

Is Disclosure an Effective Cleansing Mechanism? The Dynamics of Compensation Peer Benchmarking

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Firms routinely justify CEO compensation by benchmarking against companies with highly paid CEOs. We examine whether the 2006 regulatory requirement of disclosing compensation peers mitigated firms' opportunistic peer selection activities. We find that strategic peer benchmarking did not disappear after enhanced disclosure. In fact, it intensified at firms with low institutional ownership, low director ownership, low CEO ownership, busy boards, large boards, and non-intensive monitoring boards, and at firms with shareholders complaining about compensation practices. The effect is also stronger at firms with new CEOs. These findings call into question whether disclosure regulation can remedy potential problems in compensation practices. (*JEL* G34, J31, J33)

Changes in the level and dispersion of CEO compensation since the early 1990s have triggered an increasingly heated debate over whether current compensation practices primarily reflect the equilibrium outcome of the CEO

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labor market¹ or the power of entrenched CEOs.² One factor in this debate is the practice of compensation benchmarking in which firms justify their CEO's compensation by comparing it to the pay packages of a group of companies with highly paid CEOs. Firms rationalize this group by claiming that they compete for managerial talent with those selected peer companies.³ This paper examines the dynamics of the peer benchmarking process. Specifically, we investigate whether the 2006 regulation requiring firms to disclose their compensation peer group members has mitigated opportunistic firm behavior in benchmarking against self-selected peer companies with highly paid CEOs (Faulkender and Yang 2010; Bizjak, Lemmon, and Nguyen 2011).

Disclosure regulations like those enacted in 2006 have often been put into place during economic downturns (e.g., the Exchange Act and the Securities Act of 1933) or after corporate scandals (e.g., the Sarbanes-Oxley Act of 2002) to mitigate firms' opportunistic behavior. There is an extensive literature on the benefits, costs, and both intended and unintended consequences of disclosure regulation (Leuz and Wysocki 2008; Healy and Palepu 2001). In contrast to market solutions (voluntary disclosure), disclosure regulation is designed to create positive externalities and save costs in aggregate. However, it inevitably imposes direct compliance costs. Indirect costs, such as informing competitors of the firm's practices or trade secrets, often result as well. Moreover, mandating disclosure may decrease the usefulness of the information even though the quantity of available information increases. For example, Bailey et al. (2003) show that the imposition of Regulation Fair Disclosure made it more difficult to forecast earnings beyond the current quarter. In addition, Hermalin and Weisbach (2012) show that disclosure regulation may actually raise pay levels for senior executives, at least partially, to compensate them for the inconvenience caused by increased monitoring associated with enhanced disclosure.

Compensation disclosure is intended to make the compensation process at firms more transparent, force the board of directors to effectively monitor management, and prevent managers from setting their own pay.⁴ However, disclosed information on the compensation of peer CEOs may actually help

¹ For example, Murphy (2002), Murphy and Zbojnik (2004), Oyer (2004), Gabaix and Landier (2008), Edmans and Gabaix (2009), Edmans, Gabaix, and Landier (2009), Core and Guay (2010), Kaplan and Rauh (2011), and Baranchuk, MacDonald, and Yang (2011) argue that the scarcity of managerial talent and increasing importance of managerial skills largely explain observed changes in level and dispersion of CEO pay.

² For example, Bertrand and Mullainathan (2001), Bebchuk and Fried (2004), and Morse, Nanda, and Seru (2011) argue that CEO entrenchment and ineffective board monitoring are the causes of increased CEO pay.

³ See, for example, Bizjak, Lemmon, and Naveen (2008).

⁴ "They [the 2006 SEC amendments] are also intended to provide investors with a clearer and more complete picture of the compensation earned by a company's principal executive officer, principal financial officer and highest paid executive officers and members of its board of directors. In addition, they are intended to provide better information about key financial relationships among companies and their executive officers, directors, significant shareholders and their respective immediate family members." SEC final rules 33-8732a, August 29, 2006.

justify a CEO's demand for higher pay. Perry and Zenner (2001) show that the tax legislation in 1992 that capped the corporate income tax deduction of non-performance-related compensation at one million dollars (IRS tax code 162(m)) and the compensation disclosure rules enacted in 1993 caused dramatic *increases* in real compensation levels. The effect was a ratcheting up of executive compensation.⁵ Murphy (2011) reviews the legislative history of executive compensation over the past eighty years and finds that for the most part, "the regulations have generally been either ineffective or counterproductive."

In this paper, we examine the 2006 Securities and Exchange Commission (SEC) rule that requires firms to disclose compensation peer companies if they are used in determining executive compensation. Researchers have documented that even after controlling for characteristics that would likely capture the competitive forces of the managerial labor market, such as industry identification and relative size of the firm and its peer group members, the compensation level of the CEO at a potential peer company had significant incremental power in explaining the company's peer group memberships (Faulkender and Yang 2010; Bizjak, Lemmon, and Nguyen 2011).⁶ In other words, firms appear to be managing the benchmarking process by including companies with highly paid CEOs in their peer groups and omitting comparable companies with lower-paid CEOs. By doing this, firms can rationalize the high level of their CEO pay by claiming that they are paying the median compensation of their peer CEOs. Since the mandatory disclosure of compensation peer companies, investors have been informed about compensation peers, and firms have had ample time to alter their peer companies. Has enhanced disclosure mitigated the opportunistic behavior in peer selection? Or has enhanced disclosure actually increased peer selection biases and created an unintended consequence similar to that of IRS code 162(m)? That is the focus of this study.

The timing of the change in disclosure requirements makes it a useful setting for examining the effects of mandated disclosure. On August 29, 2006, the SEC issued a disclosure requirement that came into effect for fiscal years ending on or after December 15, 2006, according to which firms must state "Whether the registrant engaged in any benchmarking of total compensation, or any material element of compensation, identifying the benchmark and, if applicable,

⁵ Chidambaran and Prabhala (2011) show that stock option repricing regulation likewise had the unintended consequence of increasing executive compensation. In the context of the mutual fund industry, Carlin and Manso (2011) argue that attempts to educate investors may provide incentives for financial institutions to create more complex products and services that enable them to retain an informational advantage. Applying this idea to compensation disclosure, it may similarly be the case that heightened disclosure requirements incentivize firms to increase the complexity of their compensation practices in an attempt to overwhelm unsophisticated investors.

⁶ DiPrete, Eirich, and Pittinsky (2010) show that the effects of leapfrogging potentially explain a considerable fraction of the overall upward movement of executive compensation over a recent fifteen-year period. In contrast, Albuquerque, De Franco, and Verdi (2012) and Cadman and Carter (2009) argue that compensation peer benchmarking is consistent with the equilibrium outcomes of the CEO labor market.

its components (*including component companies* [emphasis added])” (SEC final rules 33-8732a, Item 402(b)(2)(xiv), August 29, 2006). Firms generally construct their peer groups and determine the compensation structure at the beginning of the fiscal year. Because the fiscal year of firms typically ends in December, most firms have already formed their compensation peer groups by March of that year;⁷ for 2006, this was well before the announcement of the change in the reporting requirement on August 29. Thus, the first year that we observe should be primarily composed of peer groups that were formed prior to the firm knowing that the names of the compensation peer companies would have to be disclosed. These observations therefore serve as a baseline for assessing firm behavior prior to the disclosure requirement.⁸ We follow the peer groups for the subsequent three years, during which boards of directors and their compensation committees had ample time to adjust peer companies away from those selected before the commencement of the disclosure rule. Analyzing the difference in peer groups selected prior to and those after enhanced disclosure arguably provides a natural experiment for assessing the effects of mandated disclosure.

Our empirical evidence suggests that firms did not generate less-biased peer groups after enhanced disclosure. Actually, if anything, firms tended to select peer companies with higher CEO pay than those selected in 2006. This was not merely the result of existing peers increasing their CEO’s pay more than unselected potential peers did. We find that firms actively added companies with higher CEO pay to their peer groups and dropped peer companies with lower CEO pay. These findings call into question the effectiveness of disclosure regulation to remedy potential problems in the pay-setting process.

Increased peer selection biases after enhanced disclosure is consistent with labor market theories of [Hermalin and Weisbach \(2012\)](#), [Acharya and Volpin \(2010\)](#), and [Hayes and Schaefer \(2009\)](#). [Hermalin and Weisbach \(2012\)](#) show theoretically that enhanced disclosure and the resulting improved monitoring can actually increase CEO compensation. Inclusion of highly paid CEOs in compensation peer groups is then needed for justifying the increased level of required pay. [Acharya and Volpin \(2010\)](#) argue that a firm may be forced by competing firms to adopt opportunistic compensation practices to attract or retain scarce managerial talent. The revelation of the prevalence of opportunistic peer selection serves as the conduit for this negative externality. Furthermore, since the peer group composition became available to investors,

⁷ We gained this knowledge from private communications with James F. Reda & Associates (a compensation consulting firm) and a retired CEO who had served on the boards of several large U.S. corporations.

⁸ The enhanced disclosure rule was proposed on January 27, 2006, followed by a period of six months during which comments were solicited. It is possible that some disclosing firms took into account the uncertainty of regulation and selected their 2006 peer groups cautiously. The details of the final rule, the lack of enforcement, and the observed prevalence of selection issues among other firms may have encouraged those firms to become more aggressive in peer selection in subsequent years. This interpretation is consistent with our conclusion of the ineffectiveness of the disclosure regulation. We thank an anonymous referee for pointing this out.

some firms may find it rational to benchmark against aspirational peer companies in CEO compensation to signal high CEO ability, especially when the CEO is new and his ability is yet to be proved (Hayes and Schaefer 2009). These pressures for selecting better-paid peers after enhanced disclosure could be offset by effective external enforcement mechanisms (which did not exist in our sample period) or strong internal corporate governance.

We next examine whether strong corporate governance at firms could counterbalance the pressures for engaging in opportunistic peer selection. First, we examine whether firms that received significant shareholder complaints about their compensation practices selected less-biased peers as a result. Had enhanced disclosure helped mitigate opportunistic activities in peer selection, we would observe some improvement in peer selection at those firms. We find that both before and after enhanced disclosure, firms that received significant shareholder complaints managed their peer selection more than firms that did not receive such complaints. Moreover, shareholder resolutions did not improve peer benchmarking practices after enhanced disclosure.

We then examine the effects of ownership structure and board characteristics on peer selection. If high ownership stakes by institutional investors improve monitoring (Hartzell and Starks 2003), we expect to observe less deterioration in the peer benchmarking practices at firms with higher (concentration of) institutional holdings. Indeed, we find that those firms did not exhibit an increase in selection biases toward peer companies with highly paid CEOs, unlike firms with lower institutional holdings. Similar patterns are shown for director ownership and CEO ownership. We also find that the increased opportunistic behavior in peer benchmarking was limited to firms whose boards of directors were not intensive monitors (Faleye, Hoitash, and Hoitash 2011a), firms with directors “busy” serving on the boards of multiple firms (Fich and Shivdasani 2006), and firms with large boards.

Interestingly, when we examine subsamples divided by several governance measures related to CEO tenure (Hermalin and Weisbach 1998; Coles, Daniel, and Naveen 2008b), we observe convergence of strategic peer selection. In particular, we find that selection biases in peer group formation were much lower at firms with new CEOs than at firms with incumbent CEOs prior to enhanced disclosure. Three years later, firms with new CEOs exceeded those with incumbent CEOs in selecting peer companies with highly paid CEOs. These findings are consistent with the externality and signaling theories of Acharya and Volpin (2010) and Hayes and Schaefer (2009).

Ultimately, to judge whether disclosure regulation is effective, one must examine whether it benefits shareholders. It is possible that after enhanced disclosure firms strategically constructed their peer groups to justify higher levels of pay provided to better-performing CEOs. We therefore test whether higher peer selection biases forecast higher industry-adjusted returns. We find no empirical support for that hypothesis.

The rest of the paper is organized as follows: Section 1 sets up the empirical framework, and Section 2 details the data. Section 3 examines the link over time between the membership in compensation peer groups and the level of CEO compensation of a potential peer company in a multivariate probit framework. These findings are reexamined using a propensity score matching approach in Section 4. In Section 5, we employ numerous alternative specifications to verify the robustness of our findings. Section 6 focuses on changes to peer groups (added and dropped peers) over our four-year sample period. In Section 7, we examine how corporate governance characteristics affect the dynamics of peer selection, and Section 8 concludes.

1. Empirical Framework

Existing work on compensation peer benchmarking (Faulkender and Yang 2010; Bizjak, Lemmon, and Nguyen 2011) shows that prior to the mandatory disclosure of compensation peer group members, firms chose compensation peers that paid their CEOs more generously, even after controlling for managerial labor market factors. We hypothesize that if disclosure regulation serves the regulator's purpose to shape corporate behavior,

H1a: Compensation peer membership will become less sensitive to CEO pay at a potential peer company in the years following the adoption of the new disclosure rule.

Alternatively, Hermalin and Weisbach (2012) show theoretically that enhanced disclosure and the resulting improved monitoring can increase executive compensation for two reasons. First, managers share some of the benefits of improved monitoring if they have any bargaining power. Second, even absent bargaining power, managerial compensation may still rise; given the increased costs placed on CEOs from enhanced monitoring, offsetting compensation will be required, leading to increases in CEO pay. Thus, governance reforms that impose greater disclosure can actually increase CEO compensation. To justify the higher level of required CEO compensation after enhanced disclosure, firms need to select peer companies with better-paid CEOs even though such required level of pay may not be realized in a period of great recession and public outrage on high CEO pay.

Moreover, the board of directors could observe the compensation peer companies opportunistically selected by other firms following enhanced disclosure. Contrary to the regulator's intentions to eliminate the bias in selecting peers, firms that did not use CEO pay at a potential peer company as a key factor in compiling their peer groups may begin to mimic other firms by including companies with highly paid CEOs in their peer groups to signal the quality of the firm (Hayes and Schaefer 2009) or to justify the level of CEO compensation needed to attract the CEO (Acharya and Volpin 2010). Such unintended consequences of compensation disclosure were previously

documented by [Perry and Zenner \(2001\)](#) in a similar context; real compensation levels increased dramatically following enhanced compensation disclosure and the enactment of 162(m) in 1993. Thus, if the unintended consequence of the regulation dominates, we hypothesize:

H1b: Compensation peer membership will become more sensitive to CEO pay at a potential peer company in the years following the adoption of the new disclosure rule.

Because there are arguments for both increases and decreases in the sensitivity of peer group membership to CEO pay of a potential peer in the years following enhanced disclosure, we essentially test the null hypothesis of no change in peer pay sensitivity and allow the data to inform us as to which hypothesis dominates.

2. Data

Beginning December 15, 2006, the SEC required firms to disclose in their proxy statements the companies against which they benchmark executive compensation. For the first two years after this reporting requirement went into effect (fiscal year ending December 2006 to November 2008), we collect compensation peers disclosed by firms in both the S&P 500 and the S&P MidCap 400 (hereafter called the *S&P 900*) from the proxy statements firms filed with the SEC at the EDGAR database.⁹ For the latter two years of our sample (fiscal year ending December 2008 to November 2010), we rely upon data in ExecComp Analytics provided by Institutional Shareholder Services (ISS, formerly RiskMetrics). We exclude firms in the financial services industry (SIC codes between 6000 and 7000) from our analysis due to the rapidly changing regulatory environment for these financial firms over our sample period.¹⁰ This results in a sample of 2,066 firm-years covering 763 firms.

To evaluate how disclosure has affected the benchmarking process, one must not only ascertain the companies chosen to be included in the benchmarking set, but also examine the set of potential peers that were not selected. Following [Faulkender and Yang \(2010\)](#), we confine our set of potential peers to companies in the S&P 900. Our approach is to examine for each year which of those 899

⁹ For example, in 2007, Applied Materials, Inc., used the following twenty-three peer companies: Advanced Micro Devices, Inc.; LSI Logic Corp.; Agilent Technologies, Inc.; Lucent Technologies, Inc.; Analog Devices, Inc.; Marvell Technology Group Ltd.; Apple Computer, Inc.; Maxim Integrated Products, Inc.; Broadcom Corp.; Motorola, Inc.; Cisco Systems, Inc.; Nortel Networks Corp.; Dell, Inc.; Novellus Systems, Inc.; Flextronics International Ltd.; Oracle Corp.; Freescale Semiconductor, Inc.; Qualcomm, Inc.; Intel Corporation; Sun Microsystems, Inc.; KLA Tencor Corp.; Texas Instruments, Inc.; and Lam Research Corp. Percentages used to benchmark salary, bonuses, and equity-based compensation were the 50th, 65th, and 75th percentiles, respectively.

¹⁰ For example, on February 4, 2009, outrage at pay for failure on Wall Street triggered a cap of \$500,000 on annual salaries for top executives at companies receiving TARP money. Our conclusion does not change when we include financial firms, even though their peer selection biases decreased in 2008 and 2009.

potential peers (self-excluded) were actually selected to be included in the firm's compensation peer group and why.¹¹

Our primary objective is to determine whether the opportunistic behavior in the benchmarking process documented in the existing literature continued after the SEC's mandate to list compensation peers in firms' proxy statements. Has sunshine cleansed this process, as intended by the SEC? Answering this question requires supplementing the peer group observations with information on the financial condition, industry classification, and CEO compensation at both the firm and the set of potential peers. Measures of each firm's size, leverage, profitability, business and geographic segments, and industry are obtained from Compustat and stock return and volatility from the Center for Research in Security Prices (CRSP), while information on the compensation levels and structure comes from ExecuComp. Because peer selection takes place at the beginning of the year and firms use information available at the time of selecting peers, we lag these firm characteristics measures by one year when examining the characteristics of potential peers. This timing convention is used throughout the paper. A sample of 1,832,679 firm-potential peer-year matches with a total of 29,461 selected peers (1.6%) emerges after compiling the data necessary to perform our analysis. Summary statistics for sample firms and selected peers are presented in Panel A of Table 1.

The median selected peer for our sample firms earned a salary of \$960,000 at both mean and median. Total direct compensation (TDC1) had a mean of \$7.519 million and a median of \$6.453 million. The average number of chosen peer companies was 18.75, and the median was 16. Chosen peer companies were similar to disclosing firms in terms of industry, size, performance, risk, visibility, and CEO responsibility. Approximately half of the chosen peers were in the firm's two-digit industry or within 50% to 200% of the firm's sales. Three quarters of firms with multiple business (geographic) segments selected peer companies with multiple business (geographic) segments. Moreover, for an S&P 500 constituent firm, 88.15% of its chosen peers were also S&P 500 components. When the firm's CEO served as the chairman of the board, 72.54% of chosen peers also had chairman CEOs.

As we are interested in how peer selection has changed over time, in Panel B of Table 1 we provide summary statistics for disclosing firms and their chosen peers in the first year (fiscal year ending December 2006 to November 2007, shortened as *2006*) and the most recent year (fiscal year ending December 2009 to November 2010, shortened as *2009*). The average size of the compensation

¹¹ The omission of selected peers outside the S&P 900 universe may appear to help us in finding the peer selection biases in each year. Keep in mind that we are comparing selected peers in the S&P 900 universe with similar but unselected peers in the same universe. Had we included all selected small peers, we would have had to add even more small companies that were not selected by our disclosing firms into the extended universe of potential peers. Actually, when we include all S&P 1500 companies as potential peers for our disclosing firms—that is, if we compare the pay of each selected peer within the S&P 1500 universe with a similar but unselected potential peer in the S&P 1500 universe—peer selection biases become slightly stronger.

Table 1
Descriptive statistics of the matched pairs of disclosing firms and chosen peers

Panel A: Entire Sample

	Median	Mean	Standard Deviation
Number of peers	16.00	18.75	17.76
Chosen peer median salary (millions of dollars)	0.960	0.960	0.267
Chosen peer median total pay (millions of dollars)	6.453	7.519	4.166
Dummy (WPS within one SD)	57.89%	55.35%	23.24%
Match (Two-digit industry)	41.67%	45.57%	31.71%
Match (Three-digit industry)	20.00%	30.29%	29.41%
Dummy (Sales within 50–200%)	54.55%	54.12%	21.90%
Dummy (Assets within 50–200%)	45.45%	43.05%	23.72%
Dummy (Market cap within 50–200%)	37.75%	36.60%	22.03%
Absolute difference in Ln(Sales)	0.644	0.708	0.342
Dummy (ROA within one SD & positive)	30.77%	32.23%	22.46%
Dummy (ROA within one SD & negative)	33.33%	33.98%	23.18%
Dummy (RET within one SD & positive)	31.58%	32.80%	21.90%
Dummy (RET within one SD & negative)	33.33%	34.36%	22.62%
Dummy (Volatility within one SD)	71.43%	65.70%	26.96%
Match (Multi business segments)	80.00%	75.90%	19.80%
Match (Single business segment)	41.67%	43.31%	22.17%
Match (Multi geo-segments)	85.71%	80.47%	19.27%
Match (Single geo-segment)	57.89%	56.88%	27.56%
Peer is Dow 30 if firm is Dow 30	45.45%	44.29%	22.80%
Peer is Dow 30 if firm is not Dow 30	0.00%	4.34%	10.05%
Peer is S&P 500 if firm is S&P 500	94.06%	88.15%	15.12%
Peer is S&P MidCap 400 if firm is S&P MidCap 400	30.43%	32.38%	20.52%
Peer CEO is chair if firm CEO is chair	74.19%	72.54%	17.07%
Peer CEO is not chair if firm CEO is not chair	30.77%	31.91%	18.84%
Dummy (Talent flows)	0.00%	10.46%	21.55%
Dummy (Peer selected firm)	25.00%	29.07%	22.20%

Panel B: 2006 vs. 2009 for Firms in Both Years of the Sample

	2006	2009	Difference
Number of peers	18.68	19.92	1.24*
Chosen peer median salary (millions of dollars)	0.914	1.004	0.09***
Chosen peer median total pay (millions of dollars)	6.907	7.410	0.50**
Dummy (WPS within one SD)	53.08%	56.68%	3.60***
Match (Two-digit industry)	43.57%	44.43%	0.86%
Match (Three-digit industry)	29.93%	28.70%	-1.23%
Dummy (Sales within 50–200%)	49.71%	54.35%	4.65***
Dummy (Assets within 50–200%)	45.14%	50.29%	5.16***
Dummy (Market cap within 50–200%)	39.37%	39.25%	-0.13%
Absolute difference in Ln(Sales)	0.723	0.719	-0.004
Dummy (ROA within one SD & positive)	31.19%	30.82%	-0.37%
Dummy (ROA within one SD & negative)	33.88%	30.07%	-3.82***
Dummy (RET within one SD & positive)	32.13%	32.22%	0.10%
Dummy (RET within one SD & negative)	32.47%	35.89%	3.42***
Dummy (Volatility within one SD)	64.76%	49.98%	-14.79***
Match (Multi business segments)	73.72%	76.56%	2.84*
Match (Single business segment)	43.30%	42.58%	-0.72%
Match (Multi geo-segments)	78.44%	81.79%	3.35**
Match (Single geo-segment)	55.35%	57.88%	2.53%
Peer is Dow 30 if firm is Dow 30	48.83%	43.82%	-5.02%
Peer is Dow 30 if firm is not Dow 30	4.82%	3.95%	-0.86%
Peer is S&P 500 if firm is S&P 500	87.88%	87.84%	-0.04%
Peer is S&P MidCap 400 if firm is S&P MidCap 400	26.75%	32.32%	5.57%

(continued)

Table 1
Continued

Panel B: 2006 vs. 2009 for Firms in Both Years of the Sample

	2006	2009	Difference
Peer CEO is chair if firm CEO is chair	75.35%	75.58%	0.24%
Peer CEO is not chair if firm CEO is not chair	26.98%	29.28%	2.31%
Dummy (Talent flows)	10.00%	9.23%	-0.77%
Dummy (Peer selected firm)	26.82%	29.06%	2.23%*

In Panel A, summary statistics are provided for each firm-year in the sample. In Panel B, the averages for each variable are provided for the first and fourth years for the subsample of 431 firms that are in the sample in both years. *Number of peers* is the number of chosen compensation peers. *Total pay* is *TDC1* in the ExecuComp database. *Median chosen peer* pay values are the statistics for the median among the selected peers for that corresponding pay variable. For each of the remaining variables, we report summary statistics on the average value over all selected peers for each disclosing firm. The remaining variables are tabulated as the percentage of the selected peers of each firm-year that meet the following criteria. *Dummy (WPS within one Standard Deviation)* indicates the WPS (*Wealth to Performance Sensitivity*; see [Edmans, Gabaix, and Landier 2009](#)) of the potential peer is within one sample standard deviation of the value for the firm. *Match (Two-digit industry)* and *Match (Three-digit industry)* are one if a chosen peer in the same two-digit and three-digit industry of the firm and zero otherwise, respectively. *Dummy (Size within 50–200%)* is one if the sizes (*Sales, Assets, and Market Cap*) of the firm and peer are within 50% to 200% of each other and zero otherwise. *Absolute sales difference* is the absolute value of the difference in the natural logs of sales for the firm and its peer. *Dummy (ROA within one SD & positive)* is one if the firm had an ROA in the previous year that was higher than but within one sample standard deviation of the potential peer's value. *Dummy (ROA within one SD & negative)* is one if the firm had an ROA in the previous year that was lower than but within one sample standard deviation of the potential peer's value. *Dummy (RET within one SD & positive)* and *Dummy (RET within one SD & negative)* are similarly defined for stock returns. *Dummy (Volatility within one SD)* is one if the realized equity volatility of the firm over the previous fiscal year was within one sample standard deviation of its peer. *Match (Multi bus-segments)*, *Match (Single bus-segment)*, *Match (Multi geo-segments)*, and *Match (Single geo-segment)* indicate whether both the firm and its peer have multiple business segments, only a single business segment, multiple geographic segments, and only a single geographic segment, respectively. *Dummy (Talent flows)* is one if at least one of the top five executives moved between the firm and any company in the same four-digit SIC code as the selected peer during 1992–2005. *Dummy (Peer selected firm)* is one if the peer company includes the disclosing firm in its compensation peer group of that year, and zero otherwise. All dollar values are in millions of U.S. dollars. In Panel B, ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

peer groups increased from 18.68 to 19.92.¹² Chosen peers were more similar to disclosing firms in size in 2009 than in 2006: more than half of chosen peers in 2009 were within the range of 50% to 200% of the disclosing firms in terms of sales and assets. This finding is consistent with the evidence in [Bizjak, Lemmon, and Nguyen \(2011\)](#) that chosen peers were more similar to disclosing firms in sales in 2007 than in 2006. In addition, in 2009 firms were more likely to select companies with similar wealth to performance sensitivity and those that had chosen them as peer group members. As a preview of the pay sensitivity results presented below, the average total pay of the median chosen peer increased by \$503,000 between 2006 and 2009. Contemporaneously, the average total pay of S&P 900 CEOs fell by \$459,000 (untabulated statistic). Peer groups seem to be more biased toward companies with higher CEO compensation in 2009 than in 2006.

¹² In the later years of our sample period, more firms benchmarked executive compensation against a long list (often a few hundred) of peer companies included in the surveys of compensation consulting firms (e.g., Towers Perrin, Mercer). We exclude those peer groups that did not disclose the names of member companies.

3. Multivariate Analysis

Peer selection is determined by a number of economic factors that capture the similarities between the firm and its potential peer along dimensions relevant for the CEO labor market: industry, size, risk, performance, visibility, and CEO responsibility. Specifically, we use the discrete-choice regression developed by [Faulkender and Yang \(2010\)](#), adding fourteen variables:

$$\begin{aligned}
 \text{Chosen as peer}_{ij} = & \Phi \left[\alpha + \beta_1 * \text{Dummy}(\text{WPS within one Standard Deviation}_{ij}) \right. \\
 & + \beta_2 * \text{Match}(\text{Two-digit industry}_{ij}) \\
 & + \beta_3 * \text{Match}(\text{Three-digit industry}_{ij}) \\
 & + \beta_4 * \text{Dummy}(\text{Sales within 50–200}\%_{ij}) \\
 & + \beta_5 * \text{Dummy}(\text{Assets within 50–200}\%_{ij}) \\
 & + \beta_6 * \text{Dummy}(\text{Market Cap within 50–200}\%_{ij}) \\
 & + \beta_7 * \text{Absolute difference in Ln}(\text{Sales}_{ij}) \\
 & + \beta_8 * \text{Dummy}(\text{ROA higher, within one SD}_{ij}) \\
 & + \beta_9 * \text{Dummy}(\text{ROA lower, within one SD}_{ij}) \\
 & + \beta_{10} * \text{Dummy}(\text{Equity return higher, within one SD}_{ij}) \\
 & + \beta_{11} * \text{Dummy}(\text{Equity return lower, within one SD}_{ij}) \\
 & + \beta_{12} * \text{Dummy}(\text{Volatility within one SD}_{ij}) \quad (1) \\
 & + \beta_{13} * \text{Match}(\text{Multi business segments}_{ij}) \\
 & + \beta_{14} * \text{Match}(\text{Single business segment}_{ij}) \\
 & + \beta_{15} * \text{Match}(\text{Multi geo-segments}_{ij}) \\
 & + \beta_{16} * \text{Match}(\text{Single geo-segment}_{ij}) \\
 & + \beta_{17} * \text{Match}(\text{Dow 30}_{ij}) \\
 & + \beta_{18} * \text{Match}(\text{S\&P 500}_{ij}) \\
 & + \beta_{19} * \text{Match}(\text{S\&P MidCap 400}_{ij}) \\
 & + \beta_{20} * \text{Match}(\text{CEO is chair}_{ij}) \\
 & + \beta_{21} * \text{Match}(\text{CEO is not chair}_{ij})
 \end{aligned}$$

$$\begin{aligned}
& + \beta_{22} * \text{Dummy}(\text{Talent flow}_{ij}) \\
& + \beta_{23} * \text{Dummy}(\text{Peer selected firm}_{ij}) \\
& + \beta_{24} * (\text{Number of peers}_i) + \varepsilon_{ij}
\end{aligned}$$

where the dependent variable takes the value of one if the potential peer j is chosen to be included in the compensation peer group of firm i and zero otherwise, and Φ is the CDF of the standard normal distribution.

Independent variables include whether the firm and the potential peer were similar in total equity incentives as measured by Wealth to Performance Sensitivity (WPS);¹³ whether they were in the same industry and similar in size; whether both of them were Dow (DJIA) 30 members, S&P 500 index components, and S&P MidCap 400 index components; whether they matched chairman CEO status; whether any of the top five executives moved between the firm and its potential peer during the time period of 1992 to 2005; and whether the potential peer company selected the firm as its compensation peer in the corresponding fiscal year.¹⁴

Four variables incorporate performance similarities between the firm and its potential peer to capture the possibility that performance benchmarking coincides with compensation benchmarking. Specifically, we include dummy variables indicating whether the return on assets (ROA) and stock return of the firm in the previous year was higher (lower) than that of the potential peer but the difference is within one standard deviation of our sample firms. In addition, five measures of relative risk or organizational complexity are included in the specification: whether the realized equity volatility of the potential peer over the previous fiscal year was within one sample standard deviation of the firm, and whether both the firm and the potential peer have multiple business segments, a single business segment, multiple geographic segments, and a single geographic segment. These overlaps in business structure are likely to capture similarities in risk and organizational complexity that should influence executive compensation. In estimating the standard errors, we follow Petersen (2009) and cluster them at both the firm and peer levels, because errors in estimating peer group inclusion are likely to be correlated for a particular firm as well as for a particular peer. We also include year fixed effects in the regression.

¹³ WPS measures the change in CEO wealth (including newly granted equity, stock holdings, and vested and unvested stock options) for a 100% increase in firm value, scaled by the CEO's annual compensation. It is provided by Alex Edmans using the approach developed by Core and Guay (2002); see Edmans, Gabaix, and Landier (2009, <http://finance.wharton.upenn.edu/~aedmans/data.html>).

¹⁴ We are cautious with regard to the interpretation of the coefficient on this variable. On one hand, the fact that the potential peer selected the firm may indicate that there are similarities between the potential peer and firm not captured by our control variables. On the other hand, a small peer company may select a large disclosing firm to be its own compensation peer reflecting the aspiration to attract talent from that firm. Such aspirations are unlikely symmetric and may generate a size bias toward matching selected peers to smaller potential peers that pay their CEOs less when we use this specification in the propensity matching model estimated in Section 4. Ultimately, our results are robust to the exclusion of this *peer selected firm indicator*.

The result of this baseline estimate for all four years is in the first column of Table 2.

As previously documented, industry overlap and size similarities were important factors in explaining peer group memberships. As the size similarity increased, potential peers were significantly more likely to be included in the compensation peer group. We also find that a potential peer with similar compensation structure, performance, and risk was more likely to be included in the peer group. Furthermore, firms with chairman CEOs chose peer companies with chairman CEOs. Dow 30 firms had a preference for including other Dow 30 companies in their peer group, and likewise S&P 500 firms for choosing other S&P 500 companies, even after controlling for size similarity. Moreover, past exchanges of top executives with the firm increased a company's chance of being included in the firm's peer group.

Ultimately, our question is whether firms continued managing the pay-setting process by including in the compensation peer groups companies with high CEO compensation, after controlling for similarities between firms and potential peers in other dimensions. Thus, we add total CEO compensation at the potential peer in the prior year (to ensure that the firm had that information at the time of forming its peer group) to our multivariate specification. The result contained in the second column of Table 3 shows that firms continued including companies with higher CEO compensation, all else equal, in their peer groups over the four-year sample period. Economically, an increase of one standard deviation in CEO compensation increases the likelihood of peer group membership for a company that is similar to the firm in size but not in the firm's two-digit industry from 5.85% to 7.84%—a 34% increase!¹⁵

To track how the opportunistic behavior in peer selections has changed over time, we alter the specification above to allow the sensitivity to CEO pay at a potential peer to differ each year. If the intent of the SEC's new disclosure rule were achieved, we would expect to observe a significant decline in the sensitivity of peer selection to CEO compensation at the potential peer company over the four-year period of our sample. The results of this specification are presented in the third column of Table 2.

The results indicate that the management of compensation peer groups has actually intensified. The estimated coefficient of peer CEO compensation was higher in 2007, 2008, and 2009 than in 2006. The difference between 2006 and 2009 is statistically significant at the 1-percent level. Recall that the change in SEC disclosure requirements was made in August 2006 and was implemented

¹⁵ Other assumptions are: WPS was within one standard deviation; the firm had a higher ROA and a higher equity return (within one standard deviation) than the potential peer; volatility was within one standard deviation; both the firm and the potential peer have a single business and geographic segment; both are S&P 500 constituents; both CEOs are chairman of the board; no exchanges of top executives occurred between the firm and its potential peer; the potential peer did not include the firm in its own compensation peer group; and the firm had eighteen peers in its compensation peer group. The average and standard deviation of $\text{Ln}(\text{peer total pay})$ are 1.6 and 0.952, respectively, where total pay is measured in millions of dollars.

Table 2
Multivariate probit regressions of peer group selection

Model	(1)	(2)	(3)
Ln (Peer total pay)		0.161*** (0.015)	
Ln (Peer total pay) in 2006			0.128*** (0.016)
Ln (Peer total pay) in 2007			0.164*** (0.018)
Ln (Peer total pay) in 2008			0.189*** (0.018)
Ln (Peer total pay) in 2009			0.179*** (0.022)
Dummy (WPS within one SD)	0.067*** (0.012)	0.040*** (0.012)	0.040*** (0.012)
Match (Two-digit industry)	0.911*** (0.030)	0.930*** (0.031)	0.930*** (0.031)
Match (Three-digit industry)	0.511*** (0.037)	0.511*** (0.036)	0.512*** (0.036)
Dummy (Sales within 50–200%)	0.059*** (0.013)	0.061*** (0.013)	0.061*** (0.013)
Dummy (Assets within 50–200%)	0.145*** (0.011)	0.152*** (0.011)	0.152*** (0.011)
Dummy (Market cap within 50–200%)	0.023** (0.011)	0.033*** (0.011)	0.033*** (0.011)
Absolute difference in Ln(Sales)	−0.313*** (0.011)	−0.319*** (0.010)	−0.320*** (0.010)
Dummy (ROA within one SD & positive)	0.032** (0.016)	0.031* (0.016)	0.030* (0.016)
Dummy (ROA within one SD & negative)	0.122*** (0.014)	0.117*** (0.014)	0.116*** (0.014)
Dummy (RET within one SD & positive)	0.084*** (0.011)	0.094*** (0.011)	0.093*** (0.011)
Dummy (RET within one SD & negative)	0.099*** (0.011)	0.099*** (0.011)	0.099*** (0.011)
Dummy (Volatility within one SD)	0.119*** (0.011)	0.117*** (0.011)	0.117*** (0.011)
Match (Multi business segments)	0.133*** (0.017)	0.124*** (0.017)	0.124*** (0.017)
Match (Single business segment)	0.164*** (0.029)	0.173*** (0.029)	0.173*** (0.029)
Match (Multi geo-segments)	0.189*** (0.018)	0.184*** (0.018)	0.184*** (0.018)
Match (Single geo-segment)	0.177*** (0.022)	0.188*** (0.022)	0.173*** (0.029)
Match (Dow 30 membership)	1.288*** (0.078)	1.202*** (0.078)	1.199*** (0.078)
Match (S&P 500 membership)	0.359*** (0.021)	0.294*** (0.021)	0.292*** (0.021)
Match (S&P MidCap 400 membership)	0.000 (0.020)	0.047** (0.020)	0.047** (0.020)
Match (CEO is chair)	0.084*** (0.013)	0.070*** (0.013)	0.071*** (0.013)
Match (CEO is not chair)	−0.017 (0.015)	−0.003 (0.015)	−0.004 (0.015)
Dummy (Talent flows)	0.490*** (0.034)	0.504*** (0.034)	0.505*** (0.034)
Dummy (Peer selected firm)	1.303*** (0.026)	1.296*** (0.027)	1.295*** (0.027)

(continued)

Table 2
Continued

Model	(1)	(2)	(3)
Number of peers	0.007*** (0.000)	0.007*** (0.000)	0.007*** (0.000)
Year fixed effects	Yes	Yes	Yes
Number of observations	1,832,679	1,825,058	1,825,058
Pseudo <i>R</i> -squared	0.352	0.358	0.358

The dependent variable is one if a potential peer (Standard & Poor's [S&P] 500 and S&P MidCap 400) is chosen as a compensation peer by a disclosing firm and zero otherwise. *Peer total pay* (TDC1) is from the matching year and is measured in millions of dollars. We use $\ln(\text{Peer total pay})$ in the regression. *Match (Dow 30 membership)*, *Match (S&P 500 membership)*, and *Match (S&P 400 MidCap membership)* are one when both the firm and its potential peer are Dow 30 members, S&P 500 index components, and S&P MidCap 400 index components, respectively, and zero otherwise. *Match (CEO is chair)* is one when CEOs of both the firm and its potential peer are chairmen of the boards of directors; and *Match (CEO is not chair)* is one when neither CEO is chairman. All other variables are defined in Table 1. We winsorize compensation variables at the 1st and the 99th percentiles. Standard errors reported in parentheses are clustered at both the disclosing firm and potential peer level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

for the fiscal year ending after December 15, 2006, while peer companies were selected early in the fiscal year, generally in the first quarter. Therefore, most of the 2006 peer groups were constructed before the SEC imposed the change in disclosure requirement. Thus, peer groups in 2006 should reflect the peer benchmarking activity of firms prior to knowing that sunshine would be cast on the benchmarking practice. Every year thereafter, firms were fully aware of the new disclosure requirement and had the opportunity to modify their peer groups should they be concerned about disclosing the identities of their peer companies. However, rather than disappearing, if anything, the opportunistic behavior in peer selection was intensified.

This finding does potentially suffer from a misspecification problem if disclosure altered the sensitivities of peer membership to other characteristics. Because we force the coefficients of all other characteristics to be the same over the four-year period, it could be the case that firms became better at matching on size, industry, performance, risk, and complexity after the change in disclosure, but, since we force the sensitivities to be the same, the change spuriously loaded on CEO compensation. To address this potential concern, in Table 3 we provide the results of separately estimating the choice equation given in the second column of Table 2 for each year, allowing the coefficients on all other control variables to vary over time. Contrary to the regulatory objective, we again find that the sensitivity of peer membership to CEO compensation at a potential peer increased after the SEC mandated disclosure of compensation peers.

Selecting peer companies with higher-paid CEOs does not necessarily translate into pay ratcheting if firms that select more biased peers over time also lower the benchmarks used for determining CEO pay. We examine this possibility and find that in each year of the four-year sample period, more than 98% of disclosing firms benchmarked their CEO pay against the median or higher percentiles of the CEO pay of their peer companies. The average benchmark was 56.4% in 2006 and 56.1% in 2009, while the median stayed

Table 3
Multivariate probit regressions of peer group selection year by year

Model	2006	2007	2008	2009
Ln (Peer total pay)	0.132*** (0.017)	0.154*** (0.018)	0.202*** (0.019)	0.185*** (0.024)
Dummy (WPS within one SD)	0.029* (0.016)	0.061*** (0.016)	0.072*** (0.019)	0.021 (0.018)
Match (Two-digit industry)	0.895*** (0.034)	0.932*** (0.034)	0.972*** (0.037)	0.956*** (0.036)
Match (Three-digit industry)	0.578*** (0.041)	0.566*** (0.041)	0.487*** (0.045)	0.470*** (0.044)
Dummy (Sales within 50–200%)	0.000 (0.016)	0.062*** (0.019)	0.043** (0.021)	0.113*** (0.020)
Dummy (Assets within 50–200%)	0.126*** (0.015)	0.175*** (0.014)	0.098*** (0.018)	0.178*** (0.016)
Dummy (Market cap within 50–200%)	0.042*** (0.015)	0.063*** (0.014)	0.002 (0.018)	0.025* (0.015)
Absolute difference in Ln(Sales)	-0.365*** (0.015)	-0.315*** (0.015)	-0.380*** (0.017)	-0.277*** (0.014)
Dummy (ROA within one SD & positive)	-0.008 (0.024)	0.022 (0.022)	0.056*** (0.021)	0.061*** (0.021)
Dummy (ROA within one SD & negative)	0.110*** (0.021)	0.133*** (0.021)	0.125*** (0.021)	0.107*** (0.020)
Dummy (RET within one SD & positive)	-0.200 (0.149)	-0.381** (0.151)	0.076*** (0.020)	0.090*** (0.021)
Dummy (RET within one SD & negative)	-0.216** (0.097)	-0.136 (0.144)	0.118*** (0.019)	0.101*** (0.021)
Dummy (Volatility within one SD)	0.155*** (0.020)	0.153*** (0.019)	0.157*** (0.020)	0.070*** (0.016)
Match (Multi business segments)	0.133*** (0.020)	0.136*** (0.019)	0.104*** (0.021)	0.092*** (0.021)
Match (Single business segment)	0.185*** (0.036)	0.196*** (0.038)	0.197*** (0.038)	0.147*** (0.036)
Match (Multi geo-segments)	0.234*** (0.023)	0.147*** (0.020)	0.220*** (0.024)	0.177*** (0.021)
Match (Single geo-segment)	0.177*** (0.029)	0.195*** (0.024)	0.217*** (0.030)	0.145*** (0.030)
Match (Dow 30 membership)	1.257*** (0.088)	1.285*** (0.093)	1.003*** (0.113)	1.102*** (0.121)
Match (S&P 500 membership)	0.276*** (0.024)	0.340*** (0.024)	0.231*** (0.025)	0.253*** (0.030)
Match (S&P MidCap 400 membership)	0.050* (0.027)	0.046* (0.025)	0.067** (0.028)	0.054** (0.025)
Match (CEO is chair)	0.031 (0.018)*	0.068*** (0.018)	0.049** (0.021)	0.089*** (0.019)
Match (CEO is not chair)	0.041 (0.027)	0.004 (0.021)	-0.001 (0.020)	-0.027 (0.024)
Dummy (Talent flows)	0.504*** (0.042)	0.507*** (0.039)	0.468*** (0.042)	0.507*** (0.045)
Dummy (Peer selected firm)	1.316*** (0.034)	1.139*** (0.038)	1.426*** (0.035)	1.336*** (0.032)
Number of peers	0.012*** (0.000)	0.006*** (0.000)	0.025*** (0.001)	0.020*** (0.000)
Intercept	-3.153*** (0.052)	-3.180*** (0.054)	-3.541*** (0.058)	-3.533*** (0.058)
Number of observations	492,472	437,903	456,978	437,705
Pseudo R-squared	0.360	0.348	0.386	0.373

The dependent variable is one if a potential peer (Standard & Poor's [S&P] 500 and S&P MidCap 400) is chosen as a compensation peer by a disclosing firm and zero otherwise. *Peer total pay* (TDC1) is from the matching year and is measured in millions of dollars. We use *Ln (Peer total pay)* in the regression and winsorize compensation variables at the 1st and the 99th percentiles. All independent variables are defined in Tables 1 and 2. Standard errors reported in parentheses are clustered at both the disclosing firm and potential peer level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

at 50%. These benchmarks did not decrease over time. Actually, we find a weak but positive correlation between the selection sensitivity to the CEO pay at a potential peer and the benchmark used; that is, firms that selected peer companies with better-paid CEOs were more likely to use higher benchmarks. Thus, the increases in peer selection biases were not offset by decreases in the benchmarks used for determining CEO pay at disclosing firms.

One may argue that, perhaps after enhanced disclosure, firms did not follow peer benchmarking as closely as in 2006, so higher CEO compensation at peer companies did not necessarily lead to higher CEO compensation at the disclosing firm. Following [Faulkender and Yang \(2010\)](#), we regress CEO pay at a disclosing firm on the median CEO pay of its compensation peer companies and factors previously documented to affect the level of CEO compensation, including the median CEO pay of the firm's industry-size peers ([Bizjak, Lemmon, and Naveen 2008](#)). Results presented in Table 4 show that the sensitivity of CEO pay at disclosing firms to the median CEO pay of peer companies did not decrease from 2006 to 2009.

4. Propensity Score Matching

An alternative empirical approach to the multivariate probit model is to use a propensity score matching (PSM) algorithm that matches each selected peer company to the closest unselected potential peer based on firm and CEO characteristics, and then compare the compensation level of the CEO at the selected peer with that of the matched unselected company. The procedure works as follows. Similar to [Faulkender and Yang \(2010\)](#), for each disclosing firm, we calculate the probability (*propensity score*) of being included in its peer group for all potential peers using Equation (1), which includes a list of firm and peer characteristics that capture the competition for managerial talent. Equation (1) is estimated year by year, thus allowing the sensitivity of firm and peer characteristics to change over time. The propensity score is calculated using the estimated coefficients and the realizations of the corresponding independent variables for each potential peer. Each selected peer is then matched to an unselected potential peer (a company that is not included in the firm's compensation peer group) that has the closest propensity score, without replacement.¹⁶ This generates a sample of 28,854 chosen peers and the same number of best-matched unselected companies.

To validate the results of the multivariate probit approach, we calculate the difference in CEO total compensation in both dollar and percentage terms between the chosen peer and its propensity score matched unselected

¹⁶ Our results are robust to taking the best match within a caliper of 10% and 20% of the selected peer's propensity score, as well as to using the average or median of a group of matched potential peers within a caliper for each selected peer company.

Table 4
Peer group compensation as an explanation for executive compensation

Panel A: Descriptive Statistics

	Median	Mean	Standard Deviation
Firm total pay (millions of dollars)	6.124	7.887	6.481
Median peer total pay (millions of dollars)	6.445	7.522	4.166
Median total pay of industry-size peers (millions of dollars)	4.721	6.178	5.354
Lagged sales (billions of dollars)	3.900	12.230	30.610
ROA	0.077	0.081	0.089
Lagged ROA	0.085	0.090	0.083
Stock return	0.045	0.059	0.457
Lagged stock return	0.008	0.002	0.361
Lagged market-to-book value	1.680	2.011	1.123
Lagged leverage	0.127	0.152	0.125
Volatility of stock returns	0.288	0.336	0.188
Dummy (CEO is chair)	1.000	0.586	0.496
CEO tenure	5.000	6.591	6.526

Panel B: Multivariate Probit Regression

Independent variables	Ln (CEO total pay)				
	Full Sample	2006	2007	2008	2009
Ln (Median peer total pay)	0.576*** (0.040)	0.505*** (0.079)	0.573*** (0.082)	0.665*** (0.083)	0.623*** (0.095)
Ln (Median total pay of industry-size peers)	0.091*** (0.036)	0.091 (0.072)	0.091 (0.070)	0.070 (0.070)	0.110 (0.076)
Ln (Lagged sales)	0.121*** (0.017)	0.156*** (0.036)	0.089** (0.037)	0.138*** (0.034)	0.086** (0.035)
ROA	0.246 (0.241)	0.433 (0.595)	-0.208 (0.420)	-0.789 (0.513)	1.310** (0.572)
Lagged ROA	-0.613** (0.265)	-1.124* (0.672)	0.343 (0.590)	-0.700 (0.513)	-1.266** (0.498)
Stock return	0.133*** (0.034)	0.186 (0.116)	0.271*** (0.092)	0.075 (0.093)	0.073 (0.052)
Lagged stock return	0.258*** (0.045)	0.234** (0.104)	0.379*** (0.123)	0.316*** (0.080)	0.398*** (0.134)
Lagged market-to-book value	0.049*** (0.017)	0.069** (0.032)	0.005 (0.035)	0.084** (0.035)	0.074 (0.046)
Lagged leverage	-0.065 (0.134)	-0.184 (0.300)	-0.446 (0.307)	0.181 (0.261)	0.047 (0.239)
Volatility of stock returns	-0.195 (0.365)	-0.835 (0.960)	-0.722 (1.050)	-0.151 (0.790)	0.057 (0.660)
Dummy (CEO is chair)	0.149*** (0.030)	0.111* (0.061)	0.282*** (0.063)	0.080* (0.057)	0.126** (0.062)
CEO tenure	-0.001 (0.002)	-0.001 (0.004)	0.002 (0.005)	-0.006 (0.004)	0.003 (0.005)
Intercept	-0.603*** (0.131)	-0.720*** (0.278)	-0.333 (0.284)	-0.832*** (0.252)	-0.451 (0.276)
Number of observations	1,917	515	466	489	447
Adjusted R-squared	0.392	0.387	0.427	0.398	0.366

The dependent variable is *CEO total pay* (TDC1) at the disclosing firm. *Median peer total pay* is the median CEO total pay of the chosen compensation peer companies. *Median total pay of industry-size peers* is the median CEO total pay of companies in the firm's two-digit industry and of sales within 50–200% of the firm's. Firm *Sales*, *ROA*, *Stock return*, and *Volatility* (BS volatility) are from ExecuComp. *Leverage* is *total debt / (total debt + market capitalization)*. *Market-to-book value* is the ratio of market value to book value of assets. *Dummy (CEO is chair)* is one when the CEO of the firm serves as the chairman of the board, and *CEO tenure* is number of years the CEO has been in the post. We winsorize compensation variables at the 1st and the 99th percentiles and then apply log transformation to compensation variables and sales to overcome the skewness in the data. Panel A includes descriptive statistics of disclosing firms. In Panel B, we report the probit regression results for the full sample and for each of the four years separately. Standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5
Summary statistics for chosen peers versus matched unselected companies

Panel A: Pay Gap Using All Chosen Peers

Pay gap between selected peers and best-matched companies	Mean of dollar pay gap (thousands of dollars)	Median of dollar pay gap (thousands of dollars)	Mean of percentage pay gap	Median of percentage pay gap
2006	1,285.315***	824.538***	14.05%***	16.08%***
2007	1,276.093***	899.770***	15.02%***	16.30%***
2008	1,405.710***	1,112.851***	15.09%***	15.23%***
2009	1,552.548***	1,152.966***	16.99%***	18.62%***
2009 minus 2006	267.233*	328.428***	2.93%**	2.54%

Panel B: Pay Gap Using the Median Peer for Each Disclosing Firm

Pay gap between selected peers and best-matched companies	Mean of dollar pay gap (thousands of dollars)	Median of dollar pay gap (thousands of dollars)	Mean of percentage pay gap	Median of percentage pay gap
2006	1,399.601***	878.428***	17.23%***	15.83%***
2007	1,076.507***	863.082***	16.50%***	14.83%***
2008	1,172.744***	1,062.249***	14.41%***	15.29%***
2009	1,374.460***	1,198.954***	18.17%***	17.03%***
2009 minus 2006	-25.141	320.526*	0.94%	1.20%

This table contains mean and median differences in total CEO compensation (TDC1) between the selected peers and their propensity score-matched unselected companies. We first calculate the pay gap for each selected propensity score-matched pair (pay at the selected peer minus pay at the propensity score matched unselected company). Panel A reports the pay gaps of all matched pairs. Panel B reports the median pay difference of all matched pairs for each firm in each year (each disclosing firm has only one observation in each year). Pay differences are expressed in thousands of dollars for the first two columns and as percentages of the average CEO compensation at the chosen peer and the best-matched unselected company in the last two columns. We report results for each year separately and calculate the changes of these pay differences from 2006 to 2009. Due to the significant skewness, we winsorize pay gaps at the 5th and 95th percentiles. Standard errors are clustered at the disclosing firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

company.¹⁷ We are interested in whether the difference (*pay gap*) is significantly different from zero and in how that pay gap changed over time, as the multivariate results suggest that the gap had actually grown since the change in the disclosure requirement. The results of this analysis are available in Table 5.

Panel A of Table 5 shows that, in all four years, both the average and median CEO pay of the chosen peer were significantly higher than that of the matched unselected companies. All of these pay gaps were statistically different from zero at the 1% level, in both dollar terms and percentage terms. Consistent with the multivariate probit analysis, the pay gaps between chosen and their best-matched unselected companies had not been eliminated; they had actually increased. The average pay gap rose from \$1.285 million in 2006, when peers were chosen before the change in disclosure requirements went into effect, to \$1.553 million in 2009. At the median, the pay gap rose from \$825,000 to \$1.153 million. In percentage terms, the average pay gap increased from 14.05% to 16.99%, and the median pay gap increased from 16.08% to 18.62%

¹⁷ We normalize the pay gap by the average CEO compensation of the chosen peer and the matched company. This approach limits the range of this statistic to be between -200% and +200%, thereby limiting the effect of outliers that exists when normalizing by one of the two compensation levels.

over four years. The increases in the pay gap were economically significant in all four specifications and statistically significant in three of them. These findings suggest that opportunistic peer selection had not been curtailed by the increased disclosure requirement.

The propensity score matching results discussed above are based on all selected peers and their best-matched unselected companies. However, some firms have larger peer groups than others. The current comparison may place excessive weight on firms with large peer groups. We therefore repeat our analysis, focusing only on the median pair in each peer group (as ranked by the difference in CEO compensation between the chosen and best-matched non-chosen peers). The results reported in Panel B of Table 5 show that in each of the four years, evaluated at either the mean or median of the sample, the median chosen peer for each disclosing firm had total compensation significantly above its best-matched non-chosen company in both dollar terms and percentage terms. While the median dollar pay gap increased significantly between the first and fourth years, changes in pay gaps under other measures were not statistically significant. Overall, empirical findings presented in Sections 3 and 4 invalidate Hypothesis H1a, largely confirming H1b.

5. Robustness Checks

Our results are robust to numerous alternative specifications. The finding that peer selection biases have increased over our sample period is stronger using the specification in [Faulkender and Yang \(2010\)](#), which does not include the similarity of accounting and stock performance or the overlap of organizational complexity when calculating the propensity score for a potential peer company. Likewise, the results are stronger when we exclude from the matching specification whether the peer included the firm in its compensation peer group.

To address the concern that the change in peer selection biases might be driven by the change of our sample firms, we restrict our sample to firms that disclosed the names of their compensation peers in each of the four years; we also look at firms with the same CEO in all four years ([Graham, Li, and Qiu 2012](#)). The conclusion that peer selection process did not improve retains in both cases.

In the Appendix, we also report the results from examining the effect of CEO compensation on the frequency with which an S&P 900 company was included in the peer groups of our sample firms.¹⁸ Because the dependent

¹⁸ The most popular peer was Johnson & Johnson, which was selected by 52, 50, 44, and 53 of our sample firms over 2006–2009. For all S&P 900 companies, the average and median numbers of being included in the peer groups of our sample firms were 8.28 and 6, respectively. The corresponding numbers were 9.46 and 7, conditional on being chosen at least once. Fifty-four companies were never selected as compensation peers by our sample firms.

variable is a count variable, we use a negative binomial regression, which allows the sample mean to be different from the sample variance.¹⁹ Results in Panel A show that after controlling for size, ROA, stock return, volatility, and industry fixed effects, companies with better-paid CEOs were more popular peers. This effect was stronger in 2009 than in 2006. Furthermore, in Panel B we decompose CEO compensation into the predicted and excessive components using firm size, ROA, stock return, volatility, and industry. The results show that while the predicted pay component played a larger role in explaining peer selection frequency, the increase in the sensitivity of peer membership to CEO pay at a potential peer over the four-year period arose from the excessive pay component.

6. Changes of Peer Group Members

We show that firms had selected peer companies with more upward biases in CEO compensation over the four-year period of our sample. What was the mechanism underlying the increasing sensitivity of peer membership to CEO compensation? Were firms actively changing their peer groups, or was it merely the case that highly paid CEOs who were already included in peer groups at the beginning of the period happened to receive greater pay raises? To answer this question, we focus on the companies that were added to or dropped from the compensation peer groups of disclosing firms over time. If firms were reducing the management of the benchmarking process, consistent with the intention of regulators, we should observe that the added peers were those with more moderately paid CEOs and the dropped ones were those with highly paid CEOs.

The process that we follow for this examination is similar to the propensity score matching approach described in Section 4. For each added peer company (a company that was a peer group member in a particular year but not the previous year), we match it to another company that was not in the peer group either year and had the closest selection likelihood to the added peer company. Similarly, for each company dropped from the compensation peer group (a company was a peer group member the previous year but not this year), we match it to another company that had been a peer both years and had the closest propensity score to the dropped peer company. We then compare compensation at the 4,208 added and 2,103 dropped peer companies with their best matches, respectively. The results are provided in Table 6.

The increase in the sensitivity of peer group membership to CEO compensation at least partially resulted from active changes that firms and their compensation committees made to their compensation peer groups. Added peers on average made \$1.54 million more in total CEO compensation than the

¹⁹ OLS regressions generate similar results.

Table 6
Companies added to and dropped from the compensation peer group

Panel A: Added Peers				
Pay gap between added peers and best-matched companies	Mean of dollar pay gap (thousands of dollars)	Median of dollar pay gap (thousands of dollars)	Mean of percentage pay gap	Median of percentage pay gap
2007–2009	1,540.496***	1,095.621***	15.69%***	17.84%***
2007	1,662.126***	1,236.087***	17.45%***	19.61%***
2008	1,066.790***	927.211***	12.06%***	14.84%***
2009	1,814.900***	1,216.784***	16.87%***	20.12%***
Panel B: Dropped Peers				
Pay gap between dropped peers and best-matched companies				
2007–2009	−34.949	−141.003	−3.21%*	−2.13%
2007	−695.987*	−632.058**	−10.82%***	−8.90%**
2008	443.710	0.000	3.03%	0.00%
2009	−255.775	−439.549	−7.99%*	−6.18%*

Panel A reports mean and median differences in total CEO compensation (TDC1) between added peers and the propensity score–matched unselected companies. Panel B reports mean and median differences in total compensation between dropped peers and the propensity score–matched retained peer companies. Pay differences (gaps) are expressed in thousands of dollars for the first two columns and as percentages of the average CEO compensation at the chosen peer and the best-matched unselected company for the last two columns. We report results for all three years first and then for each year separately. We winsorize pay gaps at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

best-matched unselected peer. This difference was not driven by outliers, as the median difference in total compensation between added peers and their matched unselected peers was estimated at \$1.096 million. On a percentage basis, these added peers made an average of 15.69% more than the closest unselected potential peers. These upward-biased peer additions were not confined to a single year. In all three years, the additions were primarily companies with higher levels of executive pay than the closest unselected company.

And who was dropped from the peer group? To avoid biases due to peer companies’ bankruptcy, being acquired, or going private, we include only dropped companies that remained in the S&P 900 index that year in our sample. Looking at the dropped companies relative to the closest-matched retained peers, we observe similar but weaker results in the opposite direction. Dropped companies had an average of \$35,000 less in total CEO compensation; the difference is not statistically different from zero. On a percentage basis, dropped companies made 3.21% less on average in total compensation than the closest retained peers. Interesting patterns appeared in the second year, immediately after the enactment of the new disclosure rule. The average CEO pay at a dropped peer was \$696,000 less than their best-matched non-dropped peer; the difference is statistically significant. The latter two years showed less pay sensitivity in the decisions of which companies to drop from the peer groups. Recognize that to eliminate the existing opportunistic peer benchmarking, we

would actually need to see that the highly paid peers got dropped rather than no bias in the drops.

Overall, our empirical evidence suggests that some firms were engaged in a process of actively adding peers that were paid higher than otherwise similar companies and dropping the low-paid members of their peer group. All of these additions and deletions took place after firms were required to disclose the members of their compensation peer groups. This indicates that the enhanced disclosure rule did not effectively deter firms from managing the peer benchmarking process.

7. Corporate Governance and Peer Group Benchmarking

Sections 3 through 6 discuss the intensified pressure for firms to include peer companies with highly paid CEOs after enhanced disclosure and document the resulting increases in peer selection biases. We expect the unintended consequence of disclosure regulation to be mitigated by strong corporate governance, which has been shown to play a key role in shaping compensation practices.²⁰ How changes in peer selection biases varied with corporate governance measures should also inform us as to what extent our results are consistent with labor market theories or agency explanations.

We test the effect of corporate governance using the following measures: (i) whether shareholders had recently expressed significant concerns regarding compensation practices; (ii) whether institutional shareholders composed a significant ownership position in the firm; (iii) whether directors were busy serving on the boards of multiple firms; (iv) whether the board of directors functioned as an intensive monitor; (v) whether the CEO was new; and (vi) among new hires, whether the CEO came from outside the firm. All these governance variables are measured in the prior year to capture governance characteristics at the time of forming peer groups.

7.1 Shareholder votes on compensation-related proposals

First, we examine whether shareholders' opinion on the firm's executive pay practice affects the peer benchmarking process.²¹ When shareholders objected in sufficient numbers to the pay practices of firms, would those firms modify their pay packages, or would they instead try to better justify the existing packages by altering their compensation peer groups? Using data provided by ISS, we separate firms into those that received 20% support for a compensation-related shareholder proposal or 20% objection to a compensation-related

²⁰ See, for example, Acharya and Volpin (2010), Hartzell and Starks (2003), Weisbach (1988), Core, Holthausen, and Larcker (1999), Fich and Shivdasani (2005, 2006), and Coles, Daniel, and Naveen (2008a,b).

²¹ Examining the effect of shareholder proposals on CEO compensation, Martin and Thomas (1999) and Ertimur, Ferri, and Muslu (2011) find significant reduction or smaller increases in CEO pay at firms targeted by shareholder proposals that receive higher levels of voting support, call for a greater link between pay and performance, or are sponsored by institutional proponents.

Table 7
Effect of corporate governance

	Without shareholder resolution (A)	With shareholder resolution (B)	Difference (B) – (A)	Low concentration of institutional holdings (A)	High concentration of institutional holdings (B)	Difference (B) – (A)
2006						
Mean	1,164.95***	1,849.88***	684.93**	1,231.90***	1,342.16***	110.26
Median	719.78***	1,546.04***	826.26***	815.00***	835.89***	20.89
2009						
Mean	1,370.59***	2,337.12***	966.53***	1,643.90***	1,391.71***	-252.19
Median	992.61***	2,116.56***	1,123.95***	1,308.63***	927.30***	-381.33***
2009 minus 2006						
Mean	205.64	487.24	281.60	411.99**	49.55	-362.45
Median	272.83**	570.52**	297.69	493.63***	91.41	-402.22**
	Busy board (A)	Non-busy board (B)	Difference (B) – (A)	Non-intensive monitoring board (A)	Intensive monitoring board (B)	Difference (B) – (A)
2006						
Mean	1,392.95***	1,133.65***	-259.30	1,273.60***	1,276.85***	3.25
Median	1,004.93***	585.56**	-419.36**	785.61***	862.37***	76.75
2009						
Mean	1,793.56***	948.89***	-844.67***	1,710.59***	1,359.02***	-351.57
Median	1,341.16***	815.40***	-525.76***	1,352.98***	952.19***	-400.80**
2009 minus 2006						
Mean	400.61**	-184.76	-585.37*	436.99**	82.17	-354.82
Median	336.23**	229.84	-106.39	567.37***	89.82	-477.55**

This table illustrates differences in total compensation (TDC1) between the selected peers and their propensity score-matched unselected companies (*pay gap*). Compensation level is expressed in thousands of dollars. We report the mean and median pay gap in 2006 and 2009, separately. We also report the changes in pay gaps from 2006 to 2009. Pay gaps are reported separately for firms that did not receive at least 20% support for compensation-related shareholder proposals over the 2006 to 2009 period and for those that did; for firms with concentration of institutional ownership above the sample median and those below; for firms with the average number of boards on which the firm’s directors serve exceeds the sample median (directors are “busy”) and those without; and for firms with intensive monitoring board and those without (Faleye, Hoitash, and Hoitash 2011a). For each year in each column, the first number is the mean across the corresponding firms and the second number is the median. The final column lists the difference between the two groups of firms. The bottom two rows provide the mean and median changes in pay gaps from 2006 to 2009, respectively. We winsorize pay gaps at the 5th and 95th percentiles. Standard errors are clustered at the disclosing firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

management proposal in the previous year and those that did not.²² Firms in the former group were identified by their shareholders as having compensation issues. Did those firms select their peer group members differently than firms not facing shareholder pushback on executive compensation? How did this responsiveness change after enhanced disclosure? To answer this question, we repeat the analysis conducted in Section 4 using the propensity score matching approach for each of those two groups. The results of this analysis are located in the top left quadrant of Table 7.

²² Results are similar if we use 30% as the cutoff point. According to a private communication with Carol Bowie at ISS, shareholder resolutions with votes lower than 20% do not matter.

We find that firms at which shareholders raised significant concerns regarding compensation practices were those with more biased peer groups in 2006. For these firms, the average chosen peer made \$1.85 million more than its matched company. This is compared with a pay gap of \$1.165 million at firms without such shareholder concerns. More importantly, shareholder resolutions did not lead to less biased peer groups three years later. In 2009, the average pay gap between chosen peers and the closest non-chosen potential peers rose to \$2.337 million at firms with such shareholder concerns relative to a much smaller pay gap of \$1.371 million at those without. These results suggest that compensation peer benchmarking had been used by firms with shareholder concerns regarding their compensation practices to further justify the high levels of their CEO pay.

Arguably, firms targeted by shareholders for their compensation practices are those that could potentially benefit the most from the newly implemented Say-on-Pay regulation, which requires firms to provide shareholders an opportunity to cast an advisory vote on the compensation packages of top executives.²³ Yet, we do not observe better peer benchmarking practices at those firms after enhanced disclosure. These results call into question whether Say-on-Pay will effectively address potential issues in the pay setting practice.

7.2 Ownership structure

Ownership structure impacts monitoring effectiveness. [Hartzell and Starks \(2003\)](#) show the importance of the monitoring role of institutional shareholders, especially in disciplining compensation practices.²⁴ Institutional shareholders are likely to have the expertise necessary to evaluate compensation peer groups and raise credible concerns about the firm's benchmarking process. Thus, we expect firms with significant institutional holdings to respond differently to the change in the enhanced disclosure rule.

We define a firm as having high concentration of institutional holdings (using data from 13-F filings) when its value exceeds the sample median. The concentration of institutional holdings is the Herfindahl index of holdings among institutional shareholders. As shown in the top right quadrant of [Table 7](#), we do not find a significant difference across high and low ownership concentration groups in the pay gap between selected peers and their best-matched unselected peers in 2006. Between 2006 and 2009, the pay gap for firms with high concentration of institutional holdings did not change,

²³ During our sample period, Say-on-Pay was not implemented in the United States. The empirical evidence on the effect of Say-on-Pay on executive compensation is mixed. Using a large sample of UK firms, [Ferri and Maber \(forthcoming\)](#) find no evidence of a change in the level or growth rate of CEO pay before and after the introduction of Say-on-Pay, after controlling for various firm characteristics. In contrast, [Cai and Walkling \(2011\)](#) show that when the House passed the Say-on-Pay Bill, the market reaction was significantly positive for firms with high abnormal CEO compensation and low pay-for-performance sensitivity, and for those responsive to shareholder pressure.

²⁴ [Conyon, Core, and Guay \(2011\)](#) and [Fernandes et al. \(2010\)](#) show that firms with higher institutional ownership tend to grant more equity-based pay and higher total pay.

regardless of whether we examine the mean or the median. The increase in pay gap that we documented earlier was confined to the set of firms with low concentration of institutional holdings: the average pay gap increased from \$1.232 million to \$1.644 million. While monitoring by institutional shareholders did not eliminate the peer selection biases that existed in the compensation benchmarking process, it did appear to restrain firms from exacerbating those biases.

We further compare the changes of pay gaps from 2006 to 2009 at firms with high total institutional holdings and those at firms with low total institutional ownership, those at firms with high director ownership and those at firms with low director ownership,²⁵ and those at firms with high CEO ownership and those at firms with low CEO ownership. All tests yield results similar to those using the concentration of institutional ownership: increases in pay gaps between selected peers and their best-matched counterparts were mainly at firms with weak ownership structure.

7.3 Busy boards

Various board characteristics have been shown to affect monitoring effectiveness and thus firm value. [Fich and Shivdasani \(2006\)](#) show that when directors are busy serving on the boards of multiple firms, they are less effective monitors and are associated with lower accounting and stock performance, and lower sensitivity of CEO turnover to firm performance. We thus expect busy boards to be less effective at monitoring pay practices such as compensation peer benchmarking. To test this prediction, we divide sample firms into two groups using the sample median level as the cutoff point: a board with the average director serving on more than the sample median number of boards is labeled as a *busy board*.

The results presented in the bottom left quadrant of [Table 7](#) are similar to those reported for ownership structure. In 2006, pay gaps between selected and best-matched unselected peers of those firms with busy boards were higher than pay gaps at those with non-busy boards. Moreover, the increases in pay gaps from 2006 to 2009 were entirely limited to firms with busy boards. The average pay gap increased from \$1.393 million to \$1.794 million for firms with busy boards, while firms with non-busy boards had no increases in pay gaps.

7.4 Intensive monitoring boards

Some boards of directors are more effective at monitoring ([Faleye, Hoitash, and Hoitash 2011a](#)), while others are good at advising management on strategic decisions ([Schwartz-Ziv and Weisbach 2011](#); [Faleye, Hoitash, and Hoitash 2011b](#); [Coles, Daniel, and Naveen 2011](#)). [Faleye, Hoitash, and Hoitash \(2011a\)](#)

²⁵ Directors, who have informational advantages and a fiduciary duty to monitor, have stronger incentives to do so when their personal wealth is tied to shareholder returns ([Weisbach 1988](#); [Fich and Shivdasani 2005](#)).

show that firms with intensive monitoring boards are associated with higher CEO turnover to performance sensitivity, lower excessive CEO compensation, and better earnings quality. Following [Faleye, Hoitash, and Hoitash \(2011a\)](#), we define a board as an intensive monitoring board if the majority of independent directors serve on at least two out of the three principal monitoring committees: auditing, compensation, and nominating. We expect these intensive monitoring boards to be effective at mitigating the selection biases in peer benchmarking. The result reported in the bottom right quadrant of Table 7 shows that while the average pay gap between selected peers and best-matched unselected companies for firms without an intensive monitoring board increased from \$1.274 million in 2006 to \$1.711 million in 2009, it did not increase for firms with an intensive monitoring board.

The cross-sectional results reported in Table 7 illustrate that firms with weak corporate governance increased peer selection biases significantly after enhanced disclosure. Similar cross-sectional results hold when we measure the weakness of corporate governance by whether the CEO also serves as the chairman of the board and whether the board size is larger than the sample median. Interestingly, we also find that firms did not appear to be troubled by including a long list of well-paid CEOs in their peer groups in 2009, contrary to the finding of [Faulkender and Yang \(2010\)](#), which only used the 2006 data.

7.5 Incumbent versus new CEOs and inside versus outside CEOs

The appointment of a new CEO by the board of directors influences the bargaining power of the board vis-à-vis the CEO ([Hermalin and Weisbach 1998](#)). When a new CEO is hired, theoretically, the board and the CEO conduct arm's-length bargaining. Thus, we expect to find a lower peer selection bias at a firm with a new CEO, especially if the CEO is hired from outside, because the outside CEO is unlikely to "capture" the board. As shown in Table 8, we find that this is indeed the case prior to enhanced disclosure. In 2006, firms with new CEOs had lower pay gaps between selected peers and their best-matched unselected counterparts than firms with incumbent CEOs. In addition, firms that hired outside new CEOs selected peer companies that paid their CEOs less than their matched potential peers.²⁶

Enhanced disclosure could make biased peer groups a convenient tool to justify high levels of CEO compensation. A firm observing opportunistic peer benchmarking at competing firms may be pressured into similar practice to attract and retain scarce managerial talent ([Acharya and Volpin 2010](#)). Such pressure should be particularly acute when firms hire new CEOs. Moreover, since compensation peer information has become available to investors, some firms may find it rational to start benchmarking against "aspirational" peer

²⁶ The lack of statistical significance is likely due to the small number of outside new CEOs in our sample. We have seven new outside CEOs in 2006 and six in 2009.

Table 8
Incumbent CEOs versus new CEOs and inside versus outside new CEOs

Panel A: Incumbent vs. New CEOs

	Incumbent CEO (A)	New CEO (B)	Difference (B) – (A)
2006			
Mean	1,327.57***	594.07*	–733.50
Median	834.35***	504.76	–329.58
2009			
Mean	1,517.62***	1,728.07***	210.46
Median	1,125.55***	1,344.81***	219.27***
2009 minus 2006			
Mean	190.05	1,134.01**	943.96*
Median	291.20**	840.05*	548.85

Panel B: Inside vs. Outside New CEOs

	Inside new CEO (A)	Outside new CEO (B)	Difference (B) – (A)
2006			
Mean	711.55**	–329.00	–1,040.54
Median	571.96	–694.49	–1,266.45
2009			
Mean	1,688.30***	2,010.50***	322.20
Median	1,344.81***	1,367.36**	22.54
2009 minus 2006			
Mean	976.76*	2,339.50	1,362.74
Median	772.85	2,061.85	1,288.99

This table contains differences in total CEO compensation between the selected peers and their propensity score-matched unselected companies (*pay gap*). Compensation level is expressed in thousands of dollars. We divide firms into two groups based on whether the CEO is incumbent or new (with tenure shorter than 2 years), and among new CEOs, whether the CEO is internally promoted or hired from outside the firm. For each year in each column, the first number is the mean across the corresponding firms and the second number is the median. The final column lists the difference between two groups of firms. The bottom two rows provide the mean and median changes in pay gaps from 2006 to 2009, respectively. We winsorize pay gaps at the 5th and 95th percentiles. Standard errors are clustered at the disclosing firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

companies in an attempt to affect market perceptions of firm value and CEO ability, especially when the CEO is newly hired (Hayes and Schaefer 2009).

Consistent with the predictions of those theories, we find that after enhanced disclosure, firms that hired new CEOs had greater increases in pay gaps between selected peers and their best-matched unselected counterparts than firms with incumbent CEOs. More specifically, we find that firms with outside new CEOs had an average pay gap of \$2.011 million in 2009, in contrast to a negative average pay gap in 2006. With an average pay gap of merely \$712,000 in 2006, firms with internally promoted CEOs showed an average pay gap of \$1.688 million in 2009. Pay gaps also increased at firms with incumbent CEOs, but to a lesser extent.²⁷

²⁷ We also observe convergence in opportunistic peer benchmarking at firms of which the board has been classically characterized as having bargaining power over the CEO. More specifically, we find that peer selection biases were lower in 2006 at firms whose CEO had shorter tenure than the sample median, shorter tenure than the majority of the directors, or shorter tenure than the chairman of the compensation committee. Firms in each of these three groups, however, had significant increases in their peer selection biases from 2006 to 2009, in contrast to their corresponding counterparts.

7.6 Firm performance

Ultimately, to judge whether disclosure regulation is effective, we need to examine whether it benefits shareholders (Holmstrom and Kaplan 2003; Core, Guay, and Thomas 2005). It is possible that after enhanced disclosure firms strategically constructed peer groups to justify high levels of pay to their highly skilled CEOs. If this is true, we expect to observe better subsequent performance at firms that selected peer companies with better-paid CEOs. We follow Core, Holthausen, and Larcker (1999) in testing the effect of peer selection biases on subsequent stock and accounting performance, controlling for size, risk, industry (two-digit or three-digit) effects and time trend:

$$\begin{aligned} \text{Stock return}_i = & \alpha_0 + \alpha_1 * \text{Median pay gap}_i \\ & + \alpha_2 * \text{Standard deviation of stock return}_i \\ & + \alpha_3 * \text{Ln}(\text{Market value of equity}_i) + \alpha_4 * \text{Market-to-book}_i \quad (2) \\ & + \theta * \text{Year controls}_i + \lambda * \text{Industry controls}_i + \varepsilon_i, \end{aligned}$$

$$\begin{aligned} \text{ROA}_i = & \delta_0 + \delta_1 * \text{Median pay gap}_i + \delta_2 * \text{Standard deviation of ROA}_i \\ & + \delta_3 * \text{Sales}_i + \theta * \text{Year controls}_i + \lambda * \text{Industry controls}_i + \varepsilon_i, \quad (3) \end{aligned}$$

where *median pay gap* is the median difference of CEO pay between the selected peers and their propensity score–matched potential peers. Each firm-year has only one observation, and we include two- or three-digit industry fixed effects. Given that compensation peer groups are formed at the beginning of the year, we use contemporaneous stock return and ROA as proxies for subsequent firm performance. The results are reported in Table 9. We find a statistically significant (at the 1% level) and negative relationship between firm stock return and the median pay gap of the peer group, indicating that a peer group tilted toward highly paid CEOs did not improve shareholder wealth. The relationship between ROA and the median pay gap was also negative but not statistically significant.

8. Discussion of Results and Conclusion

Four years after the enactment of the SEC rule requiring disclosure of compensation peers, firms continued to select peer companies that paid their CEOs generously, even after controlling for various economic determinants of peer group membership. Our findings suggest that the new regulation mandating disclosure of compensation peer companies did not mitigate opportunistic behavior in peer benchmarking. If anything, peer selection biases got worse at firms with poor corporate governance. These findings are consistent with the claim in Weisbach (2007) that the set of circumstances under which governance regulation can improve welfare is very limited.

Table 9
Firm performance

Panel A: Equity Return

	Three-digit industry fixed effects	Two-digit industry fixed effects
Median pay gap	-0.030*** (0.009)	-0.020** (0.008)
Equity market value	0.104*** (0.008)	0.091*** (0.008)
Equity volatility	4.477*** (0.267)	4.113*** (0.255)
Asset market-to-book ratio	-0.041*** (0.010)	-0.031*** (0.009)
Year fixed effects	Yes	Yes
Number of observations	2,006	2,006
Adjusted <i>R</i> -squared	0.363	0.343

Panel B: Return on Assets

Median pay gap	-0.139 (0.151)	-0.166 (0.155)
Ln (sales)	1.078*** (0.150)	0.700*** (0.144)
Standard deviation of ROA (rolling 5 years)	-0.117* (0.068)	-0.083 (0.068)
Year fixed effects	Yes	Yes
Number of observations	2,043	2,043
Adjusted <i>R</i> -squared	0.302	0.188

This table reports the effect of peer selection bias on subsequent firm performance: equity return in Panel A and Return on Assets (ROA) in Panel B. The main independent variable is measured as the median pay difference (*pay gap*) between chosen peers and best-matched unselected peers. We have one observation for each firm-year. Compensation level is expressed in thousands of dollars. Returns are measured in excess of the two- or three-digit SIC industry. Control variables include market capitalization, return volatility, market-to-book, and time trend for equity performance, and include firm sales, standard deviation of ROA, and time trend for accounting performance. We winsorize pay gaps at the 5th and 95th percentiles. Standard errors are clustered at the disclosing firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Several economic and enforcement-related factors may help explain why enhanced disclosure of peer benchmarking did not mitigate selection biases of that process. First, the combination of improved monitoring associated with enhanced disclosure and fierce competition for scarce managerial talent pressed firms to increase CEO compensation. Required disclosure of peer group members has made peer benchmarking a legitimate and convenient tool to justify high levels of CEO compensation. Moreover, given that the list of companies that firms used to benchmark their CEO compensation is available to investors, some firms could find it rational to benchmark against “aspirational” peer companies in order to signal high CEO ability; see [Hayes and Schaefer \(2009\)](#)²⁸ for a model of the “Lake Wobegon effect.” This effect is stronger at firms with new CEOs whose ability is yet to be proven. This is exactly what we observed in 2009.

²⁸ Former DuPont CEO Edward S. Woolard, Jr., spoke at a Harvard Business School roundtable on CEO pay: “The main reason [CEO] compensation increases every year is that most boards want their CEO to be in the top half of the CEO peer group, because they think it makes the company look strong. So when Tom, Dick, and Harry receive compensation increases, I get one too, even if I had a bad year.... [This leads to an] upward spiral.”

Effective enforcement mechanisms could possibly counterbalance the pressure for selecting peer companies with highly paid CEOs. However, such mechanisms did not exist during our sample period. The disclosure rule required firms to disclose the identities of their compensation peer group members, but only later did the SEC emphasize peer selection rationales. During our sample period, the SEC did not identify any firm with improper peer benchmarking practices.

In addition, firm proxy statements have become overwhelming since the disclosure regulation, especially given that investors have limited attention and processing power (see [Hirshleifer and Teoh 2003](#)).²⁹ To reach our conclusion, one would have to find the list of companies against which the firm benchmarks its executive compensation and, more importantly, to identify a set of companies that were not selected as peers but were comparable in firm and CEO characteristics to those selected. It is extremely challenging, if not impossible, for the average investor to conduct the same detailed analysis as we did in this paper. These obstacles could explain, at least partially, why the media and investors did not pay much attention to the peer benchmarking issue until very recently.³⁰

One group of investors, institutional investors, has incentives to monitor because of the size of their equity stakes. Institutional investors could also seek advisory firms' guidance on what role to play in influencing compensation practices. Our empirical findings lend support to this: increases in peer selection biases were limited to firms with low levels and low concentration of institutional holdings. This highlights the increasing importance of shareholder advisory firms such as ISS. With numerous institutional clients, shareholder advisory firms have the incentives, abilities, and resources to address issues such as compensation peer benchmarking. However, they did not provide explicit guidelines on peer benchmarking during our sample period because of their higher priorities on other corporate governance issues such as Say-on-Pay. Actually, the observed improvement in peer matching based on industry and size, as recently advocated by ISS and adopted by many compensation consulting firms, was a small step in the right direction. However, industry and size matching is not sufficient to improve peer benchmarking if, among companies of similar size in their industry, firms still select peers with highly paid CEOs.

²⁹ We examine a randomly selected set of fifty proxy statements out of the S&P 500 component firms and find that the average length of the proxy statement was forty-one pages in 2006. It increased to sixty-one pages in 2009. The section that contains peer benchmarking information, Compensation Discussion and Analysis (CD&A), went from six pages to fifteen pages, an increase of 150%. CD&A also contains many other pieces of newly disclosed information such as performance metrics used in the annual incentive plan and long-term incentive plan, formulas for executive pension plans, and details of perks.

³⁰ Coverage of peer benchmarking in the media includes interviews on the *PBS NewsHour* on October 4, 2011, and articles in the *Washington Post* on October 3, 2011, the *New York Times* on July 26, 2010, and the *Wall Street Journal* on August 18, 2009.

Appendix

Table A1
Times selected as compensation peers

Panel A: Times Selected as Peer – Total Compensation

	Full Sample	2006	2007	2008	2009
Ln (Total compensation)	0.210*** (0.017)	0.154*** (0.032)	0.218*** (0.031)	0.264*** (0.038)	0.248*** (0.032)
Ln (Sales)	0.287*** (0.012)	0.321*** (0.025)	0.280*** (0.024)	0.241*** (0.025)	0.271*** (0.022)
Return on assets	0.008 (0.173)	0.615 (0.432)	0.393 (0.393)	0.678* (0.347)	0.115 (0.315)
Equity return	-0.111*** (0.041)	-0.138 (0.097)	0.004 (0.106)	-0.200*** (0.074)	-0.199* (0.106)
Equity volatility	-2.896*** (0.329)	-1.528* (0.870)	-4.073*** (0.798)	-5.196*** (0.889)	-2.510*** (0.542)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	2,813	688	700	709	716
Pseudo R-squared	0.070	0.067	0.079	0.072	0.077

Panel B: Times Selected as Peer – Excess vs. Predicted Compensation

Ln (Excess compensation)	0.175*** (0.017)	0.117*** (0.033)	0.184*** (0.032)	0.231*** (0.040)	0.228*** (0.033)
Ln (Predicted compensation)	1.019*** (0.026)	1.037*** (0.053)	1.049*** (0.049)	0.979*** (0.053)	1.010*** (0.049)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	2,806	684	697	709	716
Pseudo R-squared	0.073	0.073	0.082	0.067	0.077

Times Selected as Peers counts the number of times an S&P 900 company was included in the compensation peer groups of non-financial S&P 900 firms. *Excess Compensation* is CEO compensation at the peer company in excess of the level predicted by sales, ROA, stock return, volatility, and three-digit industry fixed effects. Compensation variables are winsorized at the 1st and 99th percentiles. Standard errors are clustered at the disclosing firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

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