Peer Choice in CEO Compensation

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Abstract

Current research shows that firms are more likely to benchmark against peers that pay their Chief Executive Officers (CEOs) higher compensation, reflecting self-serving behavior. We propose an alternative explanation: the choice of highly paid peers represents a reward for unobserved CEO talent. We test this hypothesis by decomposing the effect of peer selection into talent and self-serving components. Consistent with our prediction, we find that the association between a firm's selection of highly paid peers and CEO pay mostly represents compensation for CEO talent.

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Current research shows that firms are more likely to benchmark against peers that pay their Chief Executive Officers (CEOs) higher compensation, reflecting self-serving behavior. We propose an alternative explanation: the choice of highly paid peers represents a reward for unobserved CEO talent. We test this hypothesis by decomposing the effect of peer selection into talent and self-serving components. Consistent with our prediction, we find that the association between a firm's selection of highly paid peers and CEO pay mostly represents compensation for CEO talent.

1. Introduction

We study how the choice of peers impacts CEO compensation. Corporations commonly use peer companies to help determine compensation packages for CEOs, an approach known as benchmarking. Recent papers by Faulkender and Yang (2010) and Bizjak, Lemmon, and Nguyen (2011) (FY and BLN, respectively) show that, after controlling for similarities between a firm and its chosen peers, firms are more likely to include in their peer group those companies that have higher paid CEOs than those with lower paid CEOs. We label the difference between the pay of the selected peers and the propensity-score-matched peers as the "peer pay effect." As discussed in FY and BLN, an interpretation for this result is that the peer pay effect reflects firms' self-serving behavior, in which highly paid peers are selected to justify higher CEO pay. Alternatively, as we elaborate below, the peer pay effect could represent a reward for unobserved CEO talent, which captures managerial success in managing complex organizations and in achieving high firm performance. We test this hypothesis.

A number of studies argue that the pay-setting process has strayed far from the arm's length model assumed in most economic models of pay arrangements. Bebchuk and Fried (2003, 2004, 2005) claim that flawed compensation packages are widespread, persistent, and systematic. Compensation critics argue that peer pay is used as a mechanism to justify excessively high CEO pay (e.g., Crystal, 1991; Morgenson, 2006). According to this view, firms benchmark their CEO pay against strategically selected, higher-CEO-paying peers to justify awarding their CEOs high compensation. This is possible because peer choice is partly influenced by firm executives.[1] Consistent with this view, BLN (p. 538) conclude that "peer

[1] Determining CEO compensation is the responsibility of the board of directors' compensation committee. One input into the determination of executive pay is a set of peers used to benchmark executive compensation. These peers are usually suggested by the compensation committee, often under the guidance of a compensation consulting firm. Based on Reda et al. (2007) and discussions with compensation consultants, executives typically review and

groups are constructed in a manner that biases compensation upward." Similarly, FY (p. 259) state that "compensation committees seem to be endorsing compensation peer groups that include companies with higher CEO compensation, everything else equal, possibly because such peer companies enable justification of the high level of their CEO pay."

Self-serving behavior, however, is unlikely to wholly explain the peer pay effect. For example, Holmstrom and Kaplan (2003) argue that competitive compensation packages are driven by market forces, such as the supply and demand for CEO talent, and that benchmarking enables firms to gauge the "market compensation" for their CEO. Consistent with this argument, Bizjak, Lemmon, and Naveen (2008) study the effect of peer choice on pay and provide support for the idea that peer pay serves to gauge the market wage necessary to retain valuable human capital. Using a sample of implicit (as opposed to actual) peers during the pre-Securities and Exchange Commission (SEC) disclosure regulation period, they show that increases in CEO pay attributable to peer selection are more consistent with tighter labor markets than with self-serving behavior. We extend Bizjak et al. (2008) by studying the extent to which the peer pay effect represents a reward for CEO talent that is not fully captured by similarities in firm characteristics. In other words, we contribute to this literature by studying the relative extent to which the peer pay effect reflects self-serving behavior or a reward for CEO talent.

Several arguments support a talent-based explanation for the peer pay effect. Theoretical predictions from standard agency and competitive sorting models recognize that differences in CEO ability have an important role in contract design (e.g., Harris and Holmstrom, 1982; Rosen, 1982; Gabaix and Landier, 2008; Edmans, Gabaix, and Landier, 2009; Pan, 2010). Further, a large number of empirical studies show that differences in human capital across executives affect

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provide feedback on the choice of peers, part of which may include executives' views on peers that should be excluded as well as those peers that should be added to the final set.

compensation, firm performance, and management style. For example, Milbourn (2003) and Falato, Li, and Milbourn (2011) find evidence consistent with CEO compensation reflecting the board's perception of the CEO's ability or reputation. Graham, Li, and Qiu (2012) find that the inclusion of manager fixed-effects explains a significant portion of the variation in CEO pay and they conclude that unobservable differences in human capital across executives are an important determinant of CEO compensation (see also Coles and Li, 2010; Demerjian, Lev, and McVay, 2012). Finally, albeit anecdotally, when firms describe their choice of peers in their proxy statements, they often specifically refer to the need to compete for executive talent (see the Appendix for some examples).

As the first step towards assessing the extent to which a firm benchmarks to higher paid peers, we follow FY and BLN and model firms' choice of peers. Corroborating these studies, we show that firms choose peers of similar size, industry, profitability, and business complexity. After controlling for these similarities in *firm* characteristics, firms are more likely to choose peers that pay their CEOs higher compensation. FY and BLN interpret this result as a firm's strategically selecting highly paid peers to justify higher pay for the CEO. While the analysis in FY and BLN controls for firm characteristics that drive the peer selection, it can only indirectly control for similarities in the demand and supply of CEO talent. This is because talent proxies at the *CEO level* are not available for all potential peers and thus cannot be included in the peer selection model. This creates the possibility that the peer pay effect could reflect CEO talent that is uncontrolled for in the model. Our methodology allows us to circumvent this issue by controlling for CEO-level characteristics after a sample of propensity-matched peers is determined.

We define the peer pay effect as the percentage difference between the compensation of

the actual firm-chosen peers and the compensation of a propensity-matched sample of peers, in which peers are matched based on the similarity of firm characteristics. The mean total peer pay effect in our sample is 0.133 (0.037) using the FY (BLN) specification, indicating that the mean firm chooses peers that pay their CEOs 13.3% (3.7%) more. In dollar terms, the difference between the CEO pay in selected peers versus predicted peers in our sample equals $896,000 ($463,000). These results are comparable to the peer pay effect shown in FY and BLN.

To empirically disentangle whether firms' tendency to select higher paying peers reflects self-serving behavior or pay for talent, we use multiple methods to decompose the peer pay effect into a component that proxies for CEO talent and one that proxies for self-serving behavior. The talent component is proxied by the fitted value from a regression of the peer pay effect on proxies for CEO talent. Following prior literature, we proxy for CEO talent with the CEO's historical abnormal stock and accounting performance, the market value of the firms that the CEO managed in the past, and the number of times the CEO is referred to in the business press (e.g., Milbourn, 2003; Chang, Dasgupta, and Hilary, 2010; Fee and Hadlock, 2003; Rajgopal, Shevlin, and Zamora, 2006; Gabaix and Landier, 2008). The self-serving component is proxied by the fitted value from a regression of the peer pay effect on proxies for weak corporate governance. Our proxies for self-serving behavior include three dimensions of governance used in prior literature: (i) board structure, (ii) antitakeover provisions, and (iii) ownership concentration (e.g., Core, Holthausen, and Larcker, 1999; Dittmar and Mahrt-Smith, 2007; Masulis, Wang, and Xie, 2007; Harford, Mansi, and Maxwell, 2008).

Because the constructs of CEO talent and self-serving behavior are inherently difficult to measure, we relate these predicted and residual peer pay effect measures to future accounting and stock performance to validate their respective use as proxies for these constructs [see a

similar approach in Core et al. (1999)]. If the talent component captures CEO talent, then it should be associated with stronger future performance. In contrast, if the self-serving component captures strategic behavior, then it should be negatively associated with future performance. Consistent with these predictions, we find that the talent component of the peer pay effect is positively related to future performance, while the self-serving component is either unrelated or negatively related to future performance.

We next investigate the extent to which the proxies for talent and self-serving behavior affect CEO pay. First, we confirm the FY and BLN findings that the peer pay effect is an incrementally important explanatory variable over and above established economic factors previously shown to explain CEO compensation (e.g., size, performance, growth, risk, etc.). This result provides evidence that firms engage in benchmarking to gauge the market compensation for the CEO. We then add the talent and self-serving components of the peer pay effect to the model predicting CEO compensation. We show that the talent component is positively associated with CEO compensation, consistent with firms benchmarking CEO pay to that of higher paying peers to attract and retain talented CEOs. The self-serving component is positively associated with CEO compensation in some, but not all, cases, and at lower magnitudes than that of talent. In terms of economic significance, the impact of the talent component on CEO pay is from two to almost ten times larger than is the impact of the self-serving component. As an illustration of the latter, a one-standard-deviation increase in the talent portion of the peer pay effect increases the total CEO compensation by up to $1,811,000, whereas the same effect for the self-serving component increases compensation by $184,000. Our results thus suggest that the majority of the effect of peer selection on CEO pay shown in FY and BLN can be interpreted as compensation for CEO talent.

We then conduct a series of sensitivity analyses on our decomposition of the peer pay effect into the talent and self-serving components. First, we include either historical CEO pay or the Graham et al. (2012) CEO fixed-effect measure as proxies for talent and obtain similar results. Second, our results are also robust to the use of several alternative proxies for weak governance structure as well as to controlling for firm characteristics that endogenously affect corporate governance. Finally, a recent study by Faulkender and Yang (2012) argues that peer manipulation in benchmarking practices has become more severe over time. While we confirm their findings that the *total* peer pay effect increased over time, we show (consistent with our hypothesis) that the talent component remains the main driver of the peer pay effect over the sample time period.

Our study contributes to a better understanding of the pay-setting process by extending the work of FY and BLN on the relation between peer choice and CEO compensation. We show that the peer pay effect identified in prior studies reflects, to a large extent, the need to reward CEOs for their intangible talent. While we show that self-serving behavior is also an explanation for the peer pay effect, our findings suggest that it represents a far less economically important explanation for the peer pay effect than does CEO talent. Thus, our conclusions are more in line with Holmstrom and Kaplan's (2003) argument and Bizjak et al.'s (2008) findings that the effect of peer benchmarking on CEO pay is more consistent with the need to attract and retain skilled CEOs than it is with managerial entrenchment or weak corporate governance. Further, a contemporaneous study by Cadman and Carter (2011) also argues that the peer pay effect does not reflect self-serving behavior. The unique aspect of our paper, however, is that we are the first to provide evidence that the peer pay effect represents a reward for CEO talent.

The next section describes the data collection and sample selection process. Our

empirical tests and results are presented in Section 3. Section 4 concludes.

2. Data and sample selection

We first identify firms with data available on ExecuComp for fiscal year 2006 (mostly firms that comprise the Standard and Poors (S&P) 1500 index). For these firms, we download Definitive Proxy Statements (DEF14A) for fiscal years 2006 through 2008 that were filed with the SEC after December 15, 2006, the date when the disclosure requirement took effect (SEC, 2006). Peer information is manually collected from the Compensation Discussion and Analysis (CD&A) section of the proxy statements. We read through the CD&As to ensure that the peer companies listed are the ones used for benchmarking purposes. This is important because peers can be used in other contexts. For example, about one-third of the firms disclosing peers for compensation benchmarking also disclose peers for relative performance evaluation (RPE) purposes. Approximately 20–30% of these firms use the same peer group for both compensation benchmarking and RPE (Black, Dikolli, and Hofmann, 2011; Gong, Li, and Shin, 2011).

We obtain proxy statements for 4,217 firm-year observations. About 89% of these firms report using a group of peers, a compensation consultant database, or an index of firms to benchmark compensation. The remaining 11% of firms either explicitly mention that they do not use benchmarking or surveys to set compensation or that they do not disclose any information regarding the use of peers to benchmark compensation. For example, Zenith National Insurance states in its 2007 proxy statements that "the Compensation Committee does not utilize benchmarking or surveys or the services of compensation consultants, but relies on the experience and knowledge of its members." Of the firms using peers, 418 firm-year observations do not explicitly report the names of the peers used (most of these cases pertain to proxy statements filed during the first year following the new disclosure requirements). Some of the

firms that do not explicitly disclose peers' names benchmark either against indexes, such as the S&P 500 or the S&P Electric Utility index, or against a compensation consultant database. We further exclude 133 firm-year observations for which the number of peers was greater than 75 because of the high data-collection cost per peer. For example, some firms listed the 300 peers included in a compensation consultant database.

We collect financial and compensation information for each of the peers. Compensation data are obtained from both the ExecuComp and Morningstar databases. Like ExecuComp, Morningstar collects data reported by firms in proxy statements or 10-K filings with the SEC. The Morningstar database, however, provides executive compensation data for a much larger universe of U.S. companies. For example, for fiscal year 2005, Morningstar provides data on approximately 6,400 firms, including practically all of the approximately 1,900 firms in ExecuComp. Because peers are often not included in the ExecuComp database, we augment our compensation data with Morningstar, so that the final sample size is approximately double. As a result, our sample consists of 3,158 firm-years and 45,281 firm-year-peer observations (from 1,273 unique disclosing firms and 1,972 unique peers) estimating the peer choice models. This sample is then reduced to 2,836 firm-years for the analysis on the decomposition of the peer pay effect (Table 3) and 2,158 firm-years for the analysis on performance and compensation (Tables 4 to 7) due to additional data requirements. Note that in Table 6, the number of observations drops further in some tests because of additional data requirements. Our sample is larger than the samples in FY and BLN, which consist of 657 and 707 disclosing firms, respectively. The differences in the sample come from (i) the longer time-series in our data and (ii) our use of Morningstar data to obtain the compensation of peer firms. Panel A of Table 1 summarizes the sample selection.

Panel B presents descriptive statistics for the number of peers disclosed per firm. The median firm has approximately 16 peers with available data to perform the analysis. In addition, there is considerable cross-sectional variation in the number of peers disclosed per firm. The 5th (95th) percentile equals six (36) peers per disclosing firm.

3. Empirical tests and results

This section describes our analyses. Our analyses first replicate FY and BLN and examine the effect of firm characteristics and peers' CEO pay in explaining peer choice. Then we decompose the peer pay effect into a component that reflects CEO talent and one that reflects self-serving behavior. We follow by investigating the extent to which the talent and self-serving components lead to higher CEO pay. Finally, we perform a series of robustness tests.

3.1. Firms' peer selection

To examine the peer pay effect in our sample, we estimate various specifications of the following regression:

$$Peer_{ijt} = \alpha + \Sigma\, \beta_m\, Firm\ characteristic_{m,ijt} + \delta\, Peer\ pay_{ijt} + \varepsilon_{ijt}, \quad (1)$$

where $Peer_{ijt}$ is an indicator variable that equals one if firm *i* uses peer *j* in determining executive compensation in year *t*, as disclosed in its proxy statement filed with the SEC, zero otherwise; *Firm characteristic* is a set of variables that captures similarities between firms and their potential peers, and *Peer pay* is a measure of CEO compensation for the peer firm.

The treatment sample for this test includes peers chosen by firms as disclosed in their proxy filing. These peers represent cases in which *Peer* = 1. To estimate the model, we require a sample of peers *not chosen* by management. Following FY and BLN, the sample of potential peers includes all disclosing firms and their selected peers in a given year. For example, in 2006 there are 1,067 disclosing firms in our sample and 2,922 different selected peers. Thus, for each

firm the pool of potential peers consists of the remaining 1,066 disclosing firms and the 2,922 selected peers.[2]

We estimate two specifications of Eq. (1) to follow FY and BLN, respectively. Table 2, Panel A presents a probit estimation of the FY specification. The model follows FY closely. The first column presents the results using only the firm characteristics. Firms are more likely to choose peers from the same two-digit Standard Industrial Classification (SIC) industry and that have a similar size. This is consistent with the findings in Albuquerque (2009), who shows that industry-size peer groups capture similarity in firms' economic shocks. In addition, peers are also matched on index membership (i.e., Dow Jones, S&P 500, or S&P Mid Cap 400), CEO responsibility (i.e., whether or not the CEO is also the chair of the board), number of peers, and talent flows (i.e., firms from which one of the top five executives moved during 1992–2005). Despite the larger sample, these results compare well with FY (Model 1 of their Table 4). In the second column of Table 2, as in FY, we include the log of total compensation for the peer's CEO. The coefficient on this variable is positive and significantly different from zero, consistent with firms choosing peers with higher CEO pay. One interpretation for this finding mentioned in FY is that, after controlling for economic similarities between the two firms, firms appear to select highly paid peers to justify higher CEO pay.

Panel B presents the results for the replication of the BLN specification. Consistent with BLN, firms are more likely to choose peers from the same Fama-French industry, as well as

[2] Our analyses closely replicate the methodologies in both FY and BLN. While the FY and BLN methods are similar in several ways, there are some important differences. FY require the pool of potential peers to be in the S&P 500 or the S&P Mid Cap 400, whereas BLN do not impose such a restriction. In addition, FY exclude the actual peers from the pool of potential peers, but BLN make no such exclusion. BLN allow separate coefficients for positive and negative differences between variables (e.g., positive vs. negative difference in sales) and include firm fixed-effects in the model, whereas FY do not include firm fixed-effects. As we follow each paper closely, our paper implements these differences. In untabulated analysis, we perform a series of tests (e.g., using each methodology consistently for both approaches) and find that these differences have little (if any) effect on our inferences. Further, because our sample spans more years and is larger than the samples in FY and BLN, we have estimated our FY and BLN models using a time period similar to that of each respective paper. Our results and inferences are unchanged.

peers with similar sales, profitability, growth opportunities, executive flows, S&P 500 membership, credit rating, and complexity (as captured by the number of business and geographic segments). The results in Model 1 of Panel B are comparable with those of BLN (Model 1 of their Table 3). In Model 2, like BLN, we add the difference in total compensation between the peer's CEO and the firm's CEO, and allow for asymmetry in how relative pay affects the choice of peers. We find that firms are more likely to choose potential peers with higher paid, as opposed to lower paid, CEOs.

In summary, Table 2 provides evidence that corroborates the results of FY and BLN. In addition, these tests provide evidence of the peer pay effect: that peers are more likely to be chosen if they have higher levels of CEO pay. We now turn to the main purpose of our paper: to explain the peer pay effect.

3.2. Decomposition of the peer pay effect: talent versus self-serving behavior

This section discusses how we decompose the peer pay effect into subcomponents capturing talent and self-serving behavior. We define the peer pay effect variable (*PPE*) as the percentage difference between the actual and the propensity-score-matched peer pay. Actual peer pay is the median total CEO compensation of the firm's chosen peers. Propensity-score-matched peer pay is the median total CEO compensation of the firm's propensity-matched peers. To generate the FY (BLN) propensity-score-matched peer pay, we do the following. We match each firm-peer-year observation in Panel A (Panel B) of Table 2 to a firm that has the closest fitted probability of being selected as a given peer using the fitted coefficients of Model 1 in Panel A (Panel B). We then compute the median actual pay for the selected peers and compare it to the median actual pay for the propensity-matched peers. For instance, if a firm selects 15 peers in a given year, we compare the median pay of the selected peers to the median pay of the 15

matched firms. We add the suffix *FY* or *BLN* to the *PPE* variable to indicate the version of *PPE* being used in our tests.

Panel A of Table 3 provides descriptive statistics for these measures. The mean value for *PPE* calculated using the FY (BLN) specification is 0.133 (0.037), which corresponds to firm-chosen peers paying their CEOs approximately 13.3% (3.7%) higher than the CEO pay at predicted peers. Although our sample includes two additional years of observations after the 2006 disclosure regulation takes effect, our values are similar to those reported by FY (10.7% in Table 5, p. 267). In untabulated analysis, we find that the median *PPE* among S&P 500 (non-S&P 500) firms in our sample equals 7.6% (0.6%), which is very similar to BLN's 8.0% (0.7%) for S&P 500 (non-S&P 500) firms in their Table 6, p. 549.[3] In dollar terms, the 13.3% (3.7%) pay difference corresponds to CEO pay that is $896,000 ($463,000) higher at firm-chosen peers than it is at predicted peers for the FY (BLN) model. The values are also consistent with the results in Table 2 that indicate that higher CEO pay increases the probability of being selected as a peer.

We then test whether CEO talent represents an alternative explanation for the peer pay effect not considered by FY and BLN. Eq. (1) models the peer choice as a function of firm characteristics; it implicitly assumes that all proxies for similarities between the CEO and his peers are included in the model. FY and BLN attribute the peer pay effect to self-serving behavior. There are, however, potentially unobserved CEO talent characteristics, which represents a potential alternative explanation for the peer pay effect. To test this idea, we

[3] The peer pay effect using the BLN model is smaller than the one obtained using the FY model, likely because of two differences in the empirical design. First, BLN include firm fixed-effects in their probit model. Second, BLN allow for asymmetric deviations between the firm and chosen peers. For example, in the BLN model, the probability of picking a larger peer can be different from the probability of picking a smaller peer. When we estimate Eq. (1) using the BLN model but do not allow asymmetric peer selection and exclude the firm fixed-effects, we obtain a mean *PPE* of 18%.

estimate three variations of the following model:

$$PPE_{it} = \beta_0 + \sum \beta_m \, CEO\ talent_{m,it} + \sum \beta_n \, Self\ serving_{n,it} + \varepsilon_{it}, \quad (2)$$

where *CEO talent* is a set of proxies for CEO talent and *Self serving* is a set of governance measures as proxies for self-serving behavior.

Because these constructs are inherently difficult to measure, we employ three approaches to decompose the peer pay effect into talent and self-serving components. First, we include only the proxies for *CEO talent* in the model and use the predicted component of the peer pay effect as a proxy for talent (*PPE-Talent1*). In this case, the residual from this model, i.e., the remaining portion of the peer pay effect that is not explained by our talent proxies, serves as a proxy for self-serving behavior (*PPE-Self serving1*). Second, we reverse this approach. Specifically, the model includes only the *Self serving* proxies and it uses the predicted component of the peer pay effect as a proxy for self-serving behavior. Thus, in our second approach, the residual from the model serves as a proxy for talent. We label these variables as *PPE-Talent2* and *PPE-Self serving2*.

A drawback of these first two approaches is that the residual will also capture noise as well as any other potential explanations for the peer pay effect (e.g., any omitted variable associated with the peer pay effect). Thus, the third approach estimates Eq. (2) with the full set of proxies for *CEO talent* and *Self serving*. The third measure of CEO talent is the predicted component of *PPE* calculated using the estimated coefficients on the *CEO talent* variables. Similarly, the third measure of self-serving behavior is the predicted component of *PPE* calculated using the estimated coefficients on the *Self serving* variables. We label these variables as *PPE-Talent3* and *PPE-Self serving3*.

We use three measures to capture *CEO talent:* past abnormal performance, the size of the firms the CEO has managed in the past, and media coverage. The first construct, abnormal performance, is based on the idea that CEOs who have historically produced greater abnormal performance are more talented (see Carter et al., 2010; Chang et al., 2010; Fee and Hadlock, 2003; and Rajgopal et al., 2006). We measure performance using both accounting and stock returns. *CEO abn ROA* is the average of the firm's return on assets (ROA) measured relative to the industry ROA over years *t*-3 to *t*-1.[4] Similarly, *CEO abn ret* is the average of the firm's stock return measured relative to the S&P 500 index over years *t*-3 to *t*-1. The second measure, the size of the firms the CEO has managed, is based on the argument that the most talented CEOs are assigned to the largest firms in the economy (Gabaix and Landier, 2008; Rosen, 1982). *CEO log market cap* is the natural logarithm of the average market capitalization of the companies for which the CEO worked over years *t*-3 to *t*-1. When calculating these three measures over the previous three-year period, CEOs need not have worked at the same firm nor have served as CEO. Finally, our third measure, the extent of media coverage, is based on the idea that the business press tends to cover CEOs who are recognized as talented, high achievers, or role models in their industries (see Falato et al., 2011; Milbourn, 2003; Rajgopal et al., 2006). We measure *Media coverage* as the number of articles containing the CEO's name and the firm's name that appear in the major business newspapers. Following Falato et al. (2011), we only count the number of articles that do not have a negative tone.

We use several proxies for *Self serving* behavior intended to capture weak corporate governance structures. As mentioned above, while the board's compensation committee is

[4] The use of the prior three years is admittedly ad hoc but not crucial to our findings. Our results are robust to the use of two to five years when measuring CEO talent. The important feature is that these measures are aggregated over a period longer than one year so as to distinguish the effect from firm characteristics already included in the probit selection model.

responsible for setting executive pay, executives can affect this process. Hence, the proxies used represent situations in which the CEO could more strongly influence the pay-setting process, relative to the board's ability to control it. We follow the literature in our choice of measures of weak governance or self-serving behavior (e.g., Core et al., 1999; Dittmar and Mahrt-Smith, 2007; Masulis et al., 2007; Harford et al., 2008). Our measures reflect three dimensions of governance: (i) board structure, (ii) antitakeover provisions, and (iii) ownership concentration.

We proxy for board structure using variables aimed at capturing whether the board is busy, the percentage of the board hired after the CEO, and board size. Core et al. (1999) argue that directors who serve on too many boards are less effective at attending to their monitoring duties. *Busy board* is an indicator variable that equals one if the number of other boards on which the firm directors serve is above the sample median, zero otherwise. *Board hired after CEO* proxies for the extent to which the CEO is able to exert influence over board members to extract private benefits (Core et al., 1999; BLN, 2011). This indicator variable equals one if the percentage of the board hired after the CEO is higher than the sample median, zero otherwise. Board size captures the board's effectiveness in monitoring and evaluating the CEO. Recent studies find evidence that larger boards can provide optimal monitoring when a manager's opportunity to consume private benefits is high (e.g., Harris and Raviv, 2008; Boone et al., 2007). *Small board size* is an indicator variable that equals one if board size is below the sample median, zero otherwise.

We proxy for antitakeover provisions using the Gompers, Ishii, and Metrick (2003) measure of the strength of shareholder rights (GIM index). *High GIM index* is an indicator variable equal to one if the value of GIM index is above the sample median (as in BLN), zero otherwise. In an untabulated test, we also use the Bebchuk et al. (2009) entrenchment index as

an alternative measure of antitakeover provisions. The inferences are almost identical, which is not surprising given that Bebchuk et al.'s measure is calculated based on six antitakeover provisions from the Gompers et al. index.

We proxy for ownership concentration using the percentage of the firm's shares held by institutional investors and by the firm's insiders. Having a larger percentage of shares held by institutional investors is consistent with more oversight on the part of potentially active large shareholders (Dittmar and Mahrt-Smith, 2007). *Small institutional ownership* is an indicator variable that equals one if the percentage of the firm's shares held by institutional investors is below the sample median, zero otherwise. Regarding insider ownership, prior research (e.g., Morck et al., 1988; Shleifer and Vishny, 1997; Claessens et al., 2002) argues that, among firms with low levels of insider ownership, increased insider ownership is associated with higher incentives for top managers to increase firm value ("incentive effect"), but that, for high levels of insider ownership, the entrenchment incentives exceed the incentive leading to potential opportunistic behavior by insiders. Because our sample consists of firms in the S&P 1500, for which insider ownership is arguably low, we define *Small insider ownership* as an indicator variable that equals one if the percentage of shares in the hands of the top five executives, as defined by ExecuComp, is below the sample median, zero otherwise.[5] Finally, we include a variable indicating whether the number of peers is small (*Small peer group*). FY suggest that it is easier to justify a higher compensation when the peer group is smaller because fewer highly paid peers are required.

We expect our proxies for weaker corporate governance to be positively related to the peer pay effect if CEOs are more able to influence the choice of highly paid peers when

[5] Morck et al. (1988) and McConnell and Servaes (1990) suggest that the entrenchment effect occurs for high levels of insider ownership (e.g., above 37.5% in their sample). The mean (median) level of insider ownership for our sample firms is 3% (2%), with only five firms passing the 37.5% threshold.

corporate governance is weak. However, we acknowledge that while our proxies for governance follow prior literature, these measures often have an alternative interpretation. For example, recent studies have associated smaller boards with the board's less effective monitoring of the CEO's actions (e.g., Harris and Raviv, 2008; and Boone et al., 2007), but some other studies (Yermack, 1996; Core et al., 1999) find evidence consistent with smaller boards being associated with stronger governance structures. Thus, our results are a joint test of the effect of self-serving behavior on the peer pay effect and on our measures identifying self-serving. Further, governance variables are endogenous and affected by both observable and unobservable firm characteristics. Section 3.4 discusses these issues in more detail and provides sensitivity analyses to mitigate the concern that our results are driven by our set of proxies for self-serving behavior.

Panel B of Table 3 provides Pearson (Spearman) correlations among the Eq. (2) variables below (above) the main diagonal. Based on the Pearson correlations, *PPE_FY* is positively correlated with the CEO's past stock performance (0.07), past firm size (0.16), and visibility in the news (0.13), providing evidence that the peer pay effect is related to the CEO's perceived talent. In addition, the talent proxies are positively correlated among themselves. For example, the correlation between abnormal stock return and *CEO log market cap* equals 0.24, whereas the correlation between *CEO log market cap* and *Log media coverage* equals 0.61.

In analyzing the correlations between *PPE* and the self-serving proxies, we find that the peer pay effect is only positively correlated with the board structure characteristics. For example, *PPE_BLN* is positively correlated with busy boards (0.06) and with the fraction of the board hired after the CEO (0.06). In addition, the self-serving variables are not always positively correlated amongst themselves. For example, *Small board size* is negatively correlated with *Small institutional ownership* (-0.31) and *High GIM index* (-0.15).

Panel C shows the results of regressing the peer pay effect on our proxies for talent and self-serving behavior (i.e., estimating Eq. (2)). The first (last) three columns use *PPE_FY* (*PPE_BLN*) as the dependent variable. Columns 1 and 4 show the results of regressing *PPE* on the talent proxies only, i.e., our first method for decomposing *PPE*. Coefficients on both *CEO abn ret* and *CEO log market cap* are positive and statistically significant in both the FY and BLN models. This implies that firms with high *PPE* are those which have CEOs who exhibit a larger past abnormal stock performance, and who have managed larger and more complex organizations. The coefficient on *Log media coverage* is not significant in either model. The *CEO abn ROA* coefficient is negative and statistically significant using the BLN model in column 4. This unexpected negative result is due to the inclusion of *CEO abn ret* and *CEO log market cap* in the model. Untabulated analyses show that if we remove these variables, the coefficient on *CEO abn ROA* becomes positive albeit statistically insignificant. Overall, the results in columns 1 and 4 indicate that the peer pay effect is partially explained by the proxies for CEO talent.

The results of estimating Eq. (2) using only the self-serving proxies (our second method of decomposing *PPE*) are presented in columns 2 and 5. We find some evidence that corporate governance characteristics explain the peer pay effect. *PPE* is larger for firms with busy boards, using both the FY and BLN models, and when board members were hired after the CEO took office, using the BLN model. We find little evidence that the other governance variables explain the peer pay effect.

Columns 3 and 6 present the results of estimating Eq. (2) using both the talent and self-serving proxies. In terms of talent proxies, as above, the results show that *PPE* is higher for CEOs who exhibit a higher historical abnormal stock performance, have managed larger and

more complex organizations, but with a lower accounting performance. The results also show that *PPE_FY* is larger for more visible CEOs, as captured by their media coverage. In terms of the self-serving proxies, *Busy board* and *Board hired after CEO* are significant and positively associated with *PPE* in the FY and BLN specifications, respectively. Firms with smaller boards have a higher *PPE* in both specifications. On the other hand, to the extent that firms with larger insider and institutional ownership are associated with stronger monitoring on the part of insiders and institutional investors, the negative coefficients on *Small insider ownership* and *Small institutional ownership* are inconsistent with *PPE* capturing self-serving behavior.

Overall, the results in Table 3, Panel C indicate that the peer pay effect is partially explained by proxies for CEO talent and self-serving behavior. We then use this result to decompose the peer pay effect into the talent and self-serving components. In the next sections, we validate these constructs by correlating them with future accounting and stock performance and then study their impact on CEO compensation.

3.2.1. Validating the peer pay effect decomposition

Because CEO talent and self-serving behavior are constructs that are inherently difficult to measure, following Core et al. (1999), we relate the components of the peer pay effect capturing talent and self-serving behavior to future accounting and stock performance to validate their respective use as proxies for these constructs. If the talent component captures CEO talent, then it should be associated with a stronger future performance. In contrast, if the self-serving component captures self-serving behavior, then it should be negatively associated with future performance. We measure performance by future accounting and stock returns. As discussed in Core et al. (1999), this prediction is stronger for accounting performance but less clear for stock return performance. This is because, under efficient markets, stock returns would fully price the

future cash flow implications of talent and self-serving behavior and peer choice practices would not translate into differences in stock returns. To test our assertions, we estimate the following models:

$$\begin{aligned} \textit{Future ROA}_{it} = {} & \beta_0 + \beta_1 \textit{ Cdf PPE-Talent}_{it} + \beta_2 \textit{ Cdf PPE-Self serving}_{it} \\ & + \beta_3 \textit{ Sales}_{it} + \beta_4 \textit{ Log STD ROA}_{it} \\ & + \textit{Industry effects} + \textit{Year effects} + \varepsilon_{it}. \end{aligned} \tag{3}$$

$$\begin{aligned} \textit{Future Ret}_{it} = {} & \beta_0 + \beta_1 \textit{ Cdf PPE-Talent}_{it} + \beta_2 \textit{ Cdf PPE-Self serving}_{it} \\ & + \beta_3 \textit{ Log market value}_{it} + \beta_4 \textit{ Log STD ret}_{it} + \beta_5 \textit{ Book-market ratio}_{it} \\ & + \textit{Industry effects} + \textit{Year effects} + \varepsilon_{it}. \end{aligned} \tag{4}$$

Future ROA is the one-year-ahead annual return on assets. *Future ret* is the 12-month stock returns for the one-year-ahead fiscal year. Our set of control variables follows Core et al. (1999). *STD ROA* (*STD ret*) is the standard deviation of return on assets (stock returns) over the prior four years. *Sales* is the total sales revenues. *Market value* is the market capitalization of the firm. The prefix *Log* indicates that we took the natural logarithm of the variable. Other variables are defined above.

We estimate Eqs. (3) and (4) separately for each of the three methods of decomposing the peer pay effect, and separately using the FY and BLN versions of the peer pay effect. Following Aggarwal and Samwick (1999) and Rajgopal et al. (2006), among others, to facilitate comparisons of the economic significance across *PPE-Talent* and *PPE-Self serving*, we transform these three variables by using their empirical cumulative distribution functions (indicated by the prefix *Cdf*). These variables then have the same standard deviation, and a mean and median of approximately 0.5.

Table 4, Panel A provides descriptive statistics on the variables used in these regressions. The mean value for *PPE-Talent3_FY* (*PPE-Talent3_BLN*) equals 0.41 (0.53), whereas the mean value for *PPE-Self serving3_FY* (*PPE-Self serving3_BLN*) equals 0.008 (0.016). This provides

preliminary evidence that the expected peer pay effect driven by talent is higher than the respective value for the self-serving component.

Table 4, Panel B presents the results of our estimation of Eq. (3), which uses future accounting performance as the dependent variable. The first (last) four columns present the result for the FY (BLN) specification. Column 1 shows the results when we employ the cumulative distribution function of *PPE* that uses the FY model before decomposing it. The results show that the *PPE* measure is not (statistically) negatively associated with future accounting performance, as one would expect if *PPE* were only capturing self-serving behavior. However, a different picture emerges once we decompose the *PPE* measures into their talent and self-serving components, as shown in columns 2 through 4. Specifically, the coefficients on the talent and self-serving components are now generally positive and negative, respectively. The only exception is when the residual *PPE* serves as a proxy for CEO talent (*Cdf PPE-Talent2* in model 3). In terms of economic significance, using the column 4 results, an increase in the *Cdf PPE-Talent3* from the first to the third quartile of the distribution leads to an increase in performance of 0.46% (i.e., 0.5 multiplied by the 0.91 coefficient on *Cdf PPE-Talent3* in column 4). In contrast, a similar increase in *Cdf PPE-Self serving3* leads to a decrease in performance of 0.39%. Columns 5 through 8 show a set of tests similar to columns 1 through 4 but with the BLN version of the peer pay effect. The inferences are generally similar. That is, future accounting performance is generally positively related to the talent portions of the peer pay effect whereas the relation with the self-serving component is negative, albeit statistically insignificant. In terms of control variables, accounting performance is generally positively related to sales and negatively related to the standard deviation of ROA.

Table 4, Panel C presents the results of regressions that predict future stock performance.

The coefficient on *PPE* is either insignificant (column 1) or positive and significantly different than zero (column 5), which is inconsistent with it simply capturing self-serving behavior. Further, across columns 2 to 4 and 6 to 8, the coefficients on the talent component of *PPE* (*Cdf PPE-Talent*) are always positive and statistically significant in five out of the six cases. The coefficient on *PPE-Self serving*, in contrast, is always insignificant. In terms of economic significance, using the results from column 8, an increase in the talent component of the peer pay effect from the first to the third quartile of the distribution leads to an increase in stock performance by 54% whereas a similar increase in the self-serving component leads to a decrease in stock performance of 7%.

In sum, the results in Table 4 show that the proxies for talent are generally positively related to abnormal accounting and stock performance, whereas the proxies for self-serving behavior are either unrelated or negatively related to abnormal performance. These results hence increase confidence in our assertion that the measures of *PPE-Talent* proxy for CEO talent while the *PPE-Self serving* measures proxy for self-serving behavior.

3.3. The ability of peer pay components to explain CEO compensation

If the choice of peers is a vital component of the compensation-setting process, then peers' CEO pay should be positively related to firms' CEO pay. As a starting point of this analysis, we first corroborate the results of FY and BLN that the total compensation of peer CEOs is economically important after controlling for the determinants of compensation as established by the extant literature. We estimate:

$$Log\ future\ pay_{it} = \alpha + \gamma_1\ Log\ peer\ pay_{it} + \Sigma\ \beta_m\ Controls_{m,it} + \ \varepsilon_{it}. \quad (5)$$

Future pay is equal to the total compensation for firm *i*'s CEO in year *t*+1. *Peer pay* is the median total compensation of the firm's selected peers. *Controls* include firm size, firm

performance measures (change in ROA, stock return, and lagged stock return), lagged market-to-book value of assets, and lagged firm volatility (measured by the natural logarithm of the standard deviation of stock returns calculated over the last four years), all of which have been shown to explain compensation levels (e.g., Smith and Watts, 1992; Core and Guay, 1999; Murphy, 1999). We also include year and industry (two-digit SIC codes) fixed-effects to control for any variation in CEO pay over time and across industries and we cluster the standard errors at the firm-level.

We then expand Eq. (5) in two ways. First, we substitute the compensation of the firm's selected peers, *Peer pay*, for its components: the compensation of the propensity-score-matched peers, *Peer pay matched,* and the peer pay effect (*PPE*), that is, the pay at selected peers in excess of the pay at the matched peers. To facilitate interpretation and comparison across coefficients, we standardize the matched and residual peer pay using their CDF function. We estimate the following model:

$$Log\ pay_{it+1} = \alpha + \gamma_1\ Cdf\ PPE_{it} + \gamma_2\ Cdf\ Peer\ pay\ matched_{it} + \Sigma\ \beta_m\ Controls_{m,it} + \varepsilon_{it+1}. \quad (6)$$

Second, we use our decomposition of the peer pay effect into the talent and self-serving components to test their association with CEO pay. As before, we also standardize the talent and self-serving components of the peer pay effect using their CDF function. Thus, we estimate the following regression:

$$Log\ pay_{it+1} = \alpha + \gamma_1\ Cdf\ PPE\text{-}Talent_{it} + \gamma_2\ Cdf\ PPE\text{-}Self\ serving_{it} + \gamma_3\ Cdf\ Peer\ pay\ matched_{it} + \Sigma\ \beta_m\ Controls_{m,it} + \varepsilon_{it+1}. \quad (7)$$

Table 5 shows the results. Panel A provides descriptive statistics for the CEO compensation and its control variables used in estimating Eqs. (5) to (7). The median total compensation in our sample equals \$4.59 million. This amount is slightly higher than the \$3.88

million median compensation reported by BLN, but much smaller than the median pay of $6.09 million in FY. This difference, relative to FY, is likely due to the fact that our S&P 1500 sample includes a larger set of firms (it includes not only S&P 900 Large Cap and Mid Cap firms, but also S&P 600 Small Cap firms).

Table 5, Panel B presents the regression results. The estimated coefficients on the control variables are generally consistent with the literature. For example, CEOs at larger firms with better performance and more growth opportunities receive higher pay. In column 1, the coefficient on *Log peer pay* is positive and statistically significant, which indicates that the median CEO pay of the firm-chosen peers is an incrementally important explanatory variable over and above the established economic factors shown to predict CEO compensation, as in FY and BLN. A one-standard-deviation increase in the median pay of the firm-chosen peers is associated with an increase in the disclosing firm's CEO pay of approximately $1,471,400.[6] Column 2 shows the results of Eq. (6) using the FY version of the peer pay effect. The coefficient on *Cdf_PPE* is positive and statistically significant, consistent with the peer pay effect increasing CEO compensation. As expected, the compensation of the propensity-score-matched peers, *Peer pay matched*, is also positively related to CEO compensation. The results of columns 1 and 2 corroborate the results in FY, who show that the compensation of selected peers is positively associated with CEO pay.

In columns 3 through 5, we replace the peer pay effect with its talent and self-serving components. In all cases, the coefficients are positive and statistically significant, consistent with both a talent and self-serving peer pay effect on compensation. However, the coefficient on the talent component of pay is two to almost ten times larger than the coefficient on the self-serving

[6] The dollar value of $1,471,400 is obtained as [exp(8.527+0.38*0.673)-exp(8.527)], in which 8.527 is the mean of the natural logarithm of selected peers' total pay; 0.38 is the coefficient on the variable *Peer pay* in Table 5, Panel B, column 1; and 0.673 is the standard deviation of *Log peer pay* (from Panel A of Table 5).

component of the *PPE*. For example, even when the talent component is computed as the residual from the regression of the peer pay effect on self-serving proxies (arguably our most conservative estimation method of talent) the coefficient on *Cdf PPE-Talent2* is almost twice the magnitude of the coefficient on *Cdf PPE-Self serving2* (0.60 versus 0.33 in column 4). When we model both talent and self-serving—our third method presented in column 5—the coefficient on talent is almost ten times larger than the coefficient on self-serving. In economic terms, a one-standard-deviation increase in the talent portion of the *PPE* in column 5 increases the mean compensation by 26.7%, which is about $1,811,000. In contrast, a similar increase in the self-serving component of the *PPE* in column 5 increases the mean compensation by 2.7%, which is about $184,000.[7] Columns 6 to 9 provide the same tests as in columns 2 to 5, but using the BLN version of the peer pay effect instead of the FY version. The sign and magnitude of coefficients and *t*-statistics are highly similar to their corresponding coefficients in the previous four columns.

To summarize, Table 5 provides evidence that CEO talent is an economically important explanation for why firms select highly paid peers. The self-serving measures are also positively associated with CEO compensation, but at lower magnitudes than those of talent. In terms of economic significance, the impact of the self-serving component of the peer pay effect on CEO pay ranges from about one-tenth to less than two-thirds of the impact of the talent component.

3.4. Robustness tests

The key aspect of our research design is our decomposition of the peer pay effect into the talent and self-serving components. As discussed above, these constructs are difficult to measure

[7] The dollar values of $1,811,000 and $184,000 are obtained as [exp(8.406+1.18*0.288)-exp(8.406)] and [exp(8.406+0.14*0.288)-exp(8.406)], respectively. As described in Table 5, Panel A, 8.406 is the mean of the log compensation and 0.288 is the standard deviation of the CDFs of the predicted and residual peer pay effects (untabulated).

and can only be proxied by the researcher. In our main analyses, we use three methods to implement this decomposition and validate these proxies by examining the effect of the talent and self-serving components on future firm performance. In this section, we perform three sets of additional robustness analyses. Our tests are classified in three groups: (i) sensitivity to alternative measures of CEO talent, (ii) sensitivity to alternative measures of self-serving behavior, and (iii) decomposition of the peer pay effect over time.

3.4.1. Proxies for talent

With respect to proxies for talent, we consider two alternative measures of talent used by prior research. The first considers historical CEO pay as a proxy for talent. This measure has been used in prior studies as a measure of talent; more talented CEOs are expected to receive higher total compensation under an efficient market (e.g., Chang et al., 2010). We measure *Past CEO pay* as the logarithm of cumulative total compensation over the prior three years, so *Past CEO pay* in 2006 reflects the sum of total pay for the years 2003 to 2005. Our main analysis does not include this measure because one could argue that historical CEO pay could be a reflection of prior self-serving behavior instead of talent. Thus, we present these results as a robustness test and measure historical pay over the prior three years to mitigate the concern that it could capture self-serving behavior. We then include this measure as an additional proxy for talent in the decomposition of the peer pay effect.

Our second proxy for CEO talent is CEO fixed-effects. Since Bertrand and Schoar (2003), several papers have used manager fixed-effects as a way to isolate unobserved characteristics of the CEO. Bertrand and Schoar (2003) separate manager fixed-effects from firm fixed-effects by analyzing a large panel of compensation data composed of managers who have switched firms. Their method, however, restricts the sample because a relatively small number of

executives change jobs on ExecuComp. More recently, Graham et al. (2012) estimate CEO fixed-effects as a proxy for CEO talent by means of a procedure developed by Abowd, Kramarz, and Margolis (1999) (AKM) that overcomes this data limitation. Specifically, the AKM procedure allows for the estimation of CEO fixed-effects in a much larger sample because it permits the estimation of CEO fixed-effects, in addition to firm fixed-effects, for CEOs who did not necessarily change firms over the estimation period as long as they worked for firms that replaced executives during this period. The detailed estimation is provided in Graham et al. (2012, Appendix B).

We follow Graham et al. (2012) closely in the implementation of the AKM method and estimate an *out-of-sample* measure of CEO fixed-effects using the population of ExecuComp firms from 1993 to 2005. We stop in 2005 so that the fixed-effects estimation precedes our sample period. This methodology permits us to obtain CEO fixed-effects for 597 CEOs representing 1,362 firm-years in our sample. Because the sample is substantially smaller than our main sample, we present these results as additional tests. We then include the CEO fixed-effects as another measure of talent in the decomposition of the peer pay effect. Further, this method allows us to estimate an out-of-sample firm fixed-effect, which we include as an additional control. Note, however, that we do not include the firm fixed-effect in the estimate of the talent component of the peer pay effect, as this measure captures unobservable firm characteristics unrelated to CEO talent.

These results are presented in Panels A and B of Table 6. Panel A reports the decomposition of the peer pay effect (analogous to Table 3), whereas Panel B presents the compensation regressions (analogous to Table 5). In untabulated analysis, our inferences are unchanged when we estimate the performance regressions reported in Table 4 after including

historical CEO pay and CEO fixed-effects as proxies for talent. For parsimony, we also report only our third method for decomposing the peer pay effect. This method models the peer pay effect as a function of proxies for both talent and self-serving behavior, and then uses the respective coefficients to estimate *PPE-Talent3* and *PPE-Self serving3*.

In Table 6 Panel A, we find that both *Past CEO pay* and *CEO fixed effect* are positively and statistically associated with the peer pay effect. This is consistent with our main hypothesis that the peer pay effect captures CEO talent. In terms of the compensation regressions (Panel B), our general inferences remain. Specifically, when using *Past CEO pay* (*CEO fixed effect*) as an additional proxy for talent, we find that the talent component of the peer pay effect (*Cdf PPE-Talent3*) is positively associated with CEO compensation. Further, in these regressions the self-serving component (*Cdf PPE-Self serving3*) is no longer statistically significant, which suggests that our prior inferences about the self-serving effect are even smaller if one considers prior pay or fixed-effects as a proxy for CEO talent.[8]

Overall, the findings in this section strengthen our hypothesis and results that CEO talent is a major explanation for the peer pay effect shown in FY and BLN.

3.4.2. Proxies for self-serving behavior

With respect to proxies for self-serving behavior, we perform two sensitivity analyses. First, our main analysis excludes some measures of governance used in FY and BLN that could also capture CEO talent, such as whether the CEO is also the chair of the board, the tenure of the CEO in the firm, and whether the CEO works for an S&P 500 firm. In this section, we include these measures to ensure that our results are not driven by the exclusion of these variables. Table

[8] Our measures of the talent and self-serving components of *PPE* computed in Table 3 have a positive and negative Pearson correlation of about 0.30 and -0.15, respectively, with the CEO fixed-effects measure. To the extent that CEO fixed-effects capture CEO talent, as argued in Graham et al. (2012), this provides an alternative way to validate our peer pay effect decomposition.

6 presents these results (see columns with 'FY/BLN variables'). In Panel A, we find that the peer pay effect is smaller when the CEO is also the board chair and for S&P 500 firms. Moreover, in Panel B, the results continue to support our inference that the peer pay effect mostly represents compensation for CEO talent.

Second, we include additional control variables in our decomposition of the peer pay effect to deal with the endogenous nature of some of the governance proxies (e.g., board structure). For instance, prior research finds that board structure is explained by firm characteristics such as firm size, the number of business segments, leverage, R&D intensity, intangible assets, risk, performance, and growth opportunities (e.g., Boone et al., 2007; Coles, Daniel, and Naveen, 2008; Linck, Netter, and Yang, 2008). Some of these firm characteristics are already included in the probit model that predicts the selected and propensity-matched peers. Thus, to the extent that these firm characteristics have already been matched in the first stage, they are unlikely to explain the cross-sectional variation in the peer pay effect in our decomposition. Nonetheless, we include the following firm characteristics as additional explanatory variables in the model used to decompose the peer pay effect: the firm's return volatility, leverage, R&D scaled by total assets, market-to-book value of assets, and the number of business segments in which it operates. We find little evidence, however, that these variables explain the peer pay effect (untabulated). More importantly, as shown in Table 6, our peer pay effect decomposition and the compensation results are unaffected by the inclusion of these controls. In untabulated analysis, we obtain similar results using other alternative proxies for corporate governance: board independence and a Herfindahl measure of institutional ownership concentration.

Overall, these results provide evidence that our inferences are robust to alternative

proxies for self-serving behavior as well as to controlling for firm characteristics associated with endogenous measures of corporate governance.

3.4.3. The impact of the peer pay effect on CEO compensation over time

Our last robustness analysis investigates the evolution of the peer pay effect and its components over time. A recent study by Faulkender and Yang (2012) investigates a similar issue and argues that peer manipulation for benchmarking purposes has become more severe over time. We thus repeat our analysis separately for each of the three years of our sample to ensure that our results are not driven by the earlier years in our sample. Specifically, we decompose the peer pay effect following regression models 3 and 6 in Table 3, Panel C but estimate three separate annual regressions for 2006, 2007, and 2008. We then repeat the compensation tests (regression models 5 and 9 in Table 5, Panel B) for each of these years.

Table 7 provides evidence on the impact of the talent and self-serving components on CEO compensation over time. Panel A shows the results using the FY model, while Panel B shows the results with the BLN model. For parsimony, all control variables from the Table 5 analysis are included in the regression but not tabulated (the estimated coefficients on the control variables remain very similar to the ones in Table 5). Columns 1 through 3 show that the impact of *PPE* increased from 2006 to 2008. This is consistent with the findings in Faulkender and Yang (2012). However, once we decompose the peer pay effect into the talent and self-serving components in columns 4 to 6, we find no evidence that the effect of the self-serving components of *PPE* increased over time using the FY model in Panel A, and weak evidence that this self-serving effect increased over time with the BLN specification in Panel B. More importantly, our inferences regarding talent remain significant throughout the period, and are also stronger in recent years using the BLN model.

4. Conclusion

We study how the choice of benchmarking peers impacts CEO compensation. Recent papers by FY (2010) and BLN (2011) show that firms are more likely to choose peers that pay their CEOs higher compensation, consistent with firms self-servingly selecting peers to justify increasing CEO pay. Our paper hypothesizes that the peer pay effect could also represent a reward for CEO talent, which captures managerial success in managing complex organizations and achieving high performance. In other words, we contribute to this literature by studying the relative extent to which the peer pay effect reflects self-serving behavior or a reward for CEO talent.

We show that the peer pay effect largely captures the need to pay CEOs more for their talent. While there is some evidence that self-serving behavior is also an explanation for the peer pay effect, it seems to represent a less economically important explanation for the peer pay effect than does CEO talent. Thus, our results support Holmstrom and Kaplan's (2003) argument and Bizjak et al.'s (2008) findings that the effect of peer benchmarking on CEO pay is more consistent with tighter labor markets than with managerial entrenchment or weak corporate governance. Our findings provide an efficient contracting perspective to prior results on peer selection and benchmarking. In addition, they add to a recent line of research that studies the role of CEO talent in several features of executive compensation contracts.

Appendix. Quotes from proxy statements describing how peers are selected

Quote #1
"The decision to consider data for companies beyond those in the peer group in Invacare's performance graph in setting executive compensation levels reflects Invacare's view that a broad range of companies of comparable size compete with Invacare for senior executive talent. The Company believes that the use of this survey data helps ensure that it is positioned to attract and retain qualified senior executives in the face of competitive pressures." (Source: Invacare Corp 2008 DEF 14A)

Quote #2
"We offer total compensation packages at levels we consider to be competitive with a peer group of companies of similar size in the restaurant industry. In determining our executive officer compensation, we may consider generally available source material on companies in the restaurant industry from business periodicals, proxy statements, and other resources. From time to time, we may consider publicly available compensation data from national companies that we believe are generally comparable to us in terms of size, organization structure, and growth characteristics, and against which we believe we compete for executive talent." (Source: Panera Bread Co. 2008 DEF 14A)

Quote #3
"We use a peer group of companies as a reference for determining competitive total compensation packages. […] These companies were selected because we share many distinguishing criteria, including, but not limited to, a common industry, similar distribution system challenges, market capitalization, global operations, significant brand equity, and/or certain financial criteria. We also compete with these companies for executive talent." (Source: Coca-Cola Co. 2006 DEF 14A)

Quote #4
"The committee selected this peer group because the group consisted of companies that were competitors of Mellon for business and talent; these companies were considered to be the comparators by analysts covering Mellon, the aggregate mix of the peer group companies resembled Mellon's overall business mix, and Mellon's scope was closely aligned with the median of the peer group's scope measures (namely, revenue, net income, market capitalization, total assets, and current assets under management)." (Source: Bank of New York Mellon Corp 2007 DEF 14A).

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Table 1
Sample selection

This table presents our sample selection. Panel A shows the criteria we used. Panel B provides descriptive statistics for the number of peers disclosed per firm.

Panel A: Sample selection

	Observations
Firm-year observations with available data for fiscal years of 2006, 2007, and 2008	4,217
Firm-year observations reporting usage of compensation peers	3,772
Firm-year observations explicitly disclosing peers	3,221
Firm-year observations with required data to estimate peer choice models (Table 2)	3,158
Firm-year observations with required data to decompose the peer pay effect (Table 3)	2,836
Firm-year observations with required data to estimate compensation models (Tables 4 to 7)	2,158

Panel B: Number of peers per firm (3,158 firm-year observations)

		Percentiles						
Mean	Std. dev.	1st	5th	25th	Median	75th	95th	99th
17.8	10.3	2	6	12	16	21	36	59

Table 2
Analysis of peer choice

This table reports the results of estimating two models that predict the peer choice (*Peer*) for 3,158 firms disclosing peers. Panel A replicates the probit model used by FY to estimate peer choice (see Table 4 of FY for more details). Panel B replicates the logit model estimated with firm fixed-effects that BLN use to estimate peer choice (see Table 3 of BLN for more details). The reported coefficient is the elasticity, which represents the change in the probability of a peer being selected for a one-standard-deviation change in the independent variable (or a unit change in the case of an indicator variable). The independent variables in Panel A are defined as follows. *Log peer pay* is the natural logarithm of the total pay of each firm's peer (i.e., measured at the peer *j* level). Total pay is calculated as the sum of salary, bonus, non-equity incentive plan compensation, the grant-date fair value of option awards, the grant-date fair value of stock awards, and other compensation for fiscal years 2006 and 2007. For fiscal year 2005, total CEO compensation is calculated as the sum of salary, bonus, long-term incentive plans, other annual compensation, the market value of restricted stock grants, the value of options awarded, and all other compensation. The value of options awarded for 2005 is calculated using the Black-Scholes value or, when the Black-Scholes value is not available, it is assumed to be the total grant-date present value of options awarded. *Two-digit industry* and *Three-digit industry* are indicator variables equal to one if a potential peer is in the same two-digit and three-digit standard industry classification (SIC) industry of the firm, zero otherwise, respectively. *Sales within 50–200%, Assets within 50–200%,* and *Market cap within 50–200%* are indicator variables equal to one if the sizes (*Sales, Assets*, and *Market capitalization*) of the firm and the potential peer are within 50–200% of each other, zero otherwise. *Dow 30*, *S&P 500*, and *S&P Mid Cap 400* are indicator variables equal to one if both the firm and its potential peer are members of the Dow30, S&P 500, or S&P Mid Cap 400 indexes, respectively, zero otherwise. *CEO is chair* (*CEO is not chair)* is an indicator variable equal to one when CEOs of both the firm and its potential peer are (are not) chairmen of the board of directors, zero otherwise. *Talent flows* is an indicator variable equal to one if at least one of the top five executives moved between the firm and its potential peer during 1992–2005, zero otherwise. *Number of peers* is the number of compensation peers chosen by the firm. The independent variables in Panel B are defined as follows. *Pos peer pay dif (Neg peer pay dif)* is defined as the Log peer total pay – Log firm total pay when firm total pay < (>) peer total pay, zero otherwise. *Fama-French industry* is an indicator variable equal to one if both the firm and potential peer are in the same 48 Fama-French (1997) industry classification, zero otherwise. *Industry correlation* is the correlation of the firm's industry return and the potential peer's industry return. *Pos sales dif* (*Neg sales dif*) is defined as the Log peer sales – Log firm sales when firm sales < (>) peer sales, zero otherwise. *Pos ROA dif* (*Neg ROA dif*) is defined as the peer ROA – firm ROA when the firm ROA < (>) peer ROA, zero otherwise. ROA is net income before extraordinary items divided by total assets. *Pos MTB dif* (*Neg MTB dif*) is defined as the peer MTB – firm MTB when the firm MTB < (>) peer MTB, zero otherwise. MTB is the ratio of the book value of equity to the market value of equity. *Talent flows* is defined as above. *S&P 500* (*Not S&P 500*) is an indicator variable equal to one if both the firm and peer are (are not) S&P 500 firms, zero otherwise. *Credit rating* is an indicator variable equal to one if both the firm and peer have the same credit rating, zero otherwise. *Multiple business segments* (*Single business segments)* is an indicator variable equal to one if both the firm and peer have multiple (only one) business segment(s), zero otherwise. *Multiple geographical segments* (*Single geographical segments)* is an indicator variable equal to one if both the firm and peer have multiple (only one) geographical segment(s), zero otherwise. Observations are at the firm-peer-year level. Reported *z*-statistics in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 2 (*continued*)

Panel A: FY specification

	(1)	(2)
Log peer pay		0.16***
		(86.69)
Two-digit industry	1.05***	1.06***
	(103.73)	(97.35)
Three-digit industry	0.56***	0.57***
	(46.07)	(51.81)
Sales within 50–200%	0.45***	0.45***
	(38.55)	(39.78)
Assets within 50–200%	0.28***	0.29***
	(101.50)	(147.91)
Market cap within 50–200%	0.14***	0.15***
	(34.27)	(37.80)
Dow 30	1.26***	1.17***
	(44.24)	(48.94)
S&P 500	0.50***	0.38***
	(49.61)	(54.68)
S&P Mid Cap 400	0.08***	0.07***
	(18.38)	(23.42)
CEO is chair	0.12***	0.10***
	(9.49)	(6.86)
CEO is not chair	-0.02*	0.00
	(-1.66)	(0.24)
Talent flows	0.88***	0.85***
	(111.38)	(67.16)
Number of peers	0.01***	0.01***
	(14.68)	(14.88)
Pseudo R^2 (%)	27.2%	28.1%
Observations	5,059,272	5,059,272

Table 2 (*continued*)

Panel B: BLN specification

	(1)	(2)
Pos peer pay dif		-0.08***
		(-8.29)
Neg peer pay dif		0.21***
		(22.56)
Fama-French industry	2.97***	2.97***
	(166.92)	(166.62)
Industry correlation	0.76***	0.77***
	(27.99)	(28.28)
Pos sales dif	-0.71***	-0.71***
	(-80.58)	(-76.73)
Neg sales dif	1.72***	1.68***
	(142.00)	(135.68)
Pos ROA dif	-0.60***	-0.72***
	(-5.12)	(-6.14)
Neg ROA dif	1.30***	1.19***
	(10.91)	(10.00)
Pos MTB dif	-0.04***	-0.02***
	(-5.39)	(-2.69)
Neg MTB dif	0.47***	0.47***
	(37.41)	(37.16)
Talent flows	1.38***	1.36***
	(23.04)	(22.84)
S&P 500	0.56***	0.53***
	(28.07)	(26.49)
Not S&P 500	-0.03**	-0.02
	(-1.99)	(-1.17)
Credit rating	0.33***	0.32***
	(28.64)	(27.88)
Multiple business segments	0.08***	0.08***
	(5.80)	(5.42)
Single business segments	0.24***	0.24***
	(13.22)	(13.29)
Multiple geographical segments	0.70***	0.70***
	(44.72)	(44.66)
Single geographical segments	0.20***	0.20***
	(10.45)	(10.28)
Pseudo R^2 (%)	31.2%	31.3%
Observations	4,965,950	4,965,950

Table 3
Decomposition of the peer pay effect

This table reports the results of decomposing the peer pay effect (*PPE*) into two components: CEO talent and self-serving behavior. Panel A provides descriptive statistics for the peer pay effects, CEO talent measures, and self-serving proxies. Panel B presents Pearson (Spearman) correlations between these variables in the lower (upper) diagonal. Panel C presents the results of regressing *PPE* on contemporaneous measures of CEO talent and the self-serving proxies. The variables are defined as follows. *PPE_FY (%) [PPE_FY ($)]* is percentage (dollar value) difference between "actual peer pay" and "propensity-score-matched peer pay" using the FY model. Actual peer pay is the natural logarithm of the median *Pay* of the firm's chosen peers. Propensity-score-matched peer pay is the natural logarithm of the median *Pay* of the firm's "matched" peers, i.e., a sample of companies that are more likely to be peers based on the Table 2 peer-choice prediction model. *PPE_BLN (%) [PPE_BLN ($)]* is the same as above but calculated using the BLN model. *CEO abn ROA* is the average of the firm's stock return measured relative to the industry ROA over the last three years. This variable is calculated using the ROA of the firm for which the CEO was working, irrelevant of whether he or she was then serving as CEO. *CEO abn ret* is the average of the firm's stock return measured relative to the S&P 500 index over the last three years, irrelevant of whether he or she was then serving as CEO. *CEO log market cap* is the natural logarithm of the average market value of equity of the firms that the CEO worked for over the last three years, irrelevant of whether he or she was then serving as CEO. *Log media coverage* is the log of the number of articles containing the CEO's name and the firm's name that appear in the major business newspapers, as identified through searches of the Factiva database. *Small peer group* is an indicator variable equal to one if the peer group size is smaller than the median, zero otherwise. *Busy board* is an indicator variable equal to one if the number of other boards on which the firm directors serve is above the sample median, zero otherwise. *Board hired after CEO* is an indicator variable equal to one if the fraction of the board that was hired after the CEO took office is larger than the sample median, zero otherwise. *Small board size* is an indicator variable equal to one if the number of board members is smaller than the sample median, zero otherwise. Board variables are obtained from the RiskMetrics database. *High GIM index* is an indicator variable equal to one if the GIM index (Gompers, Ishii, and Metrick, 2003) is greater than the sample median. *Small institutional ownership* is an indicator variable equal to one if the percentage of the firm's equity held by institutional investors is smaller than the sample median, zero otherwise. *Small insider ownership* is an indicator variable equal to one if the total percentage of the firm's equity held by the firm insiders (top five executives) is smaller than the sample median, zero otherwise. Heteroskedasticity-robust *t*-statistics with standard errors clustered by firm are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Panel A: Descriptive statistics

				Percentile		
Variable	N	Mean	Std. dev.	5th	Median	95th
PPE_FY (%)	2,836	0.133	0.535	-0.715	0.129	0.986
PPE_FY ($)	2,836	896.1	3,661.2	-3,426.4	552.3	6,333.4
PPE_BLN (%)	2,836	0.037	0.487	-0.725	0.037	0.775
PPE_BLN ($)	2,836	462.8	3,032.9	-3,138.3	156.4	4,707.5
CEO abn ROA	2,836	0.045	0.090	-0.047	0.027	0.252
CEO abn ret	2,836	0.094	0.2251	-0.205	0.063	0.508
CEO log market cap	2,836	8.047	1.477	5.892	7.892	10.760
Log media coverage	2,836	1.300	1.277	0	1.099	3.807
Small peer group	2,477	0.579	0.494	0	1	1
Busy board	2,477	0.486	0.500	0	0	1
Board hired after CEO	2,477	0.497	0.500	0	0	1
Small board size	2,477	0.488	0.500	0	0	1
High GIM index	2,477	0.463	0.499	0	0	1
Small institutional ownership	2,477	0.496	0.500	0	0	1
Small insider ownership	2,477	0.524	0.499	0	1	1

Table 3 (*continued*)

Panel B: Correlation matrix

	PPE_FY	*PPE_BLN*	*CEO abn ROA*	*CEO abn ret*	*CEO log market cap*	*Log media coverage*	*Small peer group*	*Busy board*	*Board hired after CEO*	*Small board size*	*High GIM index*	*Small institutional ownership*	*Small insider ownership*
PPE_FY	1	0.440*	0.002	0.079*	0.088*	0.101*	0.012	0.111*	0.018	0.030	-0.022	-0.039*	-0.019
PPE_BLN	0.443*	1	0.026	0.077*	0.130*	0.094*	0.003	0.075*	0.057*	0.031	0.002	-0.036*	-0.007
CEO abn ROA	0.015	-0.003	1	0.098*	0.185*	0.049*	-0.044*	0.069*	-0.004	0.091*	-0.034	-0.095*	-0.030
CEO abn ret	0.065*	0.072*	0.083*	1	0.039*	-0.026	-0.032	0.019	0.067*	-0.001	0.006	-0.070*	0.028
CEO log market cap	0.161*	0.169*	0.238*	0.008	1	0.560*	-0.057*	0.339*	-0.041*	-0.418*	0.002	0.280*	0.417*
Log media coverage	0.127*	0.109*	0.055*	-0.023	0.605*	1	-0.020	0.302*	-0.029	-0.257*	-0.024	0.124*	0.250*
Small peer group	-0.009	-0.026	-0.001	0.027	-0.066*	-0.033*	1	-0.085*	0.039*	0.070*	-0.077*	-0.051*	-0.073*
Busy board	0.090*	0.059*	0.076*	-0.028	0.362*	0.316*	-0.093*	1	-0.000	-0.189*	0.057*	0.032	0.187*
Board hired after CEO	0.005	0.056*	0.021	0.069*	-0.043*	-0.020	0.036*	0.004	1	0.058*	-0.051*	-0.047*	-0.160*
Small board size	0.012	0.013	0.030	0.027	-0.439*	-0.279*	0.080*	-0.191*	0.065*	1	-0.152*	-0.315*	-0.310*
High GIM index	-0.025	0.003	0.000	-0.014	-0.020	-0.041*	-0.086*	0.059*	-0.054*	-0.153*	1	0.079*	0.074*
Small institutional ownership	-0.039*	-0.034*	-0.049*	-0.060*	0.236*	-0.166*	-0.046*	0.034*	-0.039*	-0.310*	0.062*	1	0.226*
Small insider ownership	0.011	0.019	0.044*	0.013	0.427*	0.250*	-0.077*	0.185*	-0.167*	-0.317*	0.086*	0.195*	1

Table 3 (*continued*)

Panel C: Regression of the peer pay effect on CEO talent and corporate governance

	FY specification			BLN specification		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO abn ROA	-0.16		-0.26**	-0.29***		-0.31***
	(-1.27)		(-1.99)	(-2.79)		(-2.85)
CEO abn ret	0.16***		0.17***	0.16***		0.17***
	(3.47)		(3.07)	(3.73)		(3.23)
CEO log market cap	0.05***		0.05***	0.06***		0.06***
	(4.37)		(3.30)	(5.81)		(5.95)
Log media coverage	0.02		0.02*	0.00		0.00
	(1.54)		(1.70)	(0.29)		(0.30)
Small peer group		0.01	0.01		-0.01	-0.01
		(0.48)	(0.24)		(-0.46)	(-0.52)
Busy board		0.11***	0.07***		0.05***	0.01
		(4.95)	(2.98)		(2.72)	(0.69)
Board hired after CEO		-0.01	-0.01		0.05**	0.04**
		(-0.37)	(-0.49)		(2.57)	(2.13)
Small board size		0.04	0.08***		0.02	0.08***
		(1.35)	(2.84)		(0.90)	(3.41)
High GIM index		-0.01	-0.00		-0.00	0.02
		(-0.56)	(-0.04)		(-0.11)	(0.71)
Small institutional ownership		-0.03	-0.05**		-0.03	-0.05**
		(-1.28)	(-2.05)		(-1.14)	(-2.42)
Small insider ownership		-0.02	-0.07**		-0.00	-0.05**
		(-0.86)	(-2.47)		(-0.20)	(-2.00)
Adjusted R^2 (%)	3.09	1.15	3.36	3.47	0.60	3.90
Observations	2,836	2,477	2,316	2,836	2,477	2,316

Table 4
Analysis of the peer pay effect on future performance

This table reports the results of regressing firms' future accounting performance (*Future ROA*) and future stock returns (*Future ret*) on the predicted and self-serving peer pay effect components obtained from the Panel C regressions of Table 3, while controlling for variables expected to explain performance, including industry and year effects. Panel A provides descriptive statistics for the dependent and independent variables. Panels B and C present the regression results. The variables are defined as follows. *PPE-Talent1* and *PPE-Talent3* are the predicted components using the estimated coefficients on the talent proxies obtained from regressions of *PPE* on talent proxies only, and both talent and self-serving proxies, respectively (from Eq. (2)). *PPE-Talent2* is the residual component of regressing *PPE* on self-serving proxies only. *PPE-Self serving1* is the residual component of regressing *PPE* on talent proxies only. *PPE-Self serving2* and *PPE-Self serving3* are the predicted components using the estimated coefficients on the self-serving proxies obtained from regressions of *PPE* on self-serving proxies only, and both talent and self-serving proxies, respectively. The *_FY* (*_BLN*) suffix is added to the peer pay effect (*PPE*) variables that are measured using the FY (BLN) model. *Future ROA* is the one-year-ahead ROA, defined as net income before extraordinary items divided by total assets. *Future ret* is stock returns including dividends measured over the 12-month period starting at the end of the fiscal year. *Sales* is total revenue measured at the end of the fiscal year. *Log STD ROA* is the log of the standard deviation of the return on assets (*ROA*) calculated over the prior five years. *Log market cap* is the log of market value of equity measured at the end of the year. *Log STD ret* is the log of the standard deviation of stock returns including dividends (*Ret*) calculated over the prior five years. *Book-market ratio* is the ratio of the book value of equity to the market value of equity. The talent and self-serving peer pay components are standardized by using its cumulative distribution function (noted by *Cdf*). Coefficients in Panel C are multiplied by 100. Heteroskedasticity-robust *t*-statistics with standard errors clustered by firm are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Panel A: Descriptive statistics

				Percentile		
Variable	N	Mean	Std. dev.	5th	Median	95th
PPE-Talent1_FY	2,158	0.140	0.092	0.002	0.130	0.310
PPE-Talent2_FY	2,158	0.007	0.505	-0.793	-0.004	0.837
PPE-Talent3_FY	2,158	0.413	0.092	0.276	0.402	0.583
PPE-Self serving1_FY	2,158	-0.002	0.506	-0.805	-0.014	0.836
PPE-Self serving2_FY	2,158	0.132	0.061	0.028	0.129	0.232
PPE-Self serving3_FY	2,158	0.008	0.076	-0.125	0.010	0.146
PPE-Talent1_BLN	2,158	0.044	0.089	-0.094	0.038	0.202
PPE-Talent2_BLN	2,158	0.007	0.438	-0.705	-0.002	0.706
PPE-Talent3_BLN	2,158	0.526	0.097	0.377	0.520	0.701
PPE-Self serving1_BLN	2,158	0.008	0.435	-0.680	-0.003	0.728
PPE-Self serving2_BLN	2,158	0.045	0.041	-0.027	0.044	0.119
PPE-Self serving3_BLN	2,158	0.016	0.070	-0.087	0.015	0.128
Future ROA	2,158	0.776	2.599	-3.548	0.992	3.826
Future ret	2,158	4.023	81.36	-66.41	-5.163	92.25
Sales	2,158	0.010	0.027	0.000	0.003	0.038
Log STD ROA	2,158	1.205	0.729	0.197	1.110	2.585
Log market cap	2,158	8.100	1.529	5.754	7.977	10.75
Log STD ret	2,158	0.280	0.219	0. 094	0.248	0.546
Book-market ratio	2,158	0.605	0.799	0.129	0.475	1.462

Table 4 (*continued*)

Panel B: Dependent variable = Future ROA

	FY specification				BLN specification			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cdf PPE	-0.19				0.07			
	(-0.94)				(0.29)			
Cdf PPE-Talent1		1.31***				1.28***		
		(4.95)				(4.32)		
Cdf PPE-Talent2			-0.14				0.09	
			(-0.71)				(0.38)	
Cdf PPE-Talent3				0.91***				1.13***
				(2.97)				(3.30)
Cdf PPE-Self serving1		-0.35*				-0.14		
		(-1.84)				(-0.62)		
Cdf PPE-Self serving2			-0.46*				-0.28	
			(-1.88)				(-1.11)	
Cdf PPE-Self serving3				-0.77***				-0.49
				(-2.75)				(-1.58)
Sales	5.52***	-0.43	6.05***	0.15	5.25***	-0.34	5.43***	-0.93
	(3.04)	(-0.22)	(3.11)	(0.07)	(2.87)	(-0.17)	(2.99)	(-0.47)
Log STD ROA	-0.49***	-0.46***	-0.48***	-0.46***	-0.50***	-0.46***	-0.50***	-0.46***
	(-3.06)	(-2.81)	(-3.04)	(-2.91)	(-3.13)	(-2.84)	(-3.12)	(-2.82)
Adjusted R^2 (%)	11.99	13.74	12.15	13.52	11.96	13.47	12.01	13.67
Observations	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158

Table 4 (*continued*)

Panel C: Dependent variable = Future ret

	FY specification				BLN specification			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cdf PPE	4.05				8.77**			
	(1.03)				(2.43)			
Cdf PPE-Talent1		97.68**				105.45***		
		(2.54)				(2.68)		
Cdf PPE-Talent2			3.41				9.03**	
			(0.87)				(2.53)	
Cdf PPE-Talent3				79.02***				107.07***
				(2.59)				(2.69)
Cdf PPE-Self serving1		1.59				2.78		
		(0.42)				(0.60)		
Cdf PPE-Self serving2			5.73				8.18	
			(1.34)				(1.51)	
Cdf PPE-Self serving3				-13.49				-14.65
				(-1.46)				(-1.42)
Log market cap	-4.80	-22.07**	-4.93	-19.02**	-4.95	-23.25**	-5.07	-24.87**
	(-1.16)	(-2.05)	(-1.18)	(-1.98)	(-1.21)	(-2.14)	(-1.22)	(-2.12)
Log STD ret	-0.35	-13.36	-0.77	-11.03	-0.56	-14.96	-1.50	-13.19
	(-0.08)	(-1.17)	(-0.17)	(-1.14)	(-0.12)	(-1.28)	(-0.32)	(-1.23)
Book-market ratio	16.70	13.39	16.68	13.74	16.60	13.39	16.69	12.73
	(0.98)	(0.75)	(0.98)	(0.77)	(0.98)	(0.75)	(0.98)	(0.70)
Adjusted R^2 (%)	21.67	23.93	21.66	23.57	21.74	24.15	21.78	24.40
Observations	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158

Table 5
Analysis of the peer pay effect on CEO compensation

This table reports the results of regression models predicting firms' future CEO total compensation (*Future log pay*) using various measures of peer pay and controlling for economic factors expected to explain compensation. Panel A provides descriptive statistics for the dependent and independent variables. Panel B presents the regression results. The variables are defined as follows. *(Log) Pay* is (the natural logarithm of) TDC1 in the ExecuComp database. (*Log*) *Peer pay* is the (natural logarithm of the) median of *Pay* of the firm's selected peers (i.e., measured at the firm *i* level). (*Log*) *Peer pay matched* is the (natural logarithm of the) median *Pay* of the firm's propensity-score-matched peers, i.e., a sample of companies that are more likely to be peers based on the Column 1 of Table 2 peer-choice prediction model. *PPE* is the percentage difference between "actual peer pay" and "propensity-score-matched peer pay," where these are defined as follows. Actual peer pay is the natural logarithm of the median *Pay* of the firm's chosen peers. Expected peer pay is the natural logarithm of the median *Pay* of the firm's "propensity-score-matched peer pay" peers. The *_FY* (*_BLN*) suffix is added to the peer pay variables that are measured using the FY (BLN) model. *Log sales* is the natural logarithm of total sales revenue measured at the end of the year. *Ret* (*Lag ret*) is stock returns including dividends measured over the 12-month period ending at the end (beginning) of the fiscal year. Δ*ROA* is the change in net income before extraordinary items divided by total assets measured at the end of fiscal year. *Lag market-book assets* is the ratio of the market value of assets (book value of assets-common equity+ total market capitalization) to the book value of total assets. *Lag log STD ret* is lag of the natural logarithm of the standard deviation of stock returns including dividends (*Ret*) calculated over the prior five years. Heteroskedasticity-robust *t*-statistics with standard errors clustered by firm are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Panel A: Descriptive statistics

				Percentile		
Variable	N	Mean	Std. dev.	5th	Median	95th
Pay	2,158	6,778	7,996	1003	4,593	19,804
Log pay	2,158	8.406	0.911	6.912	8.433	9.894
Peer pay	2,158	6,289	4,394	1,616	5,096	14,826
Log peer pay	2,158	8.527	0.673	7.388	8.536	9.604
Peer pay matched _FY	2,158	5,401	3,715	1,512	4,418	12,944
Log peer pay matched _FY	2,158	8.388	0.649	7.322	8.394	9.468
PPE_FY	2,158	0.138	0.509	-0.669	0.127	0.972
Peer pay matched_BLN	2,158	5,796	3,812	1,712	4,744	13,422
Log peer pay matched_BLN	2,158	8.475	0.623	7.446	8.465	9.505
PPE_BLN	2,158	0.052	0.440	-0.667	0.042	0.753
Log sales	2,158	7.914	1.461	5.645	7.798	10.489
Ret	2,158	-0.057	0.367	-0.644	-0.059	0.525
Lag ret	2,158	0.115	0.324	-0.336	0.085	0.666
Δ*ROA*	2,158	-0.017	0.088	-0.134	-0.002	0.055
Lag market-book assets	2,158	1.894	1.055	1.011	1.590	3.831
Lag log STD ret	2,158	0.288	0.285	0.087	0.240	0.599

Table 5 (*continued*)

Panel B: Regressions

		FY specification				BLN specification			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log peer pay	0.38***								
	(8.54)								
Cdf PPE		0.61***				0.53***			
		(8.53)				(8.51)			
Cdf PPE-Talent1			1.15***				1.11***		
			(10.68)				(10.08)		
Cdf PPE-Talent2				0.60***				0.52***	
				(8.59)				(8.38)	
Cdf PPE-Talent3					1.18***				1.26***
					(11.57)				(11.23)
Cdf PPE-Self serving1			0.42***				0.37***		
			(5.98)				(6.10)		
Cdf PPE-Self serving2				0.33***				0.33***	
				(5.36)				(5.64)	
Cdf PPE-Self serving3					0.14**				0.18**
					(2.05)				(2.52)
Cdf Peer pay matched		0.72***	0.39***	0.75***	-0.00	0.72***	0.42***	0.73***	0.07
		(6.72)	(3.68)	(7.00)	(-0.03)	(6.55)	(3.80)	(6.72)	(0.83)
Log sales	0.31***	0.34***	0.21***	0.33***	0.27***	0.33***	0.21***	0.33***	0.25***
	(14.52)	(15.74)	(8.49)	(15.23)	(11.60)	(15.09)	(8.64)	(14.97)	(10.11)
Ret	0.26***	0.24***	0.23***	0.25***	0.23***	0.25***	0.25***	0.25***	0.23***
	(5.28)	(5.05)	(5.08)	(5.17)	(4.89)	(5.28)	(5.32)	(5.26)	(4.95)
Lag ret	0.26***	0.26***	0.15***	0.26***	0.13***	0.27***	0.15***	0.27***	0.14***
	(5.41)	(5.32)	(3.23)	(5.37)	(2.75)	(5.61)	(3.32)	(5.64)	(3.06)
ΔROA	0.05	0.08	0.17	0.10	0.16	0.05	0.10	0.08	0.14
	(0.29)	(0.49)	(1.07)	(0.61)	(0.95)	(0.31)	(0.67)	(0.47)	(0.87)
Lag market-book assets	0.06***	0.07***	-0.01	0.06***	0.01	0.06***	-0.00	0.06***	-0.01
	(3.60)	(3.82)	(-0.45)	(3.68)	(0.43)	(3.59)	(-0.27)	(3.37)	(-0.51)
Lag log STD ret	0.05	0.06	0.02	0.03	0.01	0.07	0.02	0.03	0.01
	(1.08)	(1.12)	(0.34)	(0.73)	(0.10)	(1.27)	(0.42)	(0.68)	(0.17)
Adjusted R^2 (%)	55.66	55.61	58.07	56.16	57.18	55.62	57.88	56.32	57.18
Observations	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158

Table 6

Robustness tests: alternative specifications

Panel A (B) of this table replicates the results in Panel C of Table 3 (Panel B of Table 5) using additional talent and corporate governance controls. *Past CEO pay* is the sum of total pay for the years of *t*-1, *t*-2, and *t*-3. *CEO fixed effect* and *Firm fixed effect* are obtained following the procedure developed by Abowd, Kramarz, and Margolis (1999) estimated *out-of-sample* for a sample of ExecuComp executive-firms from 1993 to 2005. *CEO chair* is an indicator variable that equals one if the CEO is also the chairman of the board of directors, zero otherwise. *Long tenured CEO* is an indicator variable that equals one if the executive has been a CEO at the firm for more than 5.5 years (the sample median), zero otherwise. *S&P 500 firm* is equal to one if the firm belongs to the S&P 500 index. *Governance controls*, not tabulated, are the firm's return volatility, book leverage (total debt scaled by total assets), R&D scaled by total assets, market-to-book value of assets, and the number of business segments in which the firm operates. Remaining variables are defined in Tables 3 and 5. Heteroskedasticity-robust *t*-statistics with standard errors clustered by firm are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 6 (*continued*)

Panel A: Peer-pay-effect decomposition

	FY specification				BLN specification			
	Lag pay	CEO FE	FY/BLN variables	Gov. controls	Lag pay	CEO FE	FY/BLN variables	Gov. controls
CEO abn ROA	-0.25**	-0.34**	-0.27**	-0.14	-0.27**	-0.30**	-0.30***	-0.43***
	(-1.96)	(-2.00)	(-1.97)	(-0.98)	(-2.47)	(-2.24)	(-2.78)	(-3.65)
CEO abn ret	0.15***	0.12*	0.21***	0.16**	0.17***	0.12*	0.19***	0.13**
	(2.63)	(1.68)	(3.70)	(2.49)	(2.92)	(1.67)	(3.56)	(2.26)
CEO log market cap	-0.02	0.02	0.09***	0.07***	0.03*	0.04**	0.09***	0.07***
	(-1.25)	(1.15)	(5.23)	(4.44)	(1.83)	(2.53)	(6.74)	(6.45)
Log media coverage	0.00	-0.01	0.02*	0.01	-0.00	0.01	0.00	-0.00
	(0.28)	(-0.58)	(1.69)	(1.06)	(-0.28)	(0.45)	(0.31)	(-0.11)
Past CEO pay	0.18***				0.10***			
	(7.07)				(4.27)			
CEO fixed effect		0.06***				0.03*		
		(2.62)				(1.94)		
Firm fixed effect		0.06***				0.02		
		(3.16)				(1.52)		
Small peer group	0.01	0.01	-0.00	0.01	-0.01	-0.02	-0.02	-0.01
	(0.50)	(0.43)	(-0.07)	(0.22)	(-0.37)	(-0.77)	(-0.85)	(-0.26)
Busy board	0.04	0.08***	0.08***	0.06**	-0.00	0.01	0.01	-0.00
	(1.55)	(2.74)	(2.96)	(2.40)	(-0.10)	(0.22)	(0.31)	(-0.01)
Board hired after CEO	-0.05*	-0.04	0.01	-0.02	0.02	0.03	0.05**	0.03*
	(-1.79)	(-1.18)	(0.31)	(-0.91)	(1.18)	(1.15)	(2.07)	(1.72)
Small board size	0.08***	0.06*	0.07**	0.07**	0.08***	0.10***	0.07***	0.06***
	(2.72)	(1.84)	(2.55)	(2.34)	(3.35)	(3.23)	(3.04)	(2.59)
High GIM index	0.01	0.03	0.01	0.01	0.03	0.02	0.02	0.03
	(0.23)	(0.87)	(0.54)	(0.56)	(1.24)	(0.89)	(0.92)	(1.23)
Small institutional ownership	-0.02	-0.01	-0.05*	-0.05**	-0.04	-0.04	-0.05**	-0.05**
	(-0.80)	(-0.36)	(-1.94)	(-2.07)	(-1.63)	(-1.27)	(-2.35)	(-2.25)
Small insider ownership	-0.04	-0.02	-0.07**	-0.08***	-0.03	-0.01	-0.05**	-0.05**
	(-1.42)	(-0.56)	(-2.27)	(-2.69)	(-1.36)	(-0.29)	(-2.03)	(-2.02)
CEO chair			-0.07**				-0.01	
			(-2.27)				(-0.27)	
Long tenured CEO			0.00				-0.01	
			(0.07)				(-0.25)	
S&P 500 firm			-0.15***				-0.09***	
			(-4.05)				(-3.04)	
Governance controls	No	No	No	Yes	No	No	No	Yes
Adjusted R^2 (%)	7.23	3.36	4.50	4.66	5.59	2.47	4.46	5.06
Observations	2,165	1,362	2,217	2,316	2,165	1,362	2,217	2,316

Table 6 (*continued*)

Panel B: Compensation regressions

	FY specification				BLN specification			
	Lag pay	CEO FE	FY/BLN variables	Gov. controls	Lag pay	CEO FE	FY/BLN variables	Gov. controls
Cdf PPE-Talent3	1.48***	0.42***	1.48***	1.38***	1.87***	0.83***	1.46***	1.25***
	(19.86)	(4.65)	(12.07)	(11.83)	(21.37)	(6.90)	(11.85)	(10.95)
Cdf PPE-Self serving3	-0.07	0.07	0.19**	0.18***	-0.05	-0.05	0.26***	0.17**
	(-1.30)	(1.02)	(2.15)	(2.59)	(-0.79)	(-0.55)	(2.98)	(2.41)
Cdf Peer pay matched	0.08	0.24**	-0.02	-0.05	-0.06	0.23**	-0.02	0.08
	(1.07)	(2.07)	(-0.19)	(-0.66)	(-0.74)	(2.07)	(-0.23)	(0.87)
Log sales	0.26***	0.38***	0.23***	0.24***	0.17***	0.28***	0.24***	0.25***
	(15.36)	(14.62)	(8.63)	(9.32)	(7.83)	(9.62)	(9.22)	(9.98)
Ret	0.25***	0.26***	0.26***	0.23***	0.25***	0.25***	0.26***	0.24***
	(5.72)	(3.91)	(5.64)	(4.91)	(5.81)	(4.00)	(5.62)	(5.20)
Lag ret	0.16***	0.20***	0.16***	0.17***	0.11**	0.18***	0.17***	0.19***
	(3.47)	(3.59)	(3.42)	(3.60)	(2.28)	(3.32)	(3.48)	(4.07)
Δ*ROA*	0.18	-0.04	0.27*	0.17	0.18	0.01	0.25	0.08
	(1.14)	(-0.21)	(1.69)	(1.07)	(1.24)	(0.03)	(1.57)	(0.53)
Lag market-book assets	0.05***	0.10***	-0.02	-0.03	-0.01	0.07***	-0.02	0.01
	(3.72)	(4.04)	(-1.04)	(-1.61)	(-0.79)	(2.84)	(-1.09)	(0.40)
Lag log STD ret	-0.07	-0.00	0.01	0.03	-0.08	-0.02	0.01	0.02
	(-1.17)	(-0.04)	(0.19)	(0.54)	(-1.16)	(-0.46)	(0.10)	(0.47)
Adjusted R^2 (%)	65.45	57.64	57.98	57.36	65.80	59.11	57.79	57.09
Observations	2,020	1,279	2,064	2,158	2,020	1,279	2,064	2,158

Table 7
Analysis over time of the peer pay effect on CEO compensation

This table replicates the results in Table 5 for each of the three years after the SEC's new disclosure rules became effective on December 15th, 2006. Panel A (B) presents the regression results using the FY (BLN) model specification. All control variables from the Table 5 analysis are included in the regression but not tabulated. Observations are at the firm-year level. Variables are defined in Table 5. Heteroskedasticity-robust *t*-statistics with standard errors clustered by firm are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Panel A: FY specification

	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 1 (4)	Year 2 (5)	Year 3 (6)
Cdf PPE	0.54***	0.49***	0.76***			
	(4.67)	(4.81)	(6.88)			
Cdf PPE-Talent3				0.82***	1.24***	0.88***
				(6.18)	(7.04)	(6.76)
Cdf PPE-Self serving3				0.01	0.31***	0.13
				(0.15)	(3.43)	(1.62)
Cdf Peer pay predicted	0.68***	0.44***	0.94***	0.14	-0.15	0.09
	(4.23)	(2.72)	(4.67)	(1.29)	(-1.14)	(0.58)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	57.50	54.98	51.70	58.64	56.78	51.87
Observations	728	792	753	728	792	753

Panel B: BLN specification

	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 1 (4)	Year 2 (5)	Year 3 (6)
Cdf PPE	0.45***	0.48***	0.72***			
	(4.17)	(5.25)	(7.13)			
Cdf PPE-Talent3				0.92***	0.95***	1.59***
				(6.23)	(5.79)	(9.68)
Cdf PPE-Self serving3				-0.11	0.19**	0.30***
				(-1.12)	(2.23)	(2.82)
Cdf Peer pay predicted	0.55***	0.62***	1.07***	0.04	0.08	0.22
	(3.23)	(3.70)	(5.58)	(0.32)	(0.53)	(1.31)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	57.20	55.34	52.35	58.68	55.66	54.31
Observations	728	792	753	728	792	753