiring or promoting women to senior executive positions, then after compliance the number of women would likely increase. Poisson regression estimates show that the number of women executives increases overall with time but there is no significant increase (or decrease) in the number of women working in firms that did not comply in 2002 and then complied by 2004 (Table III). Thus the evidence does not suggest that insider boards were engaging in taste-based discrimination through restrictive hiring practices or reverse discrimination through over-hiring.

The effect of compliance on the gender gap differs between executives depending on their occupation (Table IV). Notably, the response of the pay gap for executives who are not CFOs or Legal Counsels is significantly negative for all firms (column (2)) as well as for firms with executives present from 2002 to 2005 (column (3)), while response of the pay gap for the executives who are CFOs and Legal Counsels is not significant (columns (5) and (6)). CFOs and Legal Counsels have jobs that have specific credentials and more easily observable measures of performance. This result is consistent with employer learning with downward-biased beliefs (Empirical prediction 2) but is not consistent with reverse-discrimination (Empirical prediction 2'). If reverse discrimination were

occurring, there is no reason to expect the response in pay after the event would differ by occupation.

The model of employer learning with biased beliefs predicts that the gap will widen after the event and subsequently narrow as independent directors gain more experience with executives' performance (Empirical prediction 3), whereas the reverse discrimination model predicts no moderation (Empirical prediction 3'). To test whether the increase in the gender gap in compensation persisted after the event, I alter the specification to estimate the effect of $\text{Female} * \text{Post} - \text{reg} * \text{Treatment}$ in 2004 and in 2005 separately (Table V). The gap increases in 2004 in firms that previously did not comply, but by 2005 the gap has reverted towards the control (column (1)). This pattern is the same for executives who are not CFOs and Legal Counsels (column (2)) and for the salary and bonus component of pay for all executives (column (3)).

Robustness tests

To ensure the results are invariant to the sample selection, I limit the sample to firms that had at least one woman in the top five positions – about 20% of all firms. The impact on total compensation for all executives is not significantly different than zero, and the impact on the pay gap is negative (-15.0%) and significant at the 90% level.

I test the robustness of the timing of the event by staggering the event into those who complied in 2003 and those who complied in 2004. I find that in the group of companies that complied in 2003, the decline in pay occurred in 2003, reached its trough in 2004, and moderated the next year. In the group of companies that complied in 2004, the decline in pay reached its trough in 2004 and moderated in 2005. Thus in each instance the gap reverted after the newly independent board members gained experience.

Since women are under-represented in the top ranks and over-represented in the bottom ranks, I break the sample into pay ranks to make sure that the decline in pay is not skewed towards the lower ranks and thus the result of a compositional effect. I find the gender gap increases significantly for both high ranks where women are under-represented and in low ranks where women are over-represented. The gap does not increase in middle ranks, due in large part to the presence of CFOs

and Legal Counsels in these ranks. Thus, the concentration of women in the lower ranks does not appear to explain the fall in women's compensation after compliance.

The findings are robust to a definition of compliance that includes independent audit committees as well as the other three requirements. Adding the independent audit committee requirement had very little effect on the number of non-complying firms in 2002, probably because most firms had already complied by 2002 with the introduction of SOX. Results are also robust to a definition of compliance that includes only an entirely independent compensation committee.

Additional evidence

If boards have downward biased prior beliefs about women's performance, then in other situations where boards have less information about executives, the gender pay gap should be wider. To test this prediction, I track the gender pay gap for new executives as their tenure increases. Between 1999 and 2002, 2,969 men and 346 women executives were new either to the company or to the top five ranks. I calculate the mean total compensation for the executives' first, second and third years of tenure. As executives' tenure in the top jobs increases, the gender pay gap narrows (Figure III). The gender pay gap for new executives exceeded 30% in the first year of tenure. The pay gap for those same executives narrowed considerably in the second year of tenure, and continued to narrow in the third year.¹⁶ This is consistent with boards having an initial bias that compelled them to pay unknown women less than unknown men.¹⁷

VI. DISCUSSION

The results of this study are consistent with the view that boards have biased beliefs about women's performance and make systematic mistakes when they set executive compensation. Boards' reliance

¹⁶ A narrowing pay gap for top executives is not inconsistent with evidence of a widening pay gap for young workers in the corporate and financial sectors as their tenure increases found by Bertrand, Goldin and Katz (2009). In this instance, the widening pay gap can be traced mainly to the financial penalty that women face when they interrupt work or reduce their hours when they have children. Women who have reached the top five executive spots would, for the most part, have their childbearing years behind them.

¹⁷ The narrowing of the gap with increased tenure might stem in part from the slightly higher leaving rates of women than men. If the lowest performing women are more likely to leave the firm, then the pay of new men and women would tend to converge. This effect does not occur in the board independence test because leaving rates are stable over the event window.

on pre-existing norms can lead to the prolonged underestimation of women's performance and a persistent pay gap (Goldin, 2002). Historical studies show that the information that boards use to ascertain the abilities of women executives as a group rests on a very small sample and a very brief history. Three decades ago, information about top women executives was hard to come by because there were almost no top women executives (Bertrand and Hallock, 2001; Cappelli and Hamori, 2004). Then, in the span of thirty years, women's skills and labor force attachment changed utterly (Blau and Kahn, 2003). The ratio of women-to-men college graduates and post-graduates climbed rapidly in the 1970s and now exceeds unity. The most prestigious private universities lifted the longstanding quotas and prohibitions on women applicants¹⁸ and women made an about turn from "female intensive" concentrations such as Education to male intensive concentrations such as Business and Management and Law (Goldin, 2004). Currently, the top women executives in the S&P 1500 are slightly more likely than men to have graduated from a private college or a top university and slightly less likely to have earned only a terminal undergraduate degree (Bell, 2005). And, having made the long climb to the top, these women of high ability tend not to self-select into less challenging jobs (Bertrand and Hallock, 2001). Even so, this recent history appends to a long and stable history of weaker skills and labor force attachment for women.

Boards might also underestimate women executives' performance because they have a harder time interpreting ability from the resumé of women than from those of men. Family responsibilities have induced women executives to seek more flexibility in the way they organize when and where they work and what path they take to the top (Hewlett and Luce, 2005), which makes their performance history unlike the traditional history of male executives. Bertrand, Goldin, and Katz (2009) find that the penalties from modest career interruptions for women who chose to have children were enormous, particularly for MBAs (Goldin and Katz, 2008). Boards often measure "leadership" ability, a requirement for senior executives, by ambiguous qualities such as "charisma," "stature," "confidence," and "vision," (Khurana, 2002) which can invite subjective comparisons that boards might not even be aware they are making (Bertrand, Chugh, and Mullainathan, 2005). Both the heterogeneity and the ambiguity of the performance measures can introduce an unintended bias in beliefs about women's abilities.

¹⁸ Yale adopted an equal access policy in 1972; Harvard in 1975. Princeton did not admit any women until 1972.

Even when men and women present the same performance indicators, boards might attribute lower competence and lower pay to a woman than a man, but that the biases are mitigated as more information on individual performance becomes available. For example, business finance students presented with identical prospectuses and CEO biographies for an imaginary initial public offering – identical except in one case the CEO was named Robert and in the other case Roberta – were willing to invest three times more in the “male” companies and rank the “women” CEOs as having less leadership experience, less ability to deal with a crisis and more likelihood to engender conflict in the management team than “men” CEOs (Bigelow and Parks, 2005). However, if boards have access to information on individual performance, gender becomes less salient and the effect of gender stereotypes on performance evaluations is mitigated (Nieva and Gutek, 1980).

Market participants tend to perceive the ability of women CEOs as lower than men. Stock markets react more negatively to the announcement of women CEOs than men, especially if the women are appointed from outside the firm (Lee and Hayes, 2007). Moreover, analysts’, particularly male analysts’, earnings forecast errors are systematically larger for firms led by women (Wolfers, 2007). If beliefs about women’s ability were downward biased, this would suggest excess stock market returns in firms led by women. Systematically excess returns have not been found for women-led firms, however, which may simply reflect the weakness of statistical tests given the small sample of women CEOs rather than an inference about the presence or lack of biased beliefs (Wolfers, 2007).

In another study, (Selody, 2010), I determine whether boards of directors in the S&P 1500 assign credit and blame differently to men and women executives for their firm’s performance. I find that negative shielding – pay that increases proportionately more in times of increasing market value that it decreases in times of decreasing market value – presents for executives overall, but women’s pay is significantly more sensitive than men’s to downswings in firms’ value. Women’s pay is also less responsive to observable exogenous factors that influence firm performance, or “luck.” This pattern does not appear to stem from inherent gender differences in risk preferences or ability of top executives. It is suggestive of mistake-based discrimination on the part of boards when they compare the performance of women relative to men.

VII. CONCLUSION

The gender gap has been a persistent feature of executive compensation and its cause has been difficult to pinpoint: an executive's marginal product is usually unobserved and the observable characteristics of executives do not represent the underlying cause of the discrepancy in pay. In this paper I look at the characteristics of the compensation setters – the board of directors – which are easily observable and can be used to make predictions about how compensation might deviate from executives' productivity. I use a unique policy change that required boards to become more independent to test the effect of board independence on the gender gap in executive compensation. Because the event involves a change in employer characteristics, differences in productivity between men and women do not confound the results. Nor do differences in self-selection into the top paying jobs. I find that the gap widens after the event. One explanation is that boards have biased beliefs about women executives' performance given their credentials. The widening is also consistent with the view that insider boards engaged in reverse discrimination toward women. However, a subsequent moderation of the effect and a smaller effect for jobs with higher information content are not consistent with the hypothesis of reverse discrimination.

These findings help inform the choice among policies aimed at mitigating the gender gap in executive pay. Policies that encourage more distance between the boards and the executives whose pay they set, such as requiring more independent boards, do not seem to help narrow the gap, and in fact might exacerbate it. Although independent board members may be less affected by personal preferences for one gender over another, they share the same potential biases about women's ability as society as a whole. Biases coupled with less information about individual executives' performance would make independent boards initially more likely than insider boards to pay women executives less than men. More effective policies, then, might encourage boards to attach less import to the pre-existing norms that could lead them to underestimate women's ability (Goldin, 2002). Boards might be encouraged to require more information from CEOs about the executives whose pay they set, to mandate more time spent reviewing executives' history and appraisals, and to monitor executives more closely. By uncovering a more complete history of performance of executives, boards could attend to the individual characteristics of the executive rather than potentially biased group characteristics.

Another way to potentially diminish the gender pay gap might be to increase the rigor and transparency of the performance measures themselves. Implicit discrimination is more likely when performance measures are ambiguous (Bertrand, Chugh, and Mullainathan, 2005). If boards were required to set out clear and quantifiable performance measures on which executives could be judged before evaluating individual executives, unconscious biases of the boards would have less opportunity to assert themselves.

Finally, any discussion about the gender pay gap for top executives cannot ignore the sheer scarcity of women executives. The same policies that improve the parity of women to men in top corporate jobs could also help diminish the pay gap. Increasing the number of women top executives would increase the exposure of boards to women's performance and thus diminish biases that boards may hold about women's ability as a group.

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TABLE I
Executive Compensation for Men and Women
Summary Statistics, 1998-2005

| Variable (\$ Thousands) | Obs. | Men executives | | | | | Women executives | | | | | |
|--|--------|----------------|--------|--------|--------|---------|------------------|-------|--------|-------|------|---------|
| | | Mean | Median | SD | Min | Max | Obs. | Mean | Median | SD | Min | Max |
| Total compensation | 38,433 | 3,142 | 1,439 | 7,659 | 0 | 658,581 | 2,112 | 2,111 | 1,142 | 4,074 | 119 | 115,235 |
| Salary | 38,433 | 463 | 384 | 288 | 0 | 7216 | 2,112 | 380 | 324 | 203 | 3 | 1,483 |
| Bonus | 38,433 | 547 | 240 | 1,507 | 0 | 129,348 | 2,112 | 343 | 187 | 642 | 0 | 10,414 |
| Options granted | 38,433 | 346 | 0 | 1,609 | 0 | 76,738 | 2,112 | 270 | 0 | 1,785 | 0 | 73,336 |
| Restricted stocks granted | 38,433 | 1,481 | 387 | 6,416 | 0 | 658,581 | 2,112 | 923 | 304 | 2,572 | 0 | 63,864 |
| Long-term incentive plan | 38,433 | 142 | 0 | 842 | -2,736 | 37,436 | 2,112 | 75 | 0 | 346 | -566 | 5,066 |
| Other annual | 38,433 | 36 | 0 | 193 | 0 | 8,697 | 2,112 | 21 | 0 | 104 | 0 | 3,062 |
| All other | 38,433 | 127 | 17 | 888 | -189 | 74,656 | 2,122 | 99 | 12 | 1128 | | 43,549 |
| CEO total compensation | 7,967 | 6,135 | 3,195 | 13,234 | 0 | 658,581 | 108 | 4,883 | 2,809 | 6,453 | 292 | 115,235 |
| CFO and Legal Counsel total compensation | 7,954 | 1,828 | 1,104 | 3,453 | 119 | 129,759 | 678 | 1,560 | 963 | 2,009 | 169 | 23,655 |
| Total compensation by industry | | | | | | | | | | | | |
| Energy | 1,868 | 3,340 | 1,522 | 6,542 | 62 | 97,863 | 53 | 1,413 | 1,094 | 936 | 323 | 4,139 |
| Materials | 2,988 | 1,854 | 1,130 | 2,668 | 205 | 49,228 | 92 | 943 | 763 | 638 | 305 | 3,464 |
| Industrials | 5,952 | 2,573 | 1,189 | 7,154 | 61 | 268,784 | 228 | 1,184 | 856 | 998 | 195 | 7,541 |
| Consumer staples | 6,955 | 3,078 | 1,492 | 6,653 | 0 | 231,871 | 583 | 1,967 | 1,266 | 2,651 | 119 | 43,769 |
| Health care | 2,168 | 3,385 | 1,827 | 4,982 | 154 | 80,460 | 144 | 3,127 | 2,306 | 3,040 | 333 | 21,637 |
| Financials | 3,892 | 3,328 | 1,766 | 5,724 | 128 | 184,591 | 252 | 2,020 | 1,359 | 2,075 | 138 | 14,151 |
| Information Technology | 4,975 | 4,159 | 1,810 | 8,000 | 24 | 252,347 | 236 | 2,466 | 1,018 | 3,517 | 145 | 21,642 |
| Telecom | 6,554 | 3,655 | 1,484 | 12,108 | 0 | 658,581 | 337 | 3,196 | 1,103 | 8,387 | 127 | 115,235 |
| Services | 343 | 7,458 | 4,369 | 10,218 | 161 | 79,051 | 32 | 2,858 | 2,424 | 2,806 | 189 | 12,268 |
| Utilities | 2,738 | 1,738 | 956 | 2,652 | 144 | 54,543 | 155 | 1,109 | 673 | 1,508 | 175 | 15,997 |

Notes: Compensation variables are in \$2004 thousands. Total compensation 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). Other annual consists of perquisites, other personal benefits, above market earnings on restricted stock, tax reimbursements. All other annual includes severance payments, debt forgiveness, imputed interest, payments for unused vacation, signing bonuses, 401K contributions and life insurance premiums.

TABLE II
The Effect of More Independent Boards on the Gender Pay Gap:
Difference-in-difference-in-differences Regressions

| | (1) | (2) | (3) | (4) | (5) Executives in the sample 2002-2005 |
|----------------------------------|------------------------|------------------------|------------------------|---------------------|--|
| Dependent variable: | ln(total compensation) | ln(total compensation) | ln(total compensation) | ln(salary + bonus) | ln(salary + bonus) |
| Female | -0.306 (0.04)*** | | | | |
| Post-reg*Treatment | | -0.002 (0.03) | 0.009 (0.03) | -0.018 (0.02) | -0.035 (0.02) |
| Female*Treatment | | | -0.040 (0.07) | -0.023 (0.05) | 0.066 (0.10) |
| Female*Post-reg*Treatment | | | -0.192 (0.08)** | -0.209 (0.07)*** | -0.183 (0.09)** |
| Market Value | 0.350 (0.03)*** | 0.349 (0.03)*** | 0.348 (0.03)*** | 0.068 (0.02)*** | 0.060 (0.02)*** |
| Firm fixed effects | yes | yes | yes | yes | yes |
| Year dummies | yes | yes | yes | yes | yes |
| Female*Year dummies | no | yes | yes | yes | yes |
| Female*(Firm variables) | no | yes | yes | yes | yes |
| Constant | 5.065 (0.35)*** | 5.050 (0.35)*** | 5.049 (0.35)*** | 5.898 (0.25)*** | 5.926 (0.32)*** |
| Observations | 20,751 | 20,751 | 20,751 | 20,751 | 12,297 |
| R-squared | 0.61 | 0.61 | 0.61 | 0.55 | 0.60 |

Notes: Dependent variable in natural logs \$2004 thousands, 2000-2005. Total compensation 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). All regressions include firm market value, assets, number of employees and sale, lagged and in natural logs. Robust standard errors are clustered at the firm level in parentheses.

*significant at 10%; **significant at 5%; ***significant at 1%

TABLE III
The Effect of More Independent Boards
on the Number of Women Executives, 2000-2005

Dependent variable: Total number of women executives per firm

| | |
|----------------------------|---------------------|
| Post-reg*Treatment | 0.019 (0.08) |
| Market Value | 0.091 (0.03)*** |
| Assets | -0.147 (0.03)*** |
| Number of Employees | 0.069 (0.02)*** |
| 2001 | 0.123 (0.10) |
| 2002 | 0.143 (0.10) |
| 2003 | 0.277 (0.10)*** |
| 2004 | 0.312 (0.10)*** |
| 2005 | 0.349 (0.10)*** |
| Firm Fixed Effects | yes |
| Constant | -1.199 (0.17)*** |
| Observations | 6,024 |
| R-squared | 0.091 |

Notes: Poisson regression. 2000-2005. Market value, assets and number of employees are lagged and in natural logs. Robust standard errors in parentheses.

*significant at 10%; **significant at 5%; ***significant at 1%

TABLE IV
The Effect of More Independent Boards on the Gender Pay Gap, by Occupation:
Difference-in-difference-in-differences Regressions

Dependent variable: ln(total compensation)

| | Top five executives except CFOs and Legal Counsels | | | Top five executives who are CFOs or Legal Counsels | | |
|----------------------------------|---|---------------------|--|---|--------------------|--|
| | (1) | (2) | (3) Executives in the sample 2002-2005 | (4) | (5) | (6) Executives in the sample 2002-2005 |
| Female | -0.335 (0.05)*** | | | -0.093 (0.05)* | | |
| Post-reg*Treatment | | 0.025 (0.03) | 0.037 (0.03) | | -0.006 (0.04) | 0.027 (0.04) |
| Female*Treatment | | -0.098 (0.09) | -0.113 (0.19) | | -0.223 (0.11)** | -0.252 (0.14)* |
| Female*Post-reg*Treatment | | -0.346 (0.10)*** | -0.283 (0.14)** | | 0.160 (0.10) | 0.133 (0.13) |
| Market Value | 0.353 (0.03)*** | 0.352 (0.03)*** | 0.376 (0.03)*** | 0.363 (0.04)*** | 0.357 (0.04)*** | 0.343 (0.05)*** |
| Firm fixed effects | yes | yes | yes | yes | yes | yes |
| Year dummies | yes | yes | yes | yes | yes | yes |
| Female*(Year dummies) | no | yes | yes | no | yes | yes |
| Female*(Firm variables) | no | yes | yes | no | yes | yes |
| Constant | 5.057 (0.36)*** | 5.042 (0.36)*** | 5.291 (0.43)*** | 5.146 (0.56)*** | 5.191 (0.56)*** | 5.859 (0.58)*** |
| Observations | 16,380 | 16,380 | 9,675 | 4,376 | 4,376 | 2,623 |
| R-squared | 0.62 | 0.62 | 0.68 | 0.79 | 0.79 | 0.82 |

Notes: Dependent variable in natural logs, \$2004 thousands, 2000-2005. Total compensation 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. All regressions include firm market value, assets, number of employees and sales are lagged and in natural logs. Robust standard errors are clustered at the firm level in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

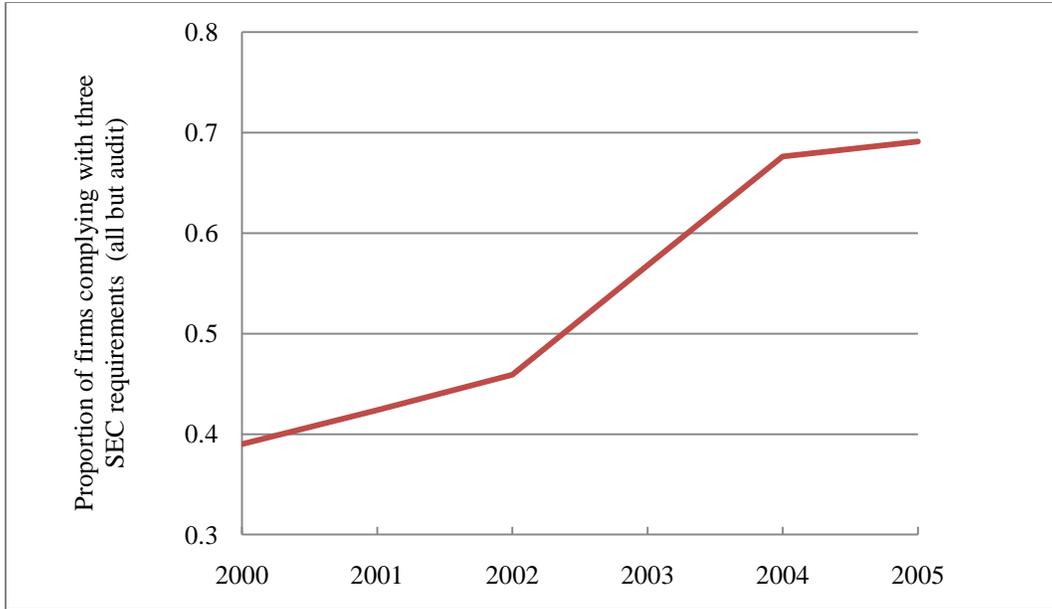
TABLE V
The Effect of More Independent Boards on the Gender Pay Gap
in the First and Second Years After Compliance:
Difference-in-difference-in-differences Regressions

| | (1) All executives | (2) Executives who are not CFO or Legal Counsel | (3) All executives |
|--------------------------------|---------------------------|--|-----------------------|
| Dependent variable: | ln(total compensation) | ln(total compensation) | ln(salary + bonus) |
| Post-reg*Treatment | 0.009 (0.03) | 0.045 (0.03) | -0.01 (0.02) |
| Female*Treatment | 0.007 (0.06) | 0.012 (0.08) | 0.021 (0.05) |
| Female*Treatment*2004 | -0.179 (0.09)** | -0.375 (0.13)*** | -0.17 (0.07)** |
| Female*Treatment*2005 | -0.108 (0.07) | -0.141 (0.13) | -0.129 (0.07) |
| Market Value | 0.336 (0.03)*** | 0.338 (0.03)*** | 0.057 (0.02)*** |
| Firm fixed effects | yes | yes | yes |
| Year dummies | yes | yes | yes |
| Female*(Year dummies) | yes | yes | yes |
| Female*(Firm variables) | yes | yes | yes |
| Constant | 5.193 (0.37)*** | 5.675 (0.39)*** | 5.849 (0.27)*** |
| Observations | 22,105 | 17,715 | 22,105 |
| R-squared | 0.62 | 0.63 | 0.57 |

Notes: The dependent variables are in natural logs in \$2004 thousands, 1999-2005. Total compensation 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. All regressions include market value, assets, number of employees and sales, lagged and in natural logs. Robust standard errors are clustered at the firm level in parentheses.

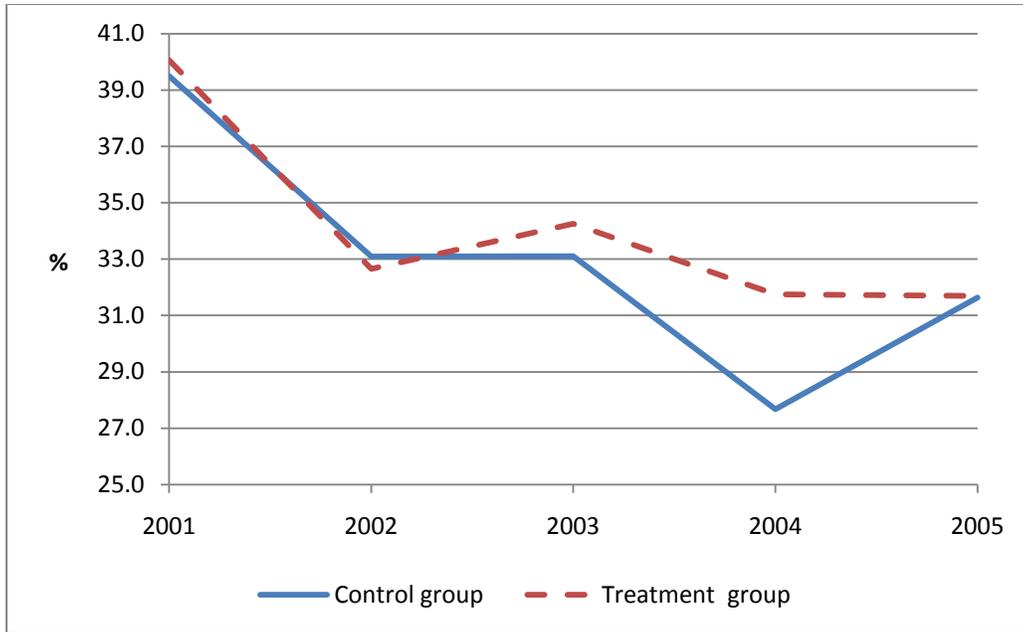
*significant at 10%; **significant at 5%; ***significant at 1%

FIGURE I
The Proportion of Firms in the Merged Sample that Complied with SEC Requirements
2000-2005



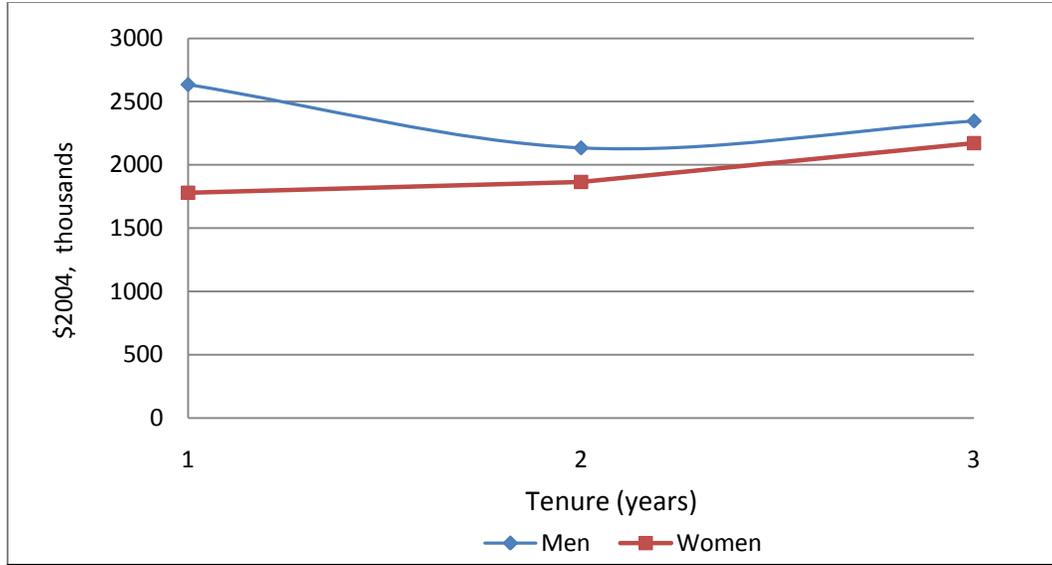
Source: Merged Execucomp and RiskMetrics databases

FIGURE II
Gender Pay Gap for Total Compensation, Control and Treatment Groups
2001-2005



Note: Total compensation scaled by market value
Source: Merged Execucomp and RiskMetrics databases

FIGURE III
Mean Total Compensation of New Executives by Year of Tenure
1999-2004



Source: Execucomp

APPENDIX A: MERGED EXECUCOMP AND RISKMETRICS DATABASE

TABLE A.1
The Number of Firms in Execucomp, RiskMetrics and the Merged Sample

| Year | Number of firms in Execucomp | Number of firms in RiskMetrics | Number of firms in merged sample |
|------|------------------------------|--------------------------------|----------------------------------|
| 1998 | 1,265 | 1,756 | 839 |
| 1999 | 1,270 | 1,789 | 894 |
| 2000 | 1,268 | 1,736 | 942 |
| 2001 | 1,272 | 1,769 | 989 |
| 2002 | 1,400 | 1,426 | 1,073 |
| 2003 | 1,409 | 1,455 | 1,143 |
| 2004 | 1,412 | 1,461 | 1,168 |
| 2005 | 1,414 | 1,439 | 1,212 |

TABLE A.2
Comparison of the Complying and Non-complying Firms in the Merged Sample

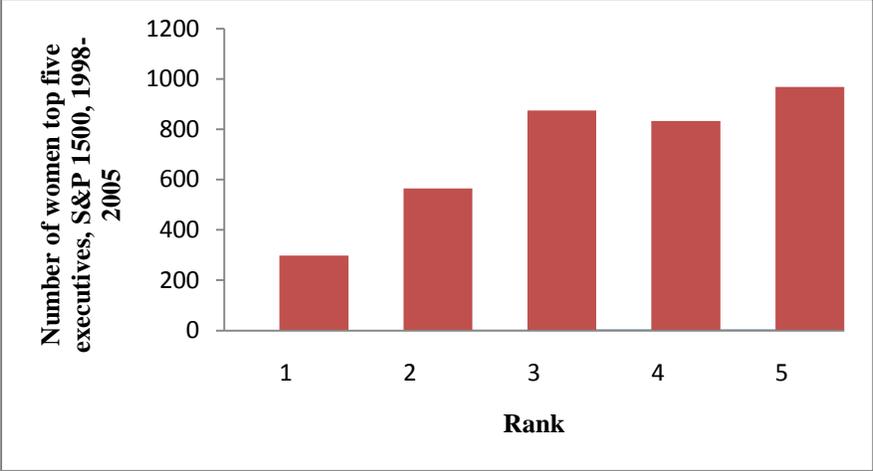
| Firm Variable | Mean for complying firm, 2002 | Mean for non-complying firm, 2002 | P-value |
|---|-------------------------------|-----------------------------------|---------|
| Market Value | 8,170.11 (1,150.37) | 7,321.89 (918.99) | 0.56 |
| Assets | 15,346.59 (2,678.60) | 17,977.78 (3,414.41) | 0.54 |
| Sales | 6213.16 (862.38) | 5670.21 (552.76) | 0.60 |
| Employees | 25.34 (4.03) | 21.78 (1.76) | 0.42 |
| Mean total compensation of top five executives | 2,946.29 (104.85) | 2,800.19 (95.61) | 0.30 |
| Number of firms | 434 | 634 | F=1.08 |

Notes: Market value, assets, sales in \$2004 millions. Employees in thousands. Standard errors in parentheses. P test assesses equality of pair-wise means of firm variables for complying and non-complying firms. ANOVA F-test assesses equality of means over all five firm variables for complying and non-complying firms.

APPENDIX B: STYLIZED FACTS

FIGURE B.1

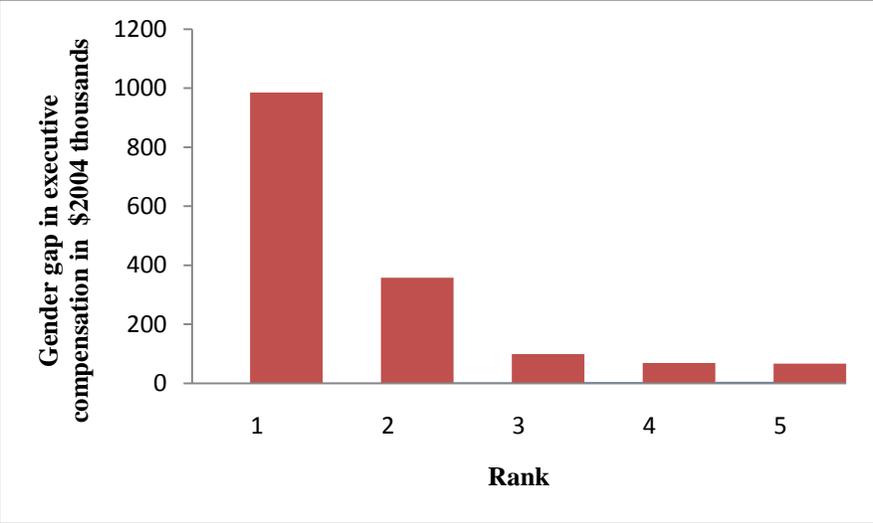
THE NUMBER OF WOMEN EXECUTIVES BY RANK



Note: Data from Execucomp database

FIGURE B.2

THE GENDER GAP IN EXECUTIVE COMPENSATION BY RANK



Note: Data from Execucomp database

APPENDIX C: THE 2003 CHANGES TO THE NYSE/NASD LISTING STANDARDS¹⁹

1 **Majority independent directors**

- The boards of directors for each listed company must have a majority of independent directors²⁰ and the definition of director has been made more stringent.
- Directors must meet regularly without management. The NYSE also requires that the name of the presiding director be disclosed in annual proxy statements so that interested parties know to whom they can address their concerns.

2 **Independent nominating committees**

- The nominating committee must comprise wholly of independent directors.
- The committee must adopt and publish a formal charter laying out the process for identifying and nominating qualified candidates. The NYSE also requires a formal performance evaluation of the nominating committee members.
- The committee has the authority and budget to retain an independent search firm to identify potential nominees.
- Nasdaq does not stipulate that companies must have nominating committees, but does require that a majority of independent directors recommend nominees. Nasdaq also allows one non-independent director to sit on a nominating committee of three or more for a maximum of two years, if this is disclosed in the annual proxy statement.

3 **Compensation Committee**

- The compensation committee must comprise wholly of independent directors.
- The committee itself or with other independent directors determines CEO compensation, based on the CEO performance evaluation, and recommends senior executive compensation to the board.
- The committee must publish a charter in the annual proxy that explains
 - its purpose and responsibility as well as the evaluation process for determining CEO compensation;
 - an annual performance evaluation of the compensation committee members.
- Nasdaq rules do not require companies to have compensation committees. However, compensation decisions for the CEO and other executives must be made either by an independent compensation committee or a majority of independent directors. The CEO may be present for voting on compensation for executive officers but not for the vote of his own compensation. Nasdaq also allows one non-independent director to sit on a compensation committee of three or more for a maximum of two years, if this is disclosed in the annual proxy statement.

19 US Securities and Exchange Commission, 2003

20 To be independent, a director must not be an employee of the firm, be related to an executive of the firm, must not have, or have a family member who has received more than \$100,000 in direct compensation from the firm in the past three years, must not be affiliated with or have a family member who is affiliated with the firm in the past three years

4 Audit Committee

- The audit committee must have at least three members and all must be independent.
- All members must be financially literate and one member must be a financial expert.
- A member sitting on the audit committee who sits on the committees of more than three boards must disclose the fact and explain why this does not diminish his capacity to serve.
- Audit committees must publish a charter in annual proxies and their websites that lays out the purpose and duties of the members. An audit committee report must be published and the financial matters discussed regularly in separate meetings with independent auditors and management.
- NYSE companies must have an internal audit function.
- Under exceptional circumstances Nasdaq allows one non-independent member to serve on the audit committee for no more than two years.

5 Other NYSE/NASD standards

- Shareholders must have the chance to vote on all equity compensation plans and any material revisions made to them, except when they are used as employment inducements.
- NYSE requires that companies publish on their website and their annual proxies the corporate governance guidelines and the charters of the committees.
- Companies must adopt a code of ethics.
- NYSE requires that the CEO certifies each year in the annual report that he is not aware of any violation of NYSE corporate governance listing standards. The CEO must notify the NYSE in writing when he becomes aware of any violation.
- The NYSE will issue a public reprimand letter to the company that violates the listing standards. Suspension and delisting continue to be the ultimate penalties.

6 Lead or presiding directors

- In September 2002 the Conference Board Blue-Ribbon Commission on Public Trust and Private Enterprise made several recommendations regarding executive compensation and corporate governance. Many of these were adopted in the NYSE/NASD listing standards. The Commission also recommended that the role of management and ownership be separated either by having a Chairman who is not a CEO or by having a separate “lead director” in addition to the Chairman.
- The NYSE standards also require a presiding director for executive non-management sessions.
- Many companies have taken this cue and appointed a lead or presiding director. This could substantially reduce the influence of the CEO/Chairman on setting the agenda and controlling information presented to the board.