# Peer Group Ties and Executive Compensation Networks

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*Abstract*

Publicly traded firms in the U.S. typically determine C.E.O. compensation by benchmarking the pay of their C.E.O.s against the pay of C.E.O.s in "peer" firms. Consequently, executive compensation is influenced not only by firm-level characteristics, but also by the selection and actions of the firm's immediate peers as well as by the structure of the executive compensation network overall. Analyzing compensation peer group choices made by the same 1,183 firms for F.Y. 2007, 2008 and 2009, we find that while the typical compensation peer is similar in size and industry to the firm that chose it, deviations from this norm are common, especially among larger firms, and tend to be towards larger firms with better paid CEOs. Further analysis shows that firms who pay CEOs well relative to the pay that would be predicted from their revenues, return on assets, and industry tend to have greater aspiration bias in their group of named peers.

**Keywords**: Inequality, networks, executive compensation, labor markets, elites.

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# 1. INTRODUCTION

Between 1980 and 2004, the adjusted average compensation of a chief executive officer (C.E.O.) at a large public corporation in the United States rose from $625,000 to $9,840,000, an annual growth rate of 12.2% (Bogle, 2008). In contrast, during the 30-year period prior to the mid-1970's, median executive compensation is thought to have generally remained flat (Frydman and Saks, 2010). For every $1 earned by an average household in 1993, U.S. C.E.O.s running S&P 500 companies earned on average approximately $80; by 2006, S&P 500 C.E.O.s were earning approximately $225 for every $1 earned by an average household (Kaplan, 2008).[1] In 2005, median annual pay to C.E.O.s at S&P 500 firms exceeded $8 million and C.E.O. pay at the top 100 U.S. firms in recent years has exceeded $15 million (Tervio, 2008). One recent estimate pegs the rate of 2005 total company sales spent on C.E.O. compensation at the largest 1,000 U.S. companies at .07% (Walsh, 2008).[2]

While C.E.O. pay has flattened of late (Kaplan, 2008), the dramatic rise and size of executive compensation these statistics describe has generated extensive public policy and media attention, and has been studied and debated within and across a variety of disciplines (see Devers et al, [2007] for a recent review). Research in the fields of management, finance, economics, law and sociology have focused on what the rise means in terms of the value of managerial labor and the functioning of executive labor markets (Himmelberg and Hubbard, 2000; Murphy and Zabojnik, 2004); optimal contracts and the relationship between pay, performance, and shareholder value, issues of corporate governance and the functioning of boards of directors (Core, Holthausen and Larcker, 1999; Bebchuk and Fried, 2005; Bebchuk, Fried and Walker,

1 In the peak year of 2000, they earned more than $300 for every $1 earned by an average household (Kaplan, 2008).

2 Using data collected by Frydman and Saks (2010), Nagel (2008) estimates the ratio of C.E.O. pay to average pay of the top three executives grew from 1.22 in the 1970's to 1.67 in the early 2000's.

2002), shareholder rights, changes in the social norms that govern pay, and general trends in U.S. income inequality, which has been aggravated by increasing compensation levels in elite occupations (Piketty and Saez, 2003).

Scholarship on the rise in executive compensation largely comprises an unsettled and occasionally contentious debate between two primary sets of explanations: *market forces* (i.e., C.E.O.s are generally paid for performance, and executive pay packages reflect optimal contracting) vs. *managerial power* (i.e., C.E.O. pay reflects rent extraction, often produced by managerial entrenchment) (Murphy, 1999; Bebchuk, Fried and Walker, 2002; Gabaix and Landier, 2008).[3] While differing substantively in their premise, proponents of pay for performance and managerial power theories typically explain rising executive compensation at a common level of analysis. First, they tend to analyze correlates of executive pay (e.g., firm performance, board governance) as opposed to the specific processes that produce executive pay (Frydman, 2008). Second, in doing so, they typically use firm- or executive-level characteristics to predict executive-level compensation and firm-level policies. Such an approach treats firms as atomistic (independent) actors, a somewhat paradoxical orientation in light of the prevailing practice by companies to benchmark their executives' pay against the pay of counterparts at "peer" organizations (Faulkender & Yang, 2008; Bizjak, Lemmon, and Nguyen, 2011).

In this paper, we report findings from a large-scale multi-year data collection project on executive compensation in the United States. The project takes advantage of recent changes in U.S. Securities and Exchange Commission (S.E.C.) compensation disclosure requirements to study directly the empirical behavior of a sample of 1,183 firms for which we have now repeat

3 Explanations that do not fit cleanly into these two buckets include Murphy's (2002) "perceived-cost" view, which focuses on the design of compensation packages, in particular the greater use of stock options.

compensation peer group measures for F.Y. 2007, 2008, and 2009[4] as they select peers and construct peer groups to benchmark their executives' pay. Our focus is the firm-to-firm economic network that emerges from (and influences) the selection of compensation peers by individual firms, and its consequences for executive compensation and trends in compensation for firms and networks. Peer group and compensation consultant reports were collected through researcher-developed software algorithms that identify the relevant compensation disclosure text in company S.E.C. filings, and match the unstructured company names used in the disclosure with structured company names in a look-up table.

Using as our universe the companies traded on either the NYSE or Nasdaq for which compensation and peer group data are available, we answer a fundamental question of network processes: What factors explain tie formation? While firms generally choose peers similar in size and industry (i.e., homophily [McPherson, Smith-Lovin & Cook, 2001]), deviations from this norm are common, especially for larger firms. When companies go outside their "natural" peer population, their choice is structured: they tend to choose peers larger than themselves. Large companies in particular are more likely to choose companies from a different industry group, a finding that differs from that of at least one recent compensation peer group study (e.g., Bizjak, Lemmon, and Nguyen, 2011). Firms also have a tendency to selectively sample from the structural locations from which they draw peers, and, consistent with other recent studies based on fewer years and smaller samples (Faulkender & Yang, 2008; Bizjak, Lemmon, and Nguyen, 2011; Faulkender and Yang 2013), we find that the selective sampling amounts to "cherry-picking"; CEOs who have relatively high compensation are more likely to be named as peers net of the characteristics of their firms. The upward bias in median benchmark values produced by peer groups is greater for total compensation (33% in F.Y. 2007, declining to 29% in F.Y. 2009)

[4] Proxy filings are made after the close of a F.Y., so the years of the filings analyzed are 2007-2010.

than cash compensation (10% in F.Y. 2007 and F.Y. 2009). Our simulations confirm that the observed upward bias is above and beyond the random variation in pay benchmarks that would be expected from a firm sampling from all possible normative peers. While our finding that reported peer groups produce inflated pay levels is generally consistent with other recent research (Bizjak, Lemmon, and Nguyen, 2011), our results suggest a larger bias than previously reported for total compensation. Generally speaking, the size of the bias corresponds with the extent to which a CEO is overpaid relative to the pay that would be predicted from revenues, return on assets, and industry sector.

## 2. BACKGROUND

Two broad sets of explanations for the rise in executive compensation dominate academic research on the topic. Proponents of market-based explanations argue that the rise in executive compensation reflects the growing size and complexity of firms over time (Gabaix and Landier, 2008), changes in the productive relationship between managerial ability and "scale of operations" (Himmelberg and Hubbard, 2000; Tervio, 2008), the increased value and transferability of general management skills (Murphy and Zabojnik, 2004), the related development of a "superstar" executive labor market (Rosen, 1981), and the trend towards more direct benefit from firm equity growth as a way of better aligning management and shareholder interests (Hall and Liebman, 1998; Holmstrom and Kaplan, 2001). They note trends such as greater board independence, preferential treatment of outsiders over presumably C.E.O.-friendly insiders (Murphy, 2002; Murphy and Zabojnik, 2004), and increased C.E.O. turnover (Kaplan and Minton, 2008) as contradicting claims of managerial power. They point to similar compensation trends among occupations not affected by managerial entrenchment dynamics, and empirical findings on the positive relationship between compensation and firm-level characteristics such as size and performance as support for their view (e.g., Hall and Liebman

[1998]; Himmelberg and Hubbard [2000]; Kaplan and Rauh [2007], Gabaix and Landier [2008]).[5]

In contrast, proponents of "managerial power" explanations argue that pay levels for executives exceed those required to achieve an effective reservation wage ("skimming") (Bebchuk and Fried, 2002), and that so-called "hidden" forms of compensation (Kuhnen and Zwiebel, 2008) and executive-friendly stock options practices (Behchuk, Fried and Walker, 2002; Bizjak, Lemmon and Whitby, 2006) run counter to a solely pay-for-performance model. They note that firm size and performance leaves much of the rise unexplained (Jensen and Murphy, 1990; Nagel, 2008), and they find that C.E.O.s are often rewarded even for events outside their control ("luck") (Bertrand and Mullainathan, 2001) and poor performance (Walsh, 2008). They argue that the relationship between boards, executives (C.E.O.s in particular) and shareholders are structured in ways that allow for increased executive entrenchment and for management to exert substantial influence on the pay setting process (Bebchuk and Fried, 2003). They point to empirical findings on the positive relationship between compensation and firm-level characteristics such as board director independence and shareholder activism as support for their view.

In this paper, we contribute to research explaining executive compensation trends and practices by shifting the level of analysis. We focus on the supra-firm dynamics that influence executive compensation practices above and beyond individual or firm level factors. Specifically, we address the basis of compensation peer tie formation as a first step towards investigating executive compensation levels and practices from a network perspective.

5 Proponents of market explanations do not necessarily disagree with a need for corporate governance reforms or moderation of pay levels, rather they argue that as an empirical matter, managerial power does not preclude optimal contracting (Core, Guay and Thomas, 2005) and market factors best explain the rise in executive compensation.

A comparatively small but growing body of research focuses on the benchmarking process, including the selection and influence of compensation consultants (Murphy & Sandino, 2009), the role of boards in the process (Wong & Gygax, 2007; Bizjak, Lemmon & Whitney, 2009), and the selection of peers (Faulkender & Yang, 2008; Bizjak, Lemmon, and Nguyen, 2011). For example, Murphy (1999) found that compensation benchmarking as commonly practiced – companies rarely pay below the median of a peer group (Bizjak, Lemmon, and Naveen, 2008) – creates a ratcheting effect that leads to ever-escalating compensation levels over time. More recently, DiPrete, Eirich, and Pittinsky (2010) found that a large percentage of the rise in executive compensation can be attributed to the behavior of a small number of companies whose executives jumped to the upper tail of their peer group pay distributions ("leapfroggers"), infecting the pay distributions of others through benchmarking, and thereby contributing to a general rise in CEO compensation.

Our focus on benchmarking and the relational structure of compensation setting is not a third theory per se; benchmarking effects can support managerial power explanations (as when peer groups are selected with bias using consultants "captured" by management), or market forces explanations (as when peer groups model the competitive market for executive talent). What distinguishes it as an approach, is its focus on a central mechanism by which pay is set, and its ability to illuminate the micro-processes behind increasing pay (e.g., change in peer groups, benchmark levels, compensation forms). Perhaps most importantly, a focus on benchmarking emphasizes the fact that firms "tie" their compensation practices to specific other firms, which may or may not reciprocate the tie and are themselves tied to other firms, including those not in the original firm's peer group. In other words, firms are embedded in a supra-firm relational

structure that emerges from and influences their individual peer choices and compensation decisions.

Prior to F.Y. 2006, publically traded companies in the U.S. were not required by the S.E.C. to disclose the composition of their compensation peer group and the vast majority did not. The best source of information about firm behavior prior to that year comes from Porac, Wade, and Pollock (1999) for 1993 for a sample of 280 of the S&P 500 companies. While these peer companies were not necessarily peers chosen for the purposes of setting compensation, Porac et al. showed that in the process of selection, companies exhibited both a strong tendency toward industry homophily coupled with strategic behavior, and specifically that when companies deviated from their home industry (about 30% of the time), they tended to select poorer performing firms, which had the consequence of making the focal company's performance look better.

The pattern of ties reported by Porac et al. are assertions of similarity between the focal firm and the named alters. These asserted ties do not involve the transfer of information or other resources. Rather, they are "prisms" in Podolny's sense; the asserted ties provide information to relevant publics about how the focal firm defines itself and how the focal firm's performance should be evaluated. Until 2006, compensation peer ties were not "prisms" because they were not publicly known. The only public information offered by some firms concerned where they saw themselves as belonging in a compensation hierarchy (Bizjak et al. 2008); thus while many firms targeted the mean or median, Bizjak et al reported that IBM and Coca Cola asserted an upper quartile target. The actual hierarchy they were benchmarking themselves against was generally left unstated other than the peer group was defined in terms of size and industry. Thus, it was the assertion of where the firm belonged in the peer group rather than the definition of the

peer group to which their CEO should be compared that was the "prismatic," status-asserting information provided to the outside world. The peer group itself was implicitly treated as "naturally" defined by a firm's size and industry classification. However, because firms did not reveal the names of their compensation peers, the implications of asserted benchmark positions for corporate compensation practices could not be evaluated by shareholders or other observers.

Since 2006 and the availability of compensation peer group reports, a small but growing literature of contemporaneous working papers have begun to report analyses of peer group data, typically in the context of informing the managerial power vs. market forces debate. For example, Cadman and Carter (2009) analyzed a sample of approximately 600 S&P 1,500 firms plus their peers for F.Y. 2006. They found that firms typically select peers that are bigger and better performing relative to other potential peers in their industry. However, they argue against the conclusion that firms are selecting their peers opportunistically in order to justify higher pay. For Cadman and Carter (2009), the test of whether this apparently biased sampling is opportunistic is whether it predicts higher C.E.O. pay in the focal firm, which they conclude it does not, although in our view their model choices and interpretation of results are less conclusive.

Bizjak, Lemmon, and Nguyen (2011) similarly examine the selection of peers in F.Y. 2006, but with a larger sample (800 firms) and consideration of the peer choices sample firms made in the subsequent year (F.Y. 2007). They found that firms tend to choose similar peers in terms of sales and revenue, although the median peer firm tends to be larger and tends to have better performance than its chooser. When firms choose peers outside of their industry, the peers they choose tend to be larger and to have higher median compensation, particularly for the smaller firms in their sample. When they subdivided their focal firms by S&P 500 membership,

they found that among S&P 500 firms, the named peers tended to be similar in both size and compensation to the focal CEOs. They argued that the smaller non S&P 500 firms were the ones that systematically chose larger and better performing peers, with total compensation approximately 15% larger than the focal peer. They concluded that smaller firms in particular tend to be opportunistic in their choice of peers.

Bizjak et al. (2011) also compared the peers of firms in F.Y. 2006 with their peers in F.Y. 2007. They found that for firms with the largest amount of peer group change, the size bias dropped from 15% to 2%, while for firms that had little change in peer groups, the size bias dropped from 18.7% to 9.6%, though the difference in reduction in the two groups is not significant. They similarly found reductions in compensation bias. Overall, they concluded that there is some evidence of a decrease in opportunism in response to greater scrutiny of pay practices at publicly traded companies. Their results highlight the value of multi-year data and samples that span a broader diversity of firms (e.g., S&P 500 vs. others).

A third recent contribution to this rapidly growing literature is by Albuquerque, Franco and Verdi (2013), who analyzed 1,764 firm-year observations and 26,426 peer choices across F.Y. 2006 and F.Y. 2007. As such, Albuquerque et al. (2009) results reflect the largest sample size analyzed to date (prior to the present paper), in part due to their use of the relatively large Morningstar compensation database (which we use in the present paper). They estimated a probit model for peer selection, using as predictors measures of the similarity between the focal firm and potential peers on industry, capital and R&D expenditures, performance, and geographic "complexity" and high market value relative to book value (Tobin's Q). They also included measures of compensation of the potential peer in their regressions. Similar to Bizjak et al. (2011), Albuquerque et al. (2013) found that named peers tend to have higher compensation

than do the C.E.O.'s at the focal firms, which again suggests bias in the process of choosing compensation peers. In their models, a one standard deviation increase in a potential peer C.E.O.'s compensation increases the chances that it will be chosen as a peer by 18%, net of labor market and performance variables. Albuquerque et al. (2009) argue, however, that while this apparent bias in the selection of peers could be due to opportunism, it could also be due to a perception of compensation committees that their C.E.O. has high "talent" that will be revealed in his future performance. They found positive effects of both cumulative C.E.O. compensation and recent performance on the compensation of named peers of the focal company, and conclude that at least part of the apparent bias in C.E.O. compensation is pay attributable to "talent," even though one of their "talent" measures (cumulative CEO compensation) itself may be an indicator of prior opportunism on the part of the C.E.O. These three papers disagree on the interpretation of their findings, but all three studies find evidence that C.E.O.'s tend to choose other C.E.O.'s who are better compensated and from larger firms than one would expect if the selection process were based strictly on the industry and size of the focal firm.

The normative model for compensation setting is for firms to choose an appropriate compensation peer group, to adopt a policy as to where in the benchmark distribution the company should place, and then do some calculations in order to arrive at the right compensation levels for its executives. From this perspective, the peer group has a well-defined "causal effect" on the compensation of the focal CEO. This causal effect would be realized via the benchmark location used by the firm to set compensation, which at least ostensibly would be a policy variable for the firm. Larger and more profitable firms would be expected to set pay near the top of their natural peer group, while other firms might be expected to target the middle of the distribution.

In reality, the causal chain suggested above is unlikely to be so simple. The process of opportunistically selecting of an aspiration peer group itself involves a bargaining process and may affect the benchmark point that the firm uses. In other words, a firm may choose an aspiration peer group because of structural attributes about that firm, which in some way "produce" high compensation for the firm's executives. However, it is just as likely that the aspiration peers were selected in order to justify a particular compensation result, in which case they are as much of a consequence as a cause of the firm's actual compensation practices. We have little evidence at this point whether asserted benchmark points are anything more than (endogenous) prisms in Podolony's sense. But whether a cause or merely a justification for CEO compensation (Wade, Porac and Pollock 1997), the composition of named peer groups, their relationship to natural peer groups, and the benchmark location of a CEOs pay provide important information about the relational character of executive compensation.

## 3. DATA

The data analyzed in our paper differ from those analyzed in Cadman and Carter (2009), Bizjak et al. (2011), and Albuquerque et al. (2013) in the size of our sample (approximately 3,500 company-year observations and 56,700 peer choices) and the number of years covered (three years for the same panel of firms). Data analyzed for this paper were drawn from a larger researcher-developed dataset that indexes the compensation benchmarking disclosures of approximately 4,500 public companies since F.Y. 2006. The broader dataset was designed to study executive compensation networks with coverage sufficient to make claims about the structure of the network overall. Data were collected through the application of researcher developed software algorithms that analyze electronic versions of the S.E.C. "proxy" filings in which companies disclose their peer groups (e.g., DEF 14A, DEF 14C). The software algorithms execute the following steps: download a company's filings for a specified range of

years; identify the compensation discussion and analysis section of each filing to minimize "false positives" from reports of companies or peer groups unrelated to compensation (e.g., director biography or stock performance peer group); identify collections of unstructured company names proximate to terms and phrases indicative of a benchmarking discussion; extract these unstructured company names; and match them against a look-up table that adds global firm identifiers (e.g., stock ticker, CUSIP).[6] These data are then merged with a variety of licensed financial datasets to provide a rich set of firm and executive level data. In this paper, we include in our analyses data from three principal sources beyond our peer reports: Morningstar Executive Compensation (C.E.O. compensation, board memberships, executive employment history, and industry classifications); Morningstar Fundamentals (company financials); and I/B/E/S (IBES) (a database of equity research analyst recommendations owned by Thompson Financial), which provides information about the firms that are jointly covered by the equity analysts in the IBES database.

We analyzed data for a sample of 1,183 firms, which constitutes the population of firms for which we have repeat compensation high quality peer group measures for F.Y. 2007, 2008 and 2009 (reported in filings submitted between 2007 and 2010). Our sample consists of 3,549 company-year records and 56,718 total dyadic peer choices. We selected our sample in the following manner. First, we defined our universe as all public companies that trade on either the NYSE or Nasdaq markets. Second, we defined our initial sample as those universe companies for which compensation data could be assembled from the largest executive compensation dataset available (the Morningstar Executive Compensation Database) for all three fiscal years.

6 We provide here a high level description of the data extraction process for the general reader. The algorithms extract additional data, including the firm's compensation consultant, if reported. They include logic for interpreting cases of more than one reported peer group (e.g., one for C.E.O. and one for Chairman, or one for general compensation and one for a particular benefit), and a variety of other complexities common to the reporting of peer groups. A more detailed description of the data extraction algorithms is available upon request.

Third, we narrowed our sample by including only companies whose proxy filings could be located on the S.E.C.'s download (FTP) manifest for all three fiscal years, and whose proxies reported compensation peer groups for all three years. Finally, we narrowed our sample further by including only companies for which our data extraction software assigned the highest quality "confidence" scores possible for all three years.[7] By working with a panel of firms, we are in a position to analyze changes in the behavior of firms over this three year period, which was one of heightened scrutiny of pay practices, both because of the well-documented rise in C.E.O. pay during the previous two decades, and the financial crisis and ensuing recession of 2008-2010.

Since our interest is in modeling peer choices, the sample of "peer-choosing" firms explicitly excludes companies that did not disclose peers in their proxy filing (either failing to comply with S.E.C. requirements or because they did not set C.E.O. pay through benchmarking).[8] Nonetheless, companies in our potential universe (i.e., in the Morningstar compensation database and either the NY Stock Exchange or Nasdaq plus any company actually named by one of the companies in our "peer-choosing" sample) remain in our study as potential peers of the "peer-choosing" firms in our study. In this way, these companies contribute to the calculation of benchmark pay levels based on the "natural" peers of peer-choosing companies. While in some respects a "convenience" sample, our sample of peer-choosing companies is more inclusive (in both scope and time-frame) of a broader set of public companies than has been studied to date.

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7 Given the form of the information being extracted, manual and software-based extraction of peer group data are susceptible to false positives (assigning a peer that was not a true reported peer) and false negatives (failing to assign a peer that was a true reported peer). To minimize false positives, the software algorithms assign a confidence score to each record and peer extraction. We have no such "tool" for false negatives. Both types of error are related to the layout complexity of the filing.

8 PeerID extracted five or fewer peers -- our minimum size for analyzing a peer group-- in approximately 40% of companies with high data extraction confidence scores in F.Y. 2007. This rate declined to 34% in F.Y. 2008 & 29% in F.Y. 2009, suggesting increased rates of disclosure and extraction.

Appendix Table A1 describes the sample of peer-choosing companies (referred to more succinctly as "the sample" below) and compares it to the Morningstar universe (all Nasdaq and NYSE firms covered in its compensation database) and those Morningstar universe companies that are also included in the S&P Execucomp database in a given year. Observations described in the table are the combined set of company-year records for the full time period. The sample is generally representative of the Morningstar universe in terms of sector composition (based on the Global Industry Classification Standard [GICS] classification system).[9] However, the sample includes a greater percentage of relatively large companies, and as a consequence companies with higher median levels of pay. These differences notwithstanding, the sample includes a relatively diverse set of companies as compared, for example, with those also covered by the Execucomp database and used in most of the empirical studies discussed earlier.[10] For example, it includes a larger proportion of Nasdaq-listed firms and a more diverse set of firms in terms of market capitalization.

## 4. ANALYSIS

Our analyses proceed as follows. We begin by describing the degree to which firms choose "similar" peers in terms of industry and firm size, which we consistently operationalize in these analyses as revenue. Previous research (Faulkender & Yang, 2008; Bizjak, Lemmon & Whitney, 2009) and discussions with practitioners suggest that firms typically select a subset, or sample, of comparable firms (based on size and industry) when constructing their peer groups. With this in mind, we next assess the degree to which firms follow a prevailing norm in terms of the size of peer groups used when benchmarking C.E.O. pay (i.e., we describe the distribution of

[9] In this paper, we use the GICS 10 category sectors, the 24 category industry groups, and the 68 category industries.

[10] See Cadman, Klasa and Matsunaga (2010) for a discussion of the differences between Execucomp and non-Execucomp firms in C.E.O. compensation.

peer group sizes, in social network analysis terms the "outdegree" distribution). We contrast this outdegree distribution with the distribution of received ties, or "indegree" distribution. In other words, we compare the distribution of choices firms made to the distribution of choices firms received. Next we report results from our estimation of conditional and multinomial logit models assessing the tendency of firms to choose other firms as peers as a function of the industry and relative size of potential peers, the size and relative compensation of the focal firm's CEO, and ties between the focal firm and potential peers via coverage by common financial analysts, the sharing of corporate directors, or the use of a common compensation consultant. Finally, we describe and report results from a series of simulations we conducted to assess the degree to which compensation benchmark values produced by a firm's *selected* peers reflected the compensation levels that prevailed in the firm's market of "*natural*" (normative) peers.

## Homophily in Peer Selection

Do firms select peers that are similar to them in terms of the prevailing norms of "comparability," namely firm size and industry? Tables 1a and 1b present "mixing matrices" that cross tabulate the GICS sectors (Table 1a) and revenue decile (Table 1b) of choosing firms (rows) by the sector and size of the peers they chose (columns), where, to save space, we only present results for FY 2009 (the results are similar for the other two years). The percentages are of peer choices for which firm attribute data were available for the chooser and chosen. For example, reviewing Table 1a, the cell at the intersection of Consumer Goods (3) and Industrial Goods (6) reports the percentage of peer choices made by firms in the consumer goods sector that went to firms in the industrial goods sector (15.7%). For ease of narrative, however, we focus on the most recent fiscal year (F.Y. 2009) as our example year throughout the paper.

[INSERT TABLE 1 ABOUT HERE]

Reviewing Table 1a (F.Y. 2009), we focus first on the diagonal cells, which report the percentage of peer choices that went to comparable firms. Table 1a suggests a strong tendency by firms to nominate peers within their own GICS sector. In five of the nine sectors, 70% or more of peer nominations made were within that sector. In the case of Financial Services firms, 91% of peer choices were made to other Financial Services companies. The four exceptions to sector homophily include Conglomerates (which by definition cross sectors), Consumer Goods, Industrial Goods, and Services (which are all product "type" classifications). Moving off-diagonal, much of the relatively low within-sector nomination rates of Consumer Goods and Industrial Goods firms can be explained by their selection of peers in one or two related sectors. For example, 74% of Consumer Goods companies named within the Consumer Goods and Industrial sectors. While based on a different industry classification system, these results are generally consistent with others reported in the literature (Bizjak, Lemmon, and Naveen, 2008). Overall, approximately 74% of peer choices were within the same GICS sector in each of the panel years. However, given that most firms name peer groups of size ten or larger, it is common for firms to include firms within their peer group who fall outside of their own GICS industry or even industry group.

Moving to Table 1b, we see that most peer choices are "homophilous" in being to firms who are within one or two size deciles of the peer-choosing firms. However, there is a strong and widespread tendency for firms to choose "up," i.e., to prefer what DiPrete et al. (2010) referred to as "aspirational," larger peers as opposed to choosing down. This is seen most clearly when contrasting values below vs. above the diagonal and contrasting the choices of the smallest firms vs. the largest firms. For example, 56% of peer choices made by firms in size decile 2 went to firms in the same decile or one decile above, compared to 73% by firms in size decile 9.

Overall, we find that 58% of peer nominations went to firms within one decile up/down in size of the choosing firm, and in the same sector. Homophily, in short, clearly plays a major role in peer selection, but deviations from homophily are common at the level of dyadic choices, but it is in fact common for named peer groups to include heterophilous peers, and heterophilous peers are more likely to be larger firms rather than smaller firms.

Figure 1 plots the network constructed from the dyadic peer relations observed, with nodes colored by industry and sized by market capitalization category (micro, small, mid and large). Firms (nodes) are positioned based on the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991). Firms proximate to one another are substantively "closer" in the broader network of compensation peer ties than those located at a distance. Thus, the evident color pattern to the diagram reflects industry homophily. As well, firms located near the center of the network – generally, the larger firms – are substantively more central, although centrality in network terms can be conceptualized in a variety of ways. The fact that larger firms tend to be located closer to the center of the network is a clear consequence of the general practice for firms to name peers that are larger than themselves; as a consequence, the largest firms receive a disproportionate number of selections as peers.

[INSERT FIGURE 1 ABOUT HERE]

## Degree Distributions

The median peer group observed was 13 in F.Y. 2007 increasing to 15 in F.Y. 2009. The central implication of such a small median is that firms typically benchmark C.E.O. pay based on a sample of the full set of comparable peers. There is no obvious theoretical or practical justification for why firms choose to benchmark based on such a relatively small number of compensation data points, but clearly this tendency provides more degrees of freedom for firms

to exercise discretion in the naming of peers. Indeed, the right tail of the out-degree distribution generally represents firms that reported using a comprehensive index of comparable companies as their peer group and named each index member accordingly.

Figure 2 reports the in-degree distribution, meaning the distribution of *received* peer ties per firm, for FY 2009.[11] While not a power-law distribution (cf. Newman 2005), it generally reflects an environment in which most firms are rarely named as compensation peers, while a relatively small number are frequently chosen. To put these "high indegree" firms in context, in F.Y. 2009, approximately 90% of high indegree companies (above the 75$^{th}$ percentile in received peer ties) came from quintiles 4 and 5 in market capitalization, approximately 85% came from quintiles 4 and 5 in total compensation, and approximately 49% paid total compensation above the 80$^{th}$ percentile of their natural peer group that year. In short, the most popular firms in the CEO compensation peer group world tend to be larger and higher paying firms, both in absolute terms and relative to their natural peers.

[INSERT FIGURE 2 ABOUT HERE]

## Predicting Peer Location

What determines the tendency to look outside the natural peer group for compensation peer companies? To address this question we estimated a set of multinomial and conditional logit models. First, we estimated the probability that a peer came from each of seven possible locations of less or greater distance from the focal firm on the key dimensions of industry and size. The seven locations were defined as:

[11] We re-emphasize that while the graph plots only sample firms, the count of received ties per firm includes ties received from non-sample firms in the broader dataset.

1. *Same Industry/Size:* (i.e., a "natural" peer), defined as companies within 50% and 200% of the focal company's size, and in the same GICS industry group.[12]
2. *Same Sector/Size, Different Industry:* defined as companies outside the same industry group but in the same sector and within 50% and 200% of the focal company's size.
3. *Same Sector, Smaller*: defined as companies in the same sector, that fall below the 50% size lower range described earlier.
4. *Same Sector, Larger*: defined as companies in the same sector, that fall above the 200% size upper range described earlier.
5. *Different Sector, Smaller:* defined as companies in a different sector, that are smaller than the focal company.
6. *Different Sector, Moderately Larger:* defined as companies in a different sector that are up to 200% larger than the focal company.
7. *Different Sector, Much Larger:* defined as companies in a different sector that are greater than 200% larger than the focal company.

Our predictors of these locations were the size quintile of the choosing firm and whether it was a high compensator, relative to its natural peer group ("High" = total compensation above the 80% percentile of the natural peer group. Table A2 reports the full set of coefficients. We summarize the results of this analysis in figure 3 with a simplified graph of the predicted probabilities for a subset of the outcomes and for the smallest and the largest quintile firms based on whether or not they were high compensators.

[INSERT FIGURE 3 ABOUT HERE]

[12] We chose this range because it conforms with the range that companies use in practice when identifying comparable firms in their market.

The multinomial logit models reveal a tendency by larger companies to reach outside their natural peer group for peers, to reach outside of their industry group to the broader sector for similar size peers, and to reach outside of their industry group and sector for larger peers. Smaller firms, in contrast, were more likely to find larger peers in their own sector. Thus, for example, in F.Y. 2007, firms in the bottom size quintile had a .94 probability to choose peers in their own sector, vs. a .79 probability for firms in the middle size quintile, and a .71 probability for firms in the top quintile. When bottom quintile firms reached outside their natural peer group into the broader sector, they were more likely to name larger peers than were firms in the middle or top quintile (the probability of naming a larger peer, given that the peer was outside the natural peer group but in the same sector was .78 for bottom quintile firms, .69 for middle quintile firms, and .39 for top quintile firms). We think this is a natural consequence of the fact that most potential peers are in fact larger than bottom quintile companies. More interesting is the question of where firms looked to find larger peers. Over 50% of the larger peers of top quintile firms came from outside the firm's sector, vs. 37% for middle quintile companies and only 8% for bottom quintile companies. A similar pattern holds for F.Y. 2008 and F.Y. 2009.[13] We interpret our findings to reflect the practical limitations on very large firms to find similar, let alone larger peers without crossing industry group and sector boundaries.[14]

The multinomial logit models also imply that relatively high compensating firms were less likely (by about 5 percentage points) to choose within their natural peer groups than other firms of the same size quintile, and were more likely to choose larger companies as peers.

[13] This pattern differs from that reported by Bizjak, et al. (2011), who found that smaller non S&P 500 firms were more likely to look outside of their industry group and sector to find bigger peers.

[14] As well, the scale and diversity of these firms may have made size and complexity, as opposed to industry, the more salient factors in their peer selections. We have not yet tested this speculation.

Because larger companies generally have more highly compensated executives, this particular tendency for firms of highly compensated CEOs to choose larger firms would generally produce a more highly compensated peer group.

Next, we estimated a set of conditional logit models to examine the factors that determine which specific potential alters were actually chosen as peers. We specified the probability to potentially depend upon three types of covariates. Homophily effects were captured with dummy variables for whether the potential peer was in the same GICS industry group, in the same revenue decile, and whether the focal firm and potential peer were jointly covered by at least one equity analyst in the IBES database. Two variables (whether the boards were interlocked and whether the focal and potential peer firm used the same compensation consultant) measured relationships between the focal firm and all potential peers. Finally, three variables (whether the alter firm pays more in total compensation, whether it has larger revenues than the focal firm, and whether it has a higher return on assets than the focal firm) measure tendencies towards choosing aspirational peers. The choosing companies are all the companies in our sample for each of the three fiscal years. We paired each chooser with all possible peers, defined as all companies that traded on the NYSE or Nasdaq markets in a given F.Y. for which we have Morningstar compensation data, in addition to any other company that was found to be an actual peer of any sample company in a given F.Y. The notes for Table 2 describe each predictor in greater detail.

[INSERT TABLE 2 ABOUT HERE]

Table 2 reports the results of this model for each of the three fiscal years under study, with coefficients expressed as odds ratios. As we would expect given the results already presented, the homophily predictors are large and highly significant. While other coefficients are statistically significant, the homophily predictors are responsible for nearly all of the explained

variance in the model. It is noteworthy that homophily is not defined exhaustively by the GICS industry categories. Net of industry category, firms are more likely to choose as potential peers those companies that are covered by one or more investment bank research analysts (IBES data) who also covers the focal firm. Equity analysts generally assigned firms to their research portfolio based on firm industry, firm size, and firm business model. As such their operationalization of similarity may represent a more nuanced conception of a firm's natural peer group than does a standard industry classification such as GICS. Our discussions with practitioners further suggest that firms are generally aware of the companies in the coverage universes of their sell-side analysts, and view them as a starting point when constructing internal peer groups. This finding is consistent with the argument of Beunza and Garud (2005) that securities analysts are "frame-makers," whose classification schemes reflect (or influence) the frames use by corporate compensation committees when they select compensation peers.

Table 2 also shows that companies are more likely to choose other companies with which they share a board interlock as peers. In models not reported, we established that the strength of the board interlock effect varied by industry sector, which may reflect differences in norms of "coop-etition" and conflict of interest (consider, e.g., the recently dissolved board interlock of Apple and Google, which were tied as compensation peers as well). Consistent with our multinomial logit results, a potential alter was more likely to be chosen as a peer if that company was larger in revenues than the focal company and if the company had a higher return on assets than the focal company. Finally, even after controlling for tendencies to choose larger and better performing firms as peers, we find that a focal company was more likely to choose an alter as a peer if the C.E.O. of the alter company was more highly paid than was the C.E.O. of the focal company. Thus, despite the strong homophily effects, firms favor potential peers that have

higher predicted compensation based on their size and performance. Among these potential peers, firms prefer peers who overpay their CEO relative to statistical expectations based on size and performance. Finally, and net of these effects, firms tend to prefer potential peers that are tied to the choosing firm via board interlocks or sharing the same compensation consultant.

## Simulation-based Tests

While the evidence presented so far suggests that firms choose peers that upwardly bias the compensation of the focal CEO, we have not directly established the validity of this conjecture. Given the complex intersection of characteristics that define a firm – e.g., business model, industry, margins, growth rate, regulatory risk, brand, and geographic scale – the correct "natural" peer population for any particular company can no doubt be debated. Furthermore, given that firms select a subset of possible peers from the population of suitable candidates, any difference between the benchmark values of an inferred natural peer group and the benchmark values of the named peer group could arise from random variation across various "draws" of a natural peer group.

To address these issues, we conducted two simulation analyses with our data. In the first analysis, which we label "simple," we simulated peer groups by repeated sampling from companies in the same GICS industry sector as the focal firm whose revenues were between 50% and 200% of the focal firm. We also included in our pool of possible peers any firm that was covered by one or more of the IBES equity analysts who also covered the focal firm. Our second "complex" simulation is more elaborate, but to avoid confusion we defer details until after describing the simulation process that we used for both of the two simulation analyses.

We fixed the size of the simulated peer groups to equal the size of the compensation peer group that each firm reported in its proxy, and for each firm we drew this many peers at random from our operationalization of the firm's natural peer population. We repeated this random draw

500 times for each firm, which yielded 500 simulated peer groups for each firm, each the same size as the named peer group it reported. For each of these simulated peer groups, we calculated total compensation and cash compensation 50th (p50), 75th (p75), and 90th (p90) percentile benchmark values, and we did this for each of 1,183 firms in our sample for each of the three years under analysis. The simulated p50 for each firm gives the value that the company would presumably use as the target for its CEO compensation if it benchmarked to the middle of its distribution, while the p75 and p90 for each firm tells us about the character of the right tail of the firm's benchmark distribution, and tells us how the firm would pay its CEO if it saw itself as a high-paying firm relative to its benchmark distribution. For the 1,183 firms taken together, we obtain a distribution of p50, p75, and p90 benchmark points for our sample. For each of the 500 simulations, we can compute order statistics such as the sample median (i.e., the median of the p50 values or the median of the p90 values across the 1,183 firms) and the 90th percentile (i.e., the 90th percentile of the p50 and the p90 values). The order statistics tell us how the benchmark values vary across the distribution of firms, with the median p50 and p90 presumably informative about a middle-size company in our sample of firms, and the 90th percentile presumably informative about a relatively large company in our sample of firms.

The order statistics for the distribution of benchmark values (e.g., the median p50 or the 90th percentile p90) will of course vary across the 500 simulations; in other words, we get a sampling distribution for each of these statistics from the 500 repetitions of the simulation. These sampling distributions allow us to compute a sample mean and a 95% confidence interval for each of these statistics. These estimates can then be compared with the empirical values of the corresponding order statistics obtained from the proxy reports.

By comparing the benchmark values for the named peer groups with the "simple" simulated peer groups, we can establish the extent to which named peer groups show bias at different points of the peer group distribution and at different points in the population distribution of firms. However, and as noted above, bias in named peer groups can be of two types. First, it can arise when focal firms choose other firms as peers that are bigger or more profitable than they are. Because size and profitability are associated with CEO pay, this strategy would naturally produce peer groups that show compensation bias at different points of the peer group distribution. In addition, named peer groups can show additional bias to the extent that focal firms are "cherry-picking" peers that have especially well compensated CEOs net of their expected compensation based on the characteristics of their companies. In order to get further insights into the size of "cherry picking" bias, we conducted a second, "complex" simulation, which attempts to mimic the behavior of a firm that is choosing a biased peer group purely on the characteristics of the firm itself.

The "complex" simulation took the following form. We estimated the predicted compensation for CEOs based on the firm's size (revenue) and performance (return on assets) within the ten GICS sectors. We ranked these predicted compensation values within each sector, and divided the ranked firms into six groups per sector, which yields 60 total groups of firms. We then computed the rate that firms within each of these 60 groups chose peers from each of the 60 possible locations. These rates (60 rates for each of the 60 locations) became our empirical probability weights. We then used these weights to draw 500 random samples of peers for each of the firms in our sample in each of the three years. This methodology incorporates any tendency for focal firms to choose biased peer groups *based solely on firm characteristics* into the simulation. By comparing actual peer groups with peer groups generated by our

complex simulation, we obtain a measurement of how firms bias their peer group selection based on the CEO compensation of peers, net of expected compensation.

[INSERT FIGURE 4 ABOUT HERE]

Figure 4 reports means and confidence intervals from these two simulations for the p50, p75, and p90 benchmark values for fiscal years 2007-2009. For each of these three benchmark values, we report the median, the 75$^{th}$ percentile, and the 90$^{th}$ percentile for the distribution of firms in our sample (i.e., we report the mean p50, the 75$^{th}$ percentile p50, and the 90$^{th}$ percentile p50, and then we report the mean p75, the 75$^{th}$ percentile p75 etc.). The nine graphs in figure 4 therefore report on three locations in a firm's benchmark distribution (the p50, p75, and p90) at three different points in the sample distribution of firms as measured by the their values for these three benchmark locations.[15] If one reads down a column in figure 4, one compares simulations at different population values for a particular location in the benchmark distribution. If one reads across a row, one compares simulations at the same population value for different locations in the benchmark distribution.[16]

Reading down the first column of figure 4, which concerns the median (p50) location of a firm's benchmark distribution, we compare the actual values with the simple simulation and see that there is a systematic tendency for firms to choose peer groups that overstate the median compensation value relative to what it would be in the natural peer group. This tendency exists

[15] The nine graphs in figure 4 use different scales on the Y axis to make it easier to see the extent to which the named peer groups differ from the two simulated peer groups in each graph for each year.

[16] The same population value does not necessarily mean the same firm. In other words, the firm that is at the 75$^{th}$ percentile of the distribution of median points of firm benchmark distributions is not necessarily the same firm as the firm at the 75$^{th}$ percentile of the distribution of p90 points in the benchmark distribution. Generally speaking, however, the firms at the 75$^{th}$ percentile for each of these benchmark locations will be larger firms than those at the 50$^{th}$ percentile for the benchmark locations, and those at the 90$^{th}$ percentile of the distributions of the three benchmark locations will be still larger.

at the middle of the firm distributions, at the 75th percentile, and also at the 90th percentile of the distribution, and it persists across all three years for which we have data. The gap between the medians of the actual peers groups and the simple simulations are always outside the 95 percent confidence intervals. The median benchmark for the named peer groups is also significantly higher than the median benchmark for the complex simulation.[17] The complex simulation achieves a similar median 75th percentile as the named peer groups, but it lags behind the 75th percentile amounts at the 75th and 90th percentiles of the distribution. The results suggest that the location of the 75th percentile of named peer group distributions is affected by the specific compensation of potential CEO peers as well as the characteristics of their companies that predict compensation. Finally, we look further out on the right tail at the 90th percentile of the peer benchmark distributions. Again, we find clear evidence that the named peer group compensation values exceed those obtained from the simple simulation. At the p90 values of the benchmark distributions, we see no evidence in figure 4 that firms are choosing firms based on the compensation of alter firm's CEOs net of the predicted compensation from the alter firm's characteristics and performance. But, clearly, there is a pervasive tendency at the p50, p75, and p90 locations of the benchmark distribution for firms to choose firms with better paid CEOs than one would obtain by selecting firms at random from a reasonable operationalization of the natural peer group population.

The biases displayed in figure 4 are not small. The median of the p50 values in the named peer groups were 33% larger than the median obtained from the simple simulation in 2007, 32% larger in 2008, and 27% larger in 2009, which corresponded to about $600,000

[17] At the 90th percentile, the median from the complex simulation lags behind the median from the simple simulation. The simple simulation samples firms within 50% and 200% of the size of the focal firm. Presumably, the 90th percentile from the simple simulation has disproportionate numbers of cases that randomly selected firms nearer the 200% point than the 50% point.

additional compensation. The biases were of similar size (36%, 29%, and 30%) at the median of the p75 benchmark values. At the median of the p90 benchmark values, the biases were again of similar size (35%, 38%, and 29%). Even at the 90th percentile of the p90 benchmark values, the biases were considerable (28%, 26%, and 36%), which corresponded to an arithmetic bias of over $3 million in compensation. Using the same benchmark values for the named peer groups as compared with the natural peer groups, in other words, would amount to substantially larger compensation levels for the CEOs in our sample.

## Aspiration Bias and Actual Benchmark Locations

The compensation of a CEO can be expressed as a function of the benchmark CEO compensation distribution and the point in the point in the benchmark distribution used by the company to set their CEOs compensation. Such a function is not a causal model; even though firms will often assert the point they use in the benchmark distribution in making compensation distributions (with the median being the most commonly asserted point), it is not at all clear that firms actually go through the kind of mechanical calculation implied by this image of compensation-setting. In fact, we can produce a ready test of the accuracy of the standard image of compensation setting by computing the empirical point in the benchmark distributions that correspond to the compensation of their CEO. Table 4 shows the empirically computed benchmark points (expressed as quintiles) for sample firms, using both their natural peer groups (a size range of 50-200% within detailed industry) and their named peer groups.[18]

Conventional wisdom tells that the typical firm benchmarks at the median or above of its benchmark distribution. This conventional wisdom underlies that assertion that firms are like the children of Lake Woebegone, who are all above average. It turns out, however, that paying

[18] We use a range of 50-200% because it is common industry practice according to conversations with practitioners and is also used by the Institutional Shareholders Services when evaluating a company's benchmark practices.

above the median characterizes the behavior of firms only when calculated against the natural peer group. As can be seen in Table 4, 51% of our sample of firms paid to the 60th percentile or higher of the natural peer group. The typical corporation builds in such a strong aspiration bias into its named peer group that it doesn't have be a Lake Woebegone child in order to pay its CEO well. Against the named peer group, only 32% of firms in our sample pay above the 60th percentile, while 44% of firms pay below the 40th percentile of their named peer group. Overall, the majority of firms in our sample actually benchmark below the median of their named peer groups, which contradicts what they say in their proxies. This suggests that the assertion by firms that they benchmark to the median or higher may be more an assertion of the firm's self-perceived status in the marketplace rather than an actual input into the firm's compensation algorithm.

[INSERT TABLE 4 ABOUT HERE]

In order to understand the relation between the extent of aspiration bias in a firm's named peer group and its compensation practices relative to its natural peer group, we estimated a set of regressions reported in Table 5. We defined aspiration bias in these analyses as

$$\boldsymbol{bias_{\theta}} = \frac{\boldsymbol{p\theta_{named}} - \boldsymbol{p\theta_{natural}}}{\boldsymbol{p\theta_{natural}}}$$

where $\boldsymbol{\theta}$ is alternatively set equal to 50 and 90. Thus, $\boldsymbol{bias_{50}}$ gives the difference between the 50th percentile total executive compensation in the named and natural peer group as a fraction of executive compensation at the 50th percentile in the natural peer group. We then regressed this bias on the percentile value of the firm's CEO total compensation measured against the firm's natural peer group controlling for the firm's revenue, return on assets, and GICS sector for each

year.[19] Revenues, performance, and industry sector are the central predictors of CEO compensation, and therefore the regression can be understood as the relationship between aspiration bias in the named peer distribution and the actual compensation of the firm's CEO, measured against a benchmark distribution of natural peers, net of the central predictors of executive compensation. The salient coefficients are shown in Table 5.

TABLE 5 ABOUT HERE

As table 5 makes clear, firms generally use larger aspiration bias in their peer groups when they are paying at a higher benchmark value. At both the p50 and the p90 point, firms whose CEO compensation ranks higher against their natural peer group are more likely to use aspiration bias in their named peer group. Comparing CEOs who rank ten percentage points apart against their natural peer group, the higher paid CEO on average uses a named peer group with about a 2% larger bias in the median and 90$^{th}$ percentile of their named peer group. Net of the relative position of actual compensation in the natural peer group, companies that have higher predicted compensation generally have lower levels of aspiration bias in their named peer groups. In other words, the larger the gap between actual compensation and predicted compensation, the higher is the aspiration bias of the peer group on average.

## 5. DISCUSSION AND CONCLUSION

Most public companies in the U.S. set pay for their executives through the process of benchmarking. In doing so, they select specific named peers against which they compare the pay packages they provide their top managerial talent. The linking of one firm's pay decisions to the decisions of another (which in turn is linked to its own peers….) means that pay decisions are embedded in a supra-firm relational structure. This network structure has generally been

[19] We operationalized the natural peer group percentile values as the means from 500 random draws from the 24 GICS industry groups, in each case limiting the peer population to firms that had between 50% and 200% of the revenues of the focal firm.

overlooked in the active, contentious, and we think substantively quite important literature on executive compensation, in particular its dramatic rise. Without discounting the empirical insights of firm/executive-level analyses, the firm-to-firm economic network structure and processes at play in executive compensation (e.g., clustering, centrality, contagion) is an equally critical level of analysis.

Using the largest and most comprehensive sample of compensation networks that is possible with current data, we confirmed the finding in other recent research that firms systematically chose as peers companies that are larger and have better compensated CEOs than themselves. In contrast to existing literature, however, we have used simulation methods to obtain more realistic comparisons between the peers actually named by companies and those they would name with reasonable operationalizations of natural peer groups. Relative to existing literature (e.g., Bizjak, Lemmon and Whitney 2009), we find larger biases and no clear direction in the size of these biases over the three year panel that we analyze here. We also find that deviations from homophily are structured by existing network relations among firms, including specifically ties involving corporate directors and through the sharing of the same compensation consultant.

Whether this tendency exists into the future is an open question. The period of time in which compensation peer groups have been reported is still quite short, and normative pressures arising from the disclosure of this information may build only gradually. Recent news reports find that shareholder concerns continue to emphasize the bottom line comparison of executive compensation growth with the growth in corporate performance. The potential role of compensation benchmarks in justifying the firm's compensation behavior has largely been ignored.

Of course, one reason why corporate watchdogs have failed to systematically question the newly revealed compensation benchmarks may be because they believe the benchmarks to be of little direct relevance to the actual process by which compensation is set. We have in fact emphasized in our analyses the lack of a direct causal connection between benchmarks and executive compensation. Indeed, the pattern of our results has reinforced our interpretation that benchmark relations are really prisms and not pipes; they play a role in rationalizing compensation practices, but it is less clear that they have any causal impact on the pay of CEOs. In fact, assertions about where a firm benchmarks its compensation may also be relatively unimportant in the actual setting of executive compensation. As Table 5 makes clear, most companies benchmark below the median of their named peers, even as other research has demonstrated that most firms assert instead that their practice is to pay at the median or above the median of their peer group. Both the assertion of benchmark location and the assertion of a set of compensation peers may fundamentally be prismatic rhetoric that has an important impact on compensation more through the rationalization and defense of compensation decisions rather than by providing a deductive basis for arriving at a sound compensation level for the company's CEO.

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**Table 1**
**The Industry and Size of Firms and their Named Peers**

*Panel A: FY 2009: GICS Industry Sector Classification 17,167 peer choices*

| **Sending Ties** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| Basic Materials (1) | 73.0 | 1.6 | 5.0 | 0.2 | 3.3 | 9.5 | 2.4 | 2.7 | 2.3 |
| Conglomerates (2) | 0.0 | 21.1 | 0.0 | 0.0 | 21.1 | 47.4 | 0.0 | 10.5 | 0.0 |
| Consumer Goods (3) | 3.8 | 2.1 | 57.5 | 1.2 | 2.4 | 15.8 | 11.2 | 5.8 | 0.2 |
| Financial (4) | 0.3 | 0.0 | 0.4 | 90.6 | 1.5 | 0.6 | 3.7 | 2.5 | 0.4 |
| Healthcare (5) | 0.4 | 0.4 | 1.8 | 1.9 | 84.3 | 1.8 | 5.2 | 4.1 | 0.0 |
| Industrial Goods (6) | 9.9 | 5.2 | 10.7 | 1.1 | 0.7 | 53.3 | 7.4 | 10.8 | 1.0 |
| Services (7) | 3.3 | 0.6 | 7.9 | 3.1 | 4.7 | 4.3 | 63.6 | 11.4 | 1.0 |
| Technology (8) | 0.9 | 0.4 | 1.8 | 1.3 | 2.2 | 3.3 | 7.1 | 83.1 | 0.1 |
| Utilities (9) | 7.5 | 0.2 | 2.0 | 1.4 | 0.4 | 2.9 | 1.6 | 1.2 | 82.7 |

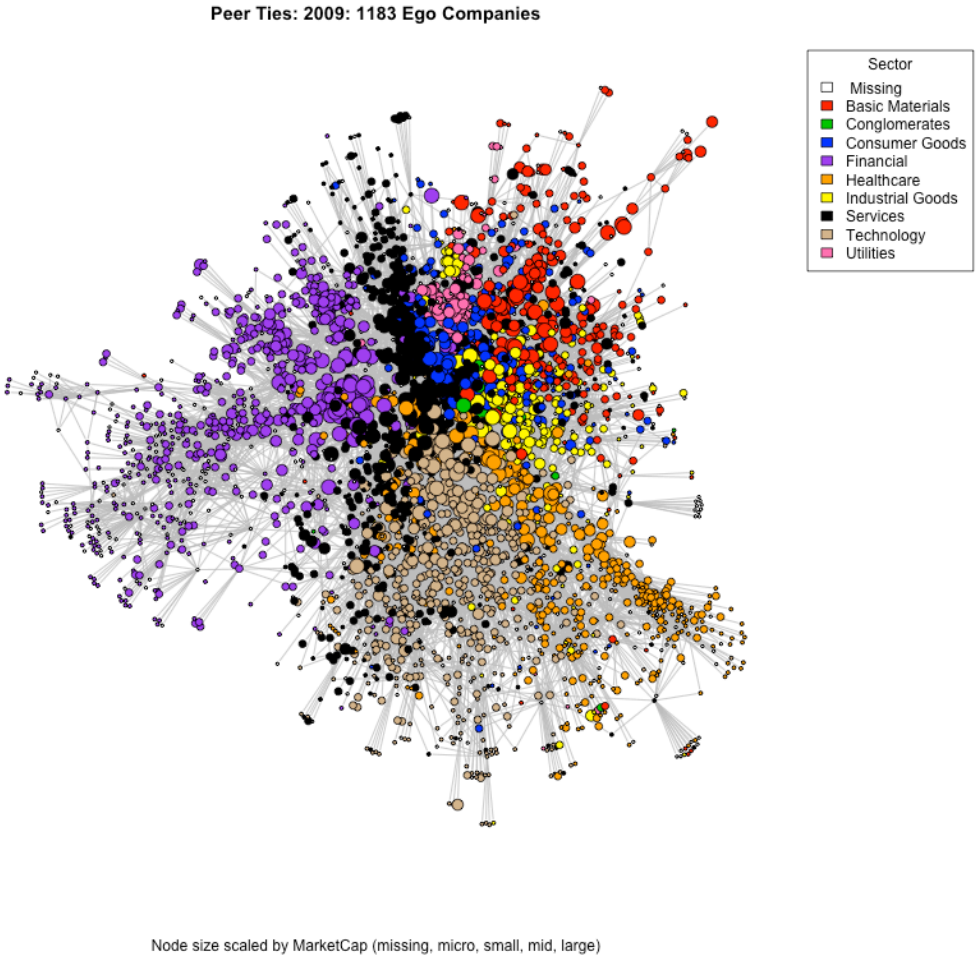
NOTE: Values are percentages of peer choices made by (ego) firms per industry sector to peer (alter) firms per industry sector, where industry sector data are available for both the ego and alter firms.

*Panel B: FY 2009: 17,134 Peer Choices*

| **Sending Ties** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| Decile 1 | 33.9 | 19.5 | 17.5 | 10.3 | 4.9 | 2.8 | 1.3 | 2.3 | 4.1 | 3.3 |
| Decile 2 | 16.8 | 27.0 | 28.7 | 16.1 | 6.8 | 3.3 | 1.2 | 0.2 | 0.0 | 0.0 |
| Decile 3 | 8.5 | 14.8 | 28.5 | 23.4 | 14.4 | 6.4 | 1.7 | 1.0 | 0.7 | 0.7 |
| Decile 4 | 4.2 | 3.9 | 12.5 | 23.9 | 24.3 | 17.1 | 6.5 | 4.6 | 2.2 | 0.9 |
| Decile 5 | 1.5 | 0.8 | 3.6 | 12.5 | 26.3 | 27.1 | 15.1 | 6.3 | 4.0 | 2.7 |
| Decile 6 | 0.5 | 0.4 | 1.2 | 6.0 | 16.9 | 26.8 | 26.8 | 15.3 | 4.6 | 1.6 |
| Decile 7 | 0.4 | 0.1 | 0.4 | 1.5 | 5.9 | 12.8 | 29.3 | 29.7 | 15.3 | 4.6 |
| Decile 8 | 0.5 | 0.2 | 0.2 | 0.8 | 1.6 | 4.8 | 16.8 | 33.6 | 31.2 | 10.3 |
| Decile 9 | 0.5 | 0.1 | 0.2 | 0.2 | 0.7 | 1.4 | 5.5 | 18.4 | 39.2 | 33.8 |
| Decile 10 | 0.2 | 0.1 | 0.0 | 0.2 | 0.3 | 0.2 | 0.9 | 3.3 | 16.6 | 78.3 |

NOTE: Values are percentages of peer choices made by (ego) firms per industry sector to peer (alter) firms per industry sector, where size decile data are available for both the ego and alter firms.

**Figure 1:**
**Executive Compensation Network Homophily: Directed Ties from Panel Firms to Peers**
*FY 2009: Color = Industry: Node Size = MarketCap Category*




NOTE: Nodes are firms. Node colors indicate industry. Node size indicates market capitalization category (Micro-Cap (<$200m), Small-Cap ($200m to $2b), Mid-Cap ($2b to $10b), Large-Cap (> $10b)). Positions of nodes based on Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991).

**Figure 2:**
**Received Peer Tie (Indegree) Distribution of Firm Compensation Peer Ties for 2009.**

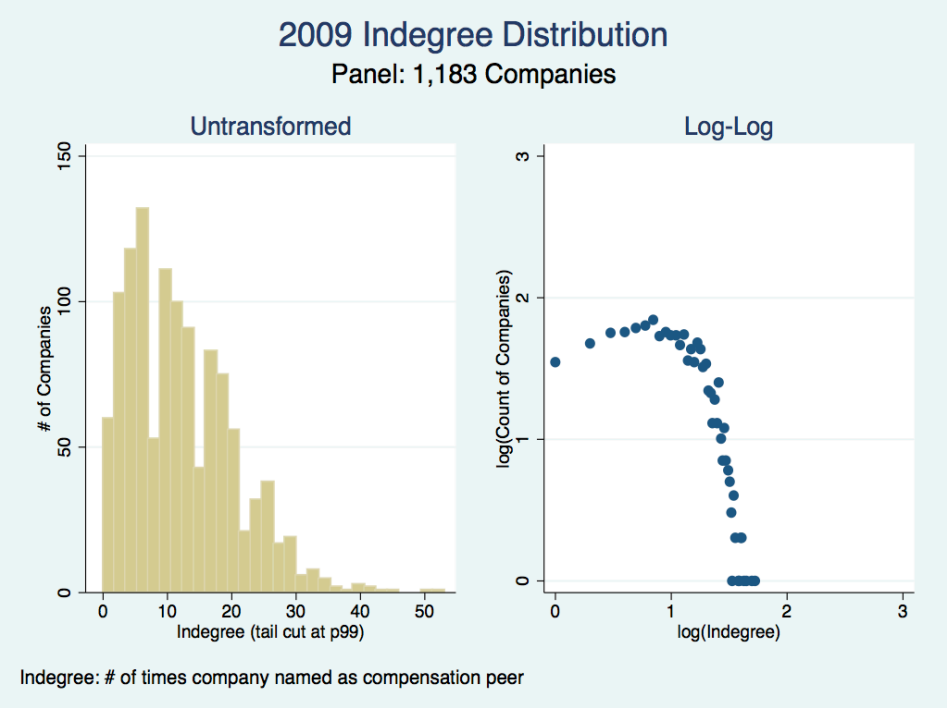


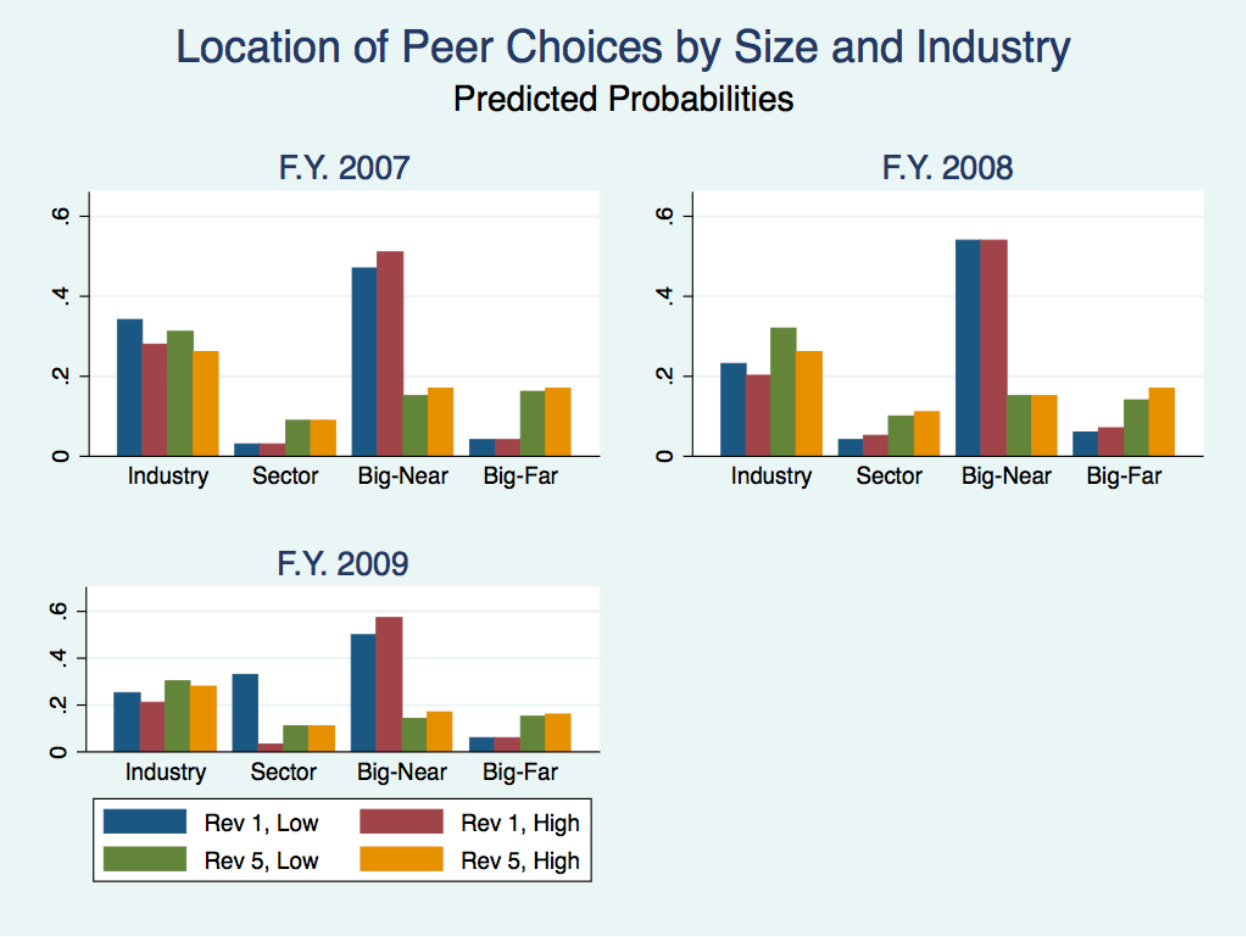
**Table 2:**
**Conditional Logit Models Estimating Odds of Peer Selection by Dyadic Covariates**

| | 2007 *(O.R.)* | 2008 *(O.R.)* | 2009 *(O.R.)* |
|---|---|---|---|
| (Outcome = Selection as Peer ) | | | |
| **Homophily** | | | |
| Chooser and potential peer… | | | |
| In Same Industry | 26.778*** | 24.647*** | 27.899*** |
| In Same Revenue Decile | 4.271*** | 4.071*** | 4.763*** |
| Same Equity Analyst (1 or more) | 10.658*** | 9.896*** | 8.899*** |
| **Relationships** | | | |
| Board Interlocked | 3.144*** | 3.741*** | 4.413*** |
| Use Same Comp Consultant | 1.477*** | 1.391*** | 1.338*** |
| **Aspiration** | | | |
| Potential peer … | | | |
| Pays More in Total Comp | 1.347*** | 1.371*** | 1.337*** |
| Larger Revenues | 2.520*** | 2.096*** | 2.083*** |
| Larger Return on Assets | 1.346*** | 1.268*** | 1.164*** |
| observations | 778030 | 801735 | 658125 |
| psuedo R-squared | 0.335 | 0.335 | 0.345 |

* p<0.05, ** p<0.01, *** p<0.001

NOTE: Observations are dyadic pairings of each sample firm with all companies in the data that trade on either the Nasdaq or NYSE markets and any company that trades on a different exchange but was named as an actual peer by a firm in the sample. Outcome is whether the focal choosing company chose a given potential peer (i.e., dyad variable "peer" = 1 vs. 0). Values reported are Odds Ratios. Models conditioned on the choosing firm. Standard errors reported do not differ substantively when clustered on choosing firm.

**Figure 3.**
**Predicting Location of Peer Choices by Chooser's Size and Relative Pay Levels**




NOTE: Location names are truncated versions of MLOGIT model definitions presented in Table A2:
Industry (Same Industry/Size): (i.e., natural peer), defined as companies within 50% and 200% the focal company's size, and in the same GICS industry (GICS industries are sub-categories of the GICS sectors listed in Table 1).
Sector (Same Sector/Size, Different Industry): defined as companies outside the same industry but in the same sector and within 50% and 200% of the focal company's size. Big-Near (Same Sector, Larger): defined as companies in the same sector, that are more than 200% larger than the focal company.
Big-Far (Different Sector, Moderately Larger + Different Sector, Much Larger): defined as companies in a different sector that are up to 200% larger than the focal company, combined with companies in a different sector that are greater than 200% larger than the focal company.

Table 4. Benchmark Location in Named Peer Group vs. Natural Peer Group for FY 2009

| | | Quintile (Natural Peer Group) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| Quintile | Q1 | 41 | 28 | 16 | 12 | 3 | 18 |
| (Named | Q2 | 11 | 31 | 32 | 23 | 3 | 26 |
| Peer | Q3 | 1 | 14 | 31 | 39 | 15 | 23 |
| Group) | Q4 | 0 | 3 | 13 | 33 | 51 | 21 |
| | Q5 | 0 | 2 | 5 | 12 | 82 | 11 |
| Total | | 11 | 17 | 22 | 26 | 25 | |

Natural peer group operationalized as GICS industries, plus or minus one decile away in firm revenue. Numbers in cell entries are percentages. Percentages sum to 100% within rows. Row and column totals are the marginal distributions across named and natural peer groups.

**Figure 4:**
**Comparison of Typical Firm's p50, p75 and p90 Benchmark Value: Actual vs. Simulated Peer Groups**

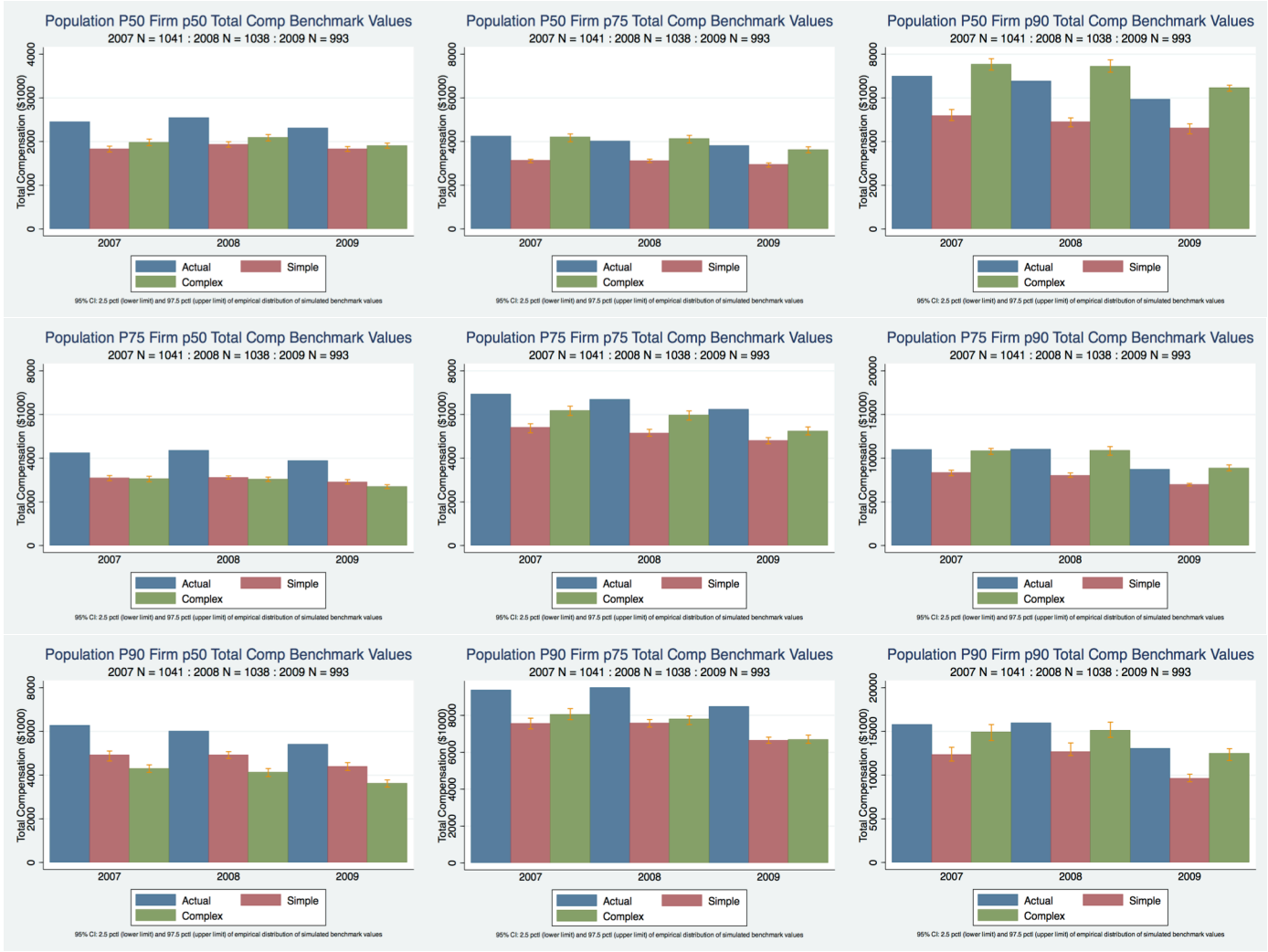


Table 5. Regression of Aspiration Bias on Benchmark Value in the Natural Peer Group Controlling for Revenues, Return on Assets, and Industry.

| | Asp. Bias at p50 | | Asp. Bias at p90 | |
|---|---|---|---|---|
| FY 2007 | Coef. | Std. err. | Coef. | Std. err. |
| Benchmark Pctl | .197*** | 0.021 | .195*** | 0.028 |
| Revenues | -3.1e-11*** | 0.000 | -3.4e-11*** | 0.000 |
| ROA | -.362* | 0.158 | -.141 | 0.209 |
| Industry Coherence Index | -.308* | 0.137 | -.499** | 0.181 |
| N. of cases | 1070 | | 1070 | |
| Adj. R-squared | 0.114*** | | 0.072*** | |
| | | | | |
| FY 2008 | Coef. | Std. err. | Coef. | Std. err. |
| Benchmark Pctl | .19*** | 0.021 | .235*** | 0.031 |
| Revenues | -2.4e-11*** | 0.000 | -2.9e-11*** | 0.000 |
| ROA | -.242* | 0.101 | -.377* | 0.153 |
| Industry Coherence Index | -.173 | 0.136 | .22 | 0.205 |
| N. of cases | 1059 | | 1059 | |
| Adj. R-squared | 0.109*** | | 0.120*** | |
| | | | | |
| FY 2009 | Coef. | Std. err. | Coef. | Std. err. |
| Benchmark Pctl | .229*** | 0.022 | .208*** | 0.027 |
| Revenues | -2.9e-11*** | 0.000 | -2.2e-11** | 0.000 |
| ROA | -.254** | 0.087 | -.113 | 0.106 |
| Industry Coherence Index | -.0196 | 0.148 | -.27 | 0.179 |
| N. of cases | 1026 | | 1026 | |
| Adj. R-squared | 0.136*** | | 0.074*** | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Appendix Table A1:**
**Descriptive Statistics of Sample and Comparatives**

| Firm Characteristic | Sample[1] | Universe[2] | Execucomp Co's in Universe[3] |
|---|---|---|---|
| | Mean/(Median) | Mean/(Median) | Mean/(Median) |
| | | | |
| *Observations (Co-FY)* | 3,549 | 12,614 | 4,650 |
| | | | |
| *Revenues ($m)* | 5,121 | 3,215 | 6,437 |
| | (1,015) | (384) | (1,524) |
| *MarketCap ($m)* | 5,884 | 3,927 | 7,570 |
| | (1,147) | (457) | (1,587) |
| *Total Employees* | 15,191 | 9,629 | 18,717 |
| | (2,600) | (1,142) | (4,700) |
| *Total Comp ($k)*[4] | 3,664 | 3,873 | 4,203 |
| | (2,234) | (1,240) | (2,565) |
| *Cash Comp ($k)*[5] | 884 | 793 | 1,063 |
| | (739) | (557) | (801) |
| | | | |
| *Board of Directors* | | | |
| # Directors | 9 | 9 | 9 |
| Rate Independent | 0.816 | 0.786 | 0.817 |
| | | | |
| *MarketCap Classification* | | | |
| Micro-Cap (<$200m) | 0.129 | 0.336 | 0.065 |
| Small-Cap ($200m to $2b) | 0.506 | 0.428 | 0.490 |
| Mid-Cap ($2b to $10b) | 0.254 | 0.163 | 0.301 |
| Large-Cap (> $10b) | 0.112 | 0.073 | 0.144 |
| | | | |
| *Industry Sector* | | | |
| Basic Materials | 0.100 | 0.092 | 0.086 |
| Conglomerates | 0.001 | 0.003 | 0.006 |
| Consumer Goods | 0.093 | 0.085 | 0.111 |
| Financial | 0.183 | 0.219 | 0.167 |
| Healthcare | 0.138 | 0.122 | 0.089 |
| Industrial Goods | 0.076 | 0.074 | 0.094 |
| Services | 0.181 | 0.197 | 0.225 |
| Technology | 0.187 | 0.181 | 0.177 |
| Utilities | 0.043 | 0.027 | 0.045 |
| | | | |
| *Exchange* | | | |
| NASDAQ | 0.462 | 0.596 | 0.365 |
| NYSE | 0.538 | 0.404 | 0.635 |
| | | | |
| *Indices (Firms in ...)*[6] | | | |
| S&P 500 | 0.233 | 0.129 | 0.298 |
| S&P Small Cap | 0.207 | 0.153 | 0.348 |
| S&P Mid Cap | 0.166 | 0.101 | 0.236 |

NOTES:

1. Screen: U.S. firms trading on the NYSE or Nasdaq markets, with complete C.E.O. compensation data in the Morningstar Executive Compensation Database, for which software extract algorithms extracted peer groups with low probability of error, in all three fiscal years (2007-2009).
2. Screen: U.S. firms trading on the NYSE or Nasdaq markets, with complete C.E.O. compensation data in the Morningstar Executive Compensation Database, in any of the three fiscal years (2007-2009).
3. Provided as reference. Companies that meet the Universe screen described in footnote 2, that were also covered in the Execucomp database, in any of the three fiscal years (2007-2009).
4. Calculated as salary + bonus + other cash compensation + equity compensation (restricted stock awards, option awards, etc.) using fair market value on the date of issuance + long term incentive plan payouts + all other compensation. Using the names of the underlying Morningstar variables from, total compensation equals salary + bonus + otherannualcompensation + restrictedstockawards + securityunderlyingoptionssars + ltippayouts + allothercompensation + optionawards. This definition is equivalent to TDC1 in the Execucomp database. The Morningstar compensation data are used to measure CEO compensation both for the choosing firms and the peer firms in our data.
5. Calculated as salary + bonus + other cash compensation.
6. Based on Q2 2010 composition of indices; indices change year to year.

## Table A2: Multinomial Logit Coefficients

| | (1) F.Y. 2007 *(Coef)* | (2) F.Y. 2008 *(Coef)* | (3) F.Y. 2009 *(Coef)* |
|---|---|---|---|
| *(1) Same Industry/Size* | (Reference category) | | |
| *(2) Same Sector/Size, Different Industry* | | | |
| Revenue 2 | 0.248 | -0.289 | 0.401 |
| Revenue 3 | 0.227 | -0.389 | -0.133 |
| Revenue 4 | 0.705** | -0.079 | 0.339 |
| Revenue 5 (Highest) | 1.172*** | 0.547** | 1.012*** |
| Relatively High Comp | 0.193* | 0.292*** | 0.149* |
| Constant | -2.389*** | -1.719*** | -2.040*** |
| *(3) Same Sector, Smaller* | | | |
| Revenue 2 | -0.234 | -0.705*** | -0.317* |
| Revenue 3 | -0.694*** | -1.103*** | -0.992*** |
| Revenue 4 | -0.317* | -0.927*** | -0.804*** |
| Revenue 5 | 0.490*** | -0.026 | 0.081 |
| Relatively High Comp | 0.263*** | 0.190** | 0.023 |
| Constant | -1.203*** | -0.632*** | -0.732*** |
| *(4) Same Sector, Larger* | | | |
| Revenue 2 | -0.802*** | -1.263*** | -0.964*** |
| Revenue 3 | -0.863*** | -1.406*** | -1.501*** |
| Revenue 4 | -0.884*** | -1.481*** | -1.373*** |
| Revenue 5 | -1.017*** | -1.587*** | -1.465*** |
| Relatively High Comp | 0.274*** | 0.179*** | 0.320*** |
| Constant | 0.316*** | 0.836*** | 0.689*** |
| *(5) Different Sector, Smaller* | | | |
| Revenue 2 | 0.918** | 0.970* | 0.090 |
| Revenue 3 | 1.025*** | 1.297*** | 0.323 |
| Revenue 4 | 1.609*** | 1.666*** | 0.671** |
| Revenue 5 | 2.199*** | 2.275*** | 1.387*** |
| Relatively High Comp | 0.147* | 0.297*** | -0.082 |
| Constant | -3.026*** | -3.142*** | -2.093*** |
| *(6) Different Sector, Moderately Larger* | | | |
| Revenue 2 | 1.197*** | 0.589 | 0.437 |
| Revenue 3 | 1.369*** | 1.001** | 0.909** |
| Revenue 4 | 2.063*** | 1.609*** | 1.298*** |
| Revenue 5 | 2.177*** | 1.658*** | 1.628*** |
| Relatively High Comp | 0.193** | 0.436*** | 0.140 |
| Constant | -3.328*** | -2.943*** | -2.774*** |
| *(7) Different Sector, Much Larger* | | | |
| Revenue 2 | 0.581* | -0.297 | 0.045 |
| Revenue 3 | 0.962*** | -0.033 | -0.043 |
| Revenue 4 | 1.047*** | 0.057 | 0.005 |
| Revenue 5 | 0.933*** | -0.217 | 0.048 |
| Relatively High Comp | 0.301*** | 0.457*** | 0.251** |
| Constant | -2.564*** | -1.683*** | -1.784*** |

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

NOTE: Relatively High Comp is defined as a firm paying above the 80$^{th}$ percentile of the firm's actual peer group total compensation distribution. Location definitions are:
(1) Same Industry/Size: (i.e., natural peer), defined as companies within 50% and 200% of the focal company's size, and in the same GICS industry (industries are sub-categories of the broad sectors listed in Table 1).
(2) Same Sector/Size, Different Industry: defined as companies outside the same industry but in the same GICS sector and within 50% and 200% of the focal company's size.
(3) Same Sector, Smaller: defined as companies in the same sector, that fall below the 50% and 200% size range described earlier.
(4) Same Sector, Larger: defined as companies in the same sector, that fall above the 50% and 200% size range described earlier.
(5) Different Sector, Smaller: defined as companies in a different sector, that are smaller than the focal company.
(6) Different Sector, Moderately Larger: defined as companies in a different sector that are up to 200% larger than the focal company.
(7) Different Sector, Much Larger: defined as companies in a different sector that are greater than 200% larger than the focal company.