

## **Compensation Peer Groups: A Comparison of ExecuComp and Non-ExecuComp Firms**

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### **ABSTRACT**

Using a hand-collected database, we compare the selection and use of compensation peer groups for a sample of 707 ExecuComp and 237 non-ExecuComp firms. While firms select peers based on characteristics—such as industry affiliation, capital market competition, and organization complexity—that signify efficient contracting, there is evidence of opportunism. On average, ExecuComp (non-ExecuComp) firms choose peers that pay executives 7.8% (19.7%) higher than they do. For every 1% increase in peer-group median compensation, executive pay increases 0.57% and 0.53% at ExecuComp and non-ExecuComp firms, respectively. We also document that the inference drawn from multivariate logistic regression is sensitive to the researchers' choice of the pool of potential peers.

*JEL Classifications:* G34, J31, J33

*Keywords:* executive compensation; benchmarking; peer groups; non-ExecuComp firms; CEO pay

## I. INTRODUCTION

Compensation peer groups have been a popular topic in the finance literature. An extensive body of literature exists that examines the selection of compensation peer groups and the effects of compensation peer groups on CEO pay for companies covered in Standard and Poor's ExecuComp database.<sup>1</sup> In contrast, because of data constraints, there is almost no evidence about compensation peer groups for non-ExecuComp companies.

Non-ExecuComp firms are important since they comprise more than 75% of firms in the Compustat database and are more representative of the sample of U.S. public firms, in general. Cadman et al. (2010) show that ExecuComp and non-ExecuComp firms operate in different contracting environments, and this leads to differences in the design of their executive compensation contracts. Hence, it is important to study how compensation structures differ across the two sets of firms. In this paper we provide some of the first comparisons of compensation peer groups in ExecuComp and non-ExecuComp firms, using a hand-collected peer-group database from 2006. We use these data both to provide new descriptive evidence about compensation peer groups in non-ExecuComp firms and to contribute to prior research on compensation peer groups using only ExecuComp firms.

Despite the large number of studies on compensation peer groups, research has not yet conclusively determined whether compensation peer groups are opportunistically selected to inflate CEO pay. In a sample of S&P 900 firms, Faulkender and Yang (2010) find firms are more likely to select firms with greater pay as their peers. Bizjak et al. (2011) show that firms select highly paid peers to bias CEO compensation upward. In contrast to these findings, Cadman and Carter (2014) suggest inference about opportunistic peer selection depends on the researcher-defined pool of potential peers. Using a group of potential peers that better reflects the CEO labor market, they find that peer-group selection is less opportunistic. Bizjak et al. (2008) find that CEO pay is set to levels comparable with firms of similar size and industry, and they conclude that the selection of compensation peers reflects efficient benchmarking. Finally, Albuquerque et al. (2013) support the efficient contracting view by showing that the choice of highly paid peers represents a reward for CEO talent not observed by investors. Given the conflicting evidence documented by prior literature, whether or not peer groups are opportunistically selected remains an open question.

In this paper, we focus on a sample of non-ExecuComp firms to better understand compensation peer-group benchmarking in U.S. public firms. We focus on two major research questions. First, we study whether non-ExecuComp firms choose peers in a way that demonstrates efficient contracting or opportunism. Second, we examine the extent to which non-ExecuComp firms benchmark their executive pay against that of chosen peers. It is worth noting that the question of how non-ExecuComp firms choose and use peer groups is, in itself, of great interest to financial economists because of a lack of data prior to our study. Moreover, the comparison between ExecuComp and non-ExecuComp firms in their compensation peer groups allows us to explore the importance of peer selection in setting CEO pay under different contracting environments.

In 2006, the Securities and Exchange Commission (SEC) adopted new proxy disclosure rules requiring firms to disclose the compensation peers they use in setting CEO pay. By using a hand-collected sample of 707 ExecuComp firms and 237 non-

ExecuComp firms in 2006, we first show that the average size of peer groups in non-ExecuComp firms is 13.98; this is smaller than the average number of peer firms in ExecuComp firms (16.36). Non-ExecuComp firms select more firms from the same industry compared with ExecuComp firms. Non-ExecuComp firms also choose slightly more of their peers from the same industry-size group. These differences in peer-group composition between ExecuComp and non-ExecuComp firms suggest a need to partition the sample based on different contracting environments.

Next, we compare size, accounting performance, and compensation between sample firms and their peers for ExecuComp and non-ExecuComp firms, respectively. For ExecuComp firms, we find significant differences between the characteristics of the peer firms and those of the sample firms. At the median, ExecuComp firms select peers that are 14% (computed as  $\exp(0.13)-1$ ), or \$132 million, larger in terms of sales. In terms of pay, peer firms have median total pay levels about 7.8%, or \$279,000, higher than sample firms. For non-ExecuComp firms, the gap is even larger: the median difference between peers and the sample firms is 35% in terms of sales, and 19.7% in terms of total compensation. Based on this analysis, non-ExecuComp firms appear to select peers even more opportunistically than do ExecuComp firms, in terms of size and total pay. They also appear to choose peer firms in a manner that could lead to unjustified pay increases.

To further examine whether non-ExecuComp firms choose compensation peers in a manner that inflates CEO pay, we examine the probability that a sample firm selects a firm as a peer as a function of differences in economic and pay characteristics. Similar to Cadman and Carter (2014), we consider four important factors: size, performance, growth opportunities, and compensation. We expect that opportunistic selection will manifest in chosen peers that are larger, have better performance, have greater growth opportunities, and have higher CEO compensation than sample firms, relative to other unselected peers. We separately run multivariate logit regressions for ExecuComp and non-ExecuComp firms, controlling for industry characteristics, customer/supplier relations, executive transfer, credit market characteristics, and product and market diversification. Interestingly, while ExecuComp firms opportunistically choose peers as demonstrated by selecting larger, better-performing, and higher-growth peers with greater CEO compensation, non-ExecuComp firms appear to select, as peers from among all the potential peer firms, smaller firms with inferior performance. This result is puzzling since it is different from the univariate results we have documented previously.

What explains the different inference based on univariate results and multivariate logit regression? In the above logit regressions, the set of potential peer firms includes all sample firms, both ExecuComp and non-ExecuComp firms, and all of the chosen peers. As Cadman and Carter (2014) point out, defining the pool in this way may introduce noise in the selection process as it introduces potential peers that are likely not in a sample firm CEO's labor market. For example, if big ExecuComp (small non-ExecuComp) firms consider all small non-ExecuComp (big ExecuComp) firms as potential peers, their chosen peers are bigger (smaller) than the unchosen peers; they would appear, to researchers, to select peers opportunistically (non-opportunistically). To address this issue, we redefine the pool of potential peers for sample firms: the set of potential peers for ExecuComp firms includes only ExecuComp firms and their chosen peers, and the set of potential peers for non-ExecuComp firms includes only non-

ExecuComp firms and their chosen peers. We now rerun the logit regression. We find ExecuComp firms continue to exhibit opportunism in peer selection; however, the degree of opportunism is reduced when using a group of potential peers that better reflects the CEO labor market. Non-ExecuComp firms, on the other hand, appear to opportunistically pick up peers that are larger, have higher growth opportunities, and have greater CEO compensation. The results suggest that both types of firms exhibit opportunistic behavior in peer selection.

If opportunism describes the selection of peer firms, then economic characteristics of chosen peers should be related to greater CEO pay. By benchmarking themselves against larger and more highly paid peers, CEOs can attempt to negotiate a compensation package that could lead to unjustified pay increases. To examine this issue, we investigate the effect of peer-group compensation on the sample firm's CEO pay. For ExecuComp firms (non-ExecuComp firms), a 1% increase in median total pay among peers leads to a 0.573% (0.532%) increase in CEO compensation. The results indicate that peer-group benchmarking is an important determinant of CEO compensation, and the degree of benchmarking is similar in ExecuComp and non-ExecuComp firms.

Having shown that both ExecuComp and non-ExecuComp firms select, on average, bigger and better-compensated peers, we next examine whether the difference in size (compensation) between chosen peers and the sample firms is related to the number of peers in the peer groups. Faulkender and Yang (2010) show that peer selection bias is more severe in smaller peer groups than in larger peer groups because it is easier to inflate median size (compensation) of a shorter list of peers. For ExecuComp firms in our sample, we find the difference in size (size bias) and compensation (compensation bias) between peer-group medians and sample firms is significantly larger in firms with small peer groups than in those with large peer groups. For non-ExecuComp firms, we also find that size and compensation bias are larger in small peer groups than in large peer groups, but the difference in compensation bias is not statistically significant.

In summary, this study contributes to the compensation literature along the following dimensions. First, we provide insight into the composition of peer groups for a set of firms that have contracting-environment characteristics different from those of firms typically examined in empirical studies on executive compensation. Hence, we can shed further light on peer-group selection and the impact of peer groups on compensation design in U.S. public firms. Second, we contribute to the debate in the literature about whether firms opportunistically select compensation peers, and we verify Cadman and Carter's (2014) finding that the researcher's choice of the pool of potential peers influences the conclusions drawn.

The remainder of the paper is organized as follows: Section II describes the data for empirical tests, Section III reports the empirical results and Section IV concludes.

## II. DATA AND DESCRIPTIVE STATISTICS

The SEC's new disclosure requirement became effective for firms with fiscal year-end on or after December 15, 2006. Thus we start with the lists of ExecuComp and non-ExecuComp firms that ended their fiscal years between December 2006 and May 2007. Similar to Cadman et al. (2010), we define ExecuComp firms as firms covered by the Standard and Poor's ExecuComp database.<sup>2</sup> Non-ExecuComp are defined as firms that

were part of the Russell 3000 index in June 2006, but are not in the ExecuComp database.<sup>3</sup>

We then read proxy statements, usually form DEF 14A obtained from the SEC's website, for each sample firm to collect the information about compensation peer group. As reported in Table 1, out of the 1,178 (894) ExecuComp (non-ExecuComp) firms for which we managed to find proxy statements, 808 (409) firms disclosed the peer groups they used to benchmark executive compensation. The numbers show that about 76% of ExecuComp firms use peer groups, but only 46% of non-ExecuComp firms do so. Non-ExecuComp firms may be less likely to use peer groups compared to ExecuComp firms because of the cost associated with constructing peer groups. Peer groups are usually formed with the help of compensation consultants, who address the specific situation of each firm in the labor market. Smaller non-ExecuComp firms may not have the resources to hire consultants, so they may choose not to have customized peer groups.<sup>4</sup> Alternatively, this difference in the use of peer groups may be due to differences in contracting environment (Cadman et al., 2010). For example, higher institutional ownership concentration may reduce the need for non-ExecuComp firms to benchmark pay against a group of peers.

**Table 1**  
Sample selection

	ExecuComp (1)	Non-ExecuComp (2)
Number of 2006 fiscal year firms that report under the new SEC rule.	1,333	975
Minus firms that proxy statements were not found.	155	81
Number of proxies read.	1,178	894
Minus firms that did not use compensation peer groups.	370	485
Number of firms used compensation peer groups.	808	409
Minus firms have zero compensation in either 05 or 06 fiscal year.	10	3
Minus firms that compensation and accounting data were not available for all of reported peers.	91	169
Final sample.	707	237
Number of reported peers.	11,570	3,314
Number of unique peers.	2,630	1,841

ExecuComp firms are firms covered by ExecuComp database. Non-ExecuComp are firms in Russell 3000 index (June 2006) that are not covered in ExecuComp database. 2006 fiscal year firms that report under the new SEC disclosure rule are firms with fiscal year end from December 2006 to May 2007.

To obtain information about sample firms and chosen peer firms, we use data from different standard databases as well as hand-collected compensation data. Accounting and stock data are from Compustat and the Center for Research in Security Prices (CRSP), respectively. Institutional ownership data are from Thomson Reuters. Regarding executive compensation, we begin with data available in the ExecuComp database. For the firms and peers that had accounting data available from Compustat, but are not

covered by ExecuComp, we hand-collected the compensation data from proxy statements.<sup>5</sup> Following Bizjak et al. (2011), we apply two filters to the sample firms. First, we require that the sample firms have non-zero CEO compensation in both the 2005 and the 2006 fiscal years. Second, we retain only those sample firms that have all peers with accounting and compensation data available. Our final sample includes 707 (237) ExecuComp (non-ExecuComp) firms. The number of reported peers is 11,570 (3,314), and this number includes 2,630 (1,841) unique peer firms.

The 2006 fiscal year is an interesting year to investigate. Most of the sample firms chose peers for this fiscal year prior to knowing that the list of peers would have to be disclosed. This is because the new SEC disclosure rule was issued on August 29, 2006, and most of the firms would have chosen peer groups well before that time (Faulkender and Yang, 2013). Thus, the results reported in our paper represent the behavior of firms for many years before the adoption of the new disclosure requirement. In addition, other prior research has looked at the peer groups for the 2006 fiscal year, for either the whole or part of the ExecuComp firm universe.<sup>6</sup> Our paper serves as an extension of their results and allows us to compare the peer-group benchmarking practices of these two groups of firms.

Table 2 reports summary statistics comparing ExecuComp and non-ExecuComp sample firms. Given that most ExecuComp firms are members of the S&P 1500 index, the biggest public firms, it is expected that ExecuComp firms have greater revenue, higher profitability, and lower stock volatility. Institutional investors own about 79% of shares outstanding of ExecuComp firms, compared with 59% of non-ExecuComp firms.<sup>7</sup> However, the ownership concentration is lower for ExecuComp. The ratio of the top five institutional ownership to the total institutional ownership for ExecuComp firms is 0.37, compared to 0.49 for non-ExecuComp firms.

Regarding compensation, CEOs of ExecuComp firms are paid, on average, 1.85 dollars for each thousand dollars of revenue. This number is 4.94 dollars for the CEOs of non-ExecuComp firms. ExecuComp firms seem to rely more on equity-based incentives to compensate their executives. The pay mix (salary and bonus/total compensation) is lower for ExecuComp firms. In summary, Table 2 shows evidence consistent with Cadman et al. (2010), in that “ExecuComp and non-ExecuComp firms operate in different contracting environments that lead to differences in the design of their executive compensation contracts”. Our paper focuses on how these two groups differ in their choice and use of compensation peer groups.

Table 3 reports the size and composition of peer groups. On average (median), ExecuComp firms have peer groups of 16.36 (15) peers. The number is 13.98 (14) for non-ExecuComp firms, and the difference is significant. Table 3 also reports the fraction of peers in the same industry and the fraction in the same industry-size group. We use Fama and French’s (1997) 49-industry classification. Peers are considered in the sample firm’s industry-size group if the peers are from the same industry and have sales revenue between 50% and 200% of that of the sample firms. While ExecuComp and non-ExecuComp firms show a non-statistically significant difference in the fraction of peers in the same industry-size group, ExecuComp firms tend to choose more peers from other industries. These results are not surprising since ExecuComp firms are the largest in their industries, and it is difficult for them to find same-industry peers that are 200% larger. In addition, it is consistent with the labor-market argument that to run big, complex firms, general management skills (transferable across companies and industries) are more

important than industry-specific skills. Thus, bigger firms tend to have more competition from outside industries for managerial talents, and it is appropriate to include more peers from other industries in their peer groups.

**Table 2**  
Summary statistics

	ExecuComp Firms Median (1)	Non-ExecuComp Firms Median (2)
<i>Financial characteristics</i>	<i>N=707</i>	<i>N=237</i>
Sales (\$ million)	2,028	294***
Total assets (\$ million)	3,080	828***
ROA (%)	8.08	5.71***
MTB	1.24	1.26
Stock volatility	0.36	0.57***
<i>Institutional ownership and concentration</i>	<i>N=695</i>	<i>N=229</i>
Institutional ownership (%)	79	59***
Institutional ownership concentration	0.37	0.49***
<i>Compensation</i>	<i>N=707</i>	<i>N=237</i>
Salary & bonus (\$ 000s)	1,538	769***
Salary & bonus/Sales (dollar per thousand)	0.76	2.51***
Total compensation (\$ 000s)	3,880	1502***
Total compensation/Sales (dollar per thousand)	1.85	4.94***
Pay mix (salary & bonus/total compensation)	0.42	0.56***

Summary statistics of ExecuComp and non-ExecuComp firms that report peer groups and that accounting and compensation data are available for all of the peers. The table reports data for 2005 fiscal year. The union of all sample firms, both ExecuComp and non-ExecuComp, and their chosen peers has 3354 firms. ROA and market-to-book are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles of the distribution of the union. Variable definitions are provided in the Appendix. Medians are reported and the Wilcoxon rank-sum test is used to compare the two values. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% confidence levels, respectively.

**Table 3**  
Statistics on the size and composition of peer groups

	ExecuComp ( <i>N=707</i> ) (1)	Non-ExecuComp ( <i>N=237</i> ) (2)
Number of firms in peer group	16.36 (15)	13.98*** (14***)
Fraction of peers in the same industry	0.63 (0.73)	0.71*** (0.89***)
Fraction of peers in the same industry-size group	0.37 (0.33)	0.40 (0.38)

This table presents evidence on peer group size and composition. Peer group data were hand-collected from corporate proxy statements. The Fama-French 49-industry classification was used. A peer is considered in the sample firm's industry-size group if the peer is in the sample firm's industry and has sales between 0.5 to 2.0

times that of the sample firm's sales. The table reports means with medians reported in parentheses. *t*-test (Wilcoxon rank-sum test) is used to compare two means (medians). \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% confidence levels, respectively.

### III. EMPIRICAL RESULTS

#### A. Firm Size, Performance and Compensation for Firms and Their Peers

We first study the economic characteristics and CEO compensation for the sample firms and the median of the selected peer groups. If peer groups are solely chosen based on labor-market considerations, then industry, size, and performance are important selection criteria.<sup>8</sup> As a firm's industry peers of similar size are also more likely its primary competitors for CEO talent, we expect firms to select, as compensation peers, other firms that are similar in industry and size. We also expect firms to select, as compensation peers, other firms similar in profitability.<sup>9</sup> On the other hand, if peer groups are chosen to give CEOs an unjustified compensation increase, then compensation at a potential peer firm would also affect the likelihood of the peer firm being selected. In our analysis, firm size is measured by revenue and performance is measured by return on assets (*ROA*). We use two ways to measure executive compensation. The first is CEO's total compensation (ExecuComp data item *TDCI*), which includes salary, bonus, restricted stock granted, and the Black-Scholes value of stock-options granted.<sup>10</sup> The second measure is *pay mix*, which is the value of salary and bonus divided by the value of total compensation of the CEO.

Table 4 provides the summary statistics for firms and their reported compensation peers. We compare size, accounting performance, and compensation between sample firms and their peers for ExecuComp and non-ExecuComp firms, respectively. The Wilcoxon signed-rank test is used to test the differences in medians between sample firms and peer groups. For ExecuComp firms, we find significant differences between the characteristics of the peer firms and those of the sample firms. At the median, ExecuComp firms select peers that are 14% (computed as  $\exp(0.13)-1$ ), or \$132 million, larger in terms of sales. In terms of pay, peer firms have median total pay levels that are about 7.8%, or \$279,000, higher than those of sample firms. For non-ExecuComp firms, the gap is even larger: the median difference between peers and the sample firms is 35% in terms of sales and 19.7% in terms of total compensation. We do not find differences in median accounting performance (measured by *ROA*) between peer group and sample firms for either ExecuComp or non-ExecuComp firms. Based on the analysis, non-ExecuComp firms appear to select peers even more opportunistically than do ExecuComp firms in terms of size and total pay.

The results documented in Table 4 show that firms appear to choose peers in a manner that could lead to unjustified pay increases. The differences in total pay between peer groups and firms come from two sources. First, firms include larger firms in their peer groups. It is well-documented that firm size is associated with pay, and thus larger firm size would lead to higher compensation. Second, among the potential peers with similar size, firms hand-pick peers with higher compensation. In the next section, we implement multivariate logit regression to shed more light on the practice of selecting peers.

**Table 4**  
Summary statistics on peer firms

	Sample Firm	Peer Group Median	Peer Group Median minus Sample Firm
	(1)	(2)	(3)
<i>Panel A: ExecuComp firms (707 firms)</i>			
Sales (log)	7.615	7.770	0.131***
Sales (\$ million)	2,028	2,367	132***
ROA (%)	8.082	9.394	0.143
Total compensation (log)	8.264	8.340	0.075***
Total compensation (\$ 000)	3,880	4,189	280
Pay mix (salary and bonus/total compensation)	0.416	0.397	-0.008***
<i>Panel B: Non-ExecuComp firms (237 firms)</i>			
Sales (log)	5.684	6.141	0.297***
Sales (\$ million)	294	464	74***
ROA (%)	5.705	6.130	0.280
Total compensation (log)	7.315	7.565	0.180***
Total compensation (\$ 000)	1,502	1,929	233**
Pay mix (salary and bonus/total compensation)	0.557	0.507	-0.027**

Summary statistics for firm size, performance, and compensation for firms and their reported compensation peers. Panel A (B) reports medians across ExecuComp (non-ExecuComp) sample firms. Data is for 2005 fiscal year. Firm size is measured by sales revenue and firm performance is ROA. Compensation includes all forms of pay such as salary and bonus, options, restricted stock awards etc. The Wilcoxon signed-rank test is used in testing the differences in column 3. \*\*\*, \*\*, and \* indicate significant at 1%, 5% and 10% confidence level.

## B. Determinants of Peer Groups

To further examine whether non-ExecuComp firms choose compensation peers in a manner that inflates CEO pay, we examine the probability of a sample firm selecting a potential peer as a function of differences in economic and pay characteristics. Similar to Cadman and Carter (2014), we consider four important factors: size, performance, growth opportunities, and compensation. We expect that opportunistic selection will manifest in chosen peers that are larger, have better performance, have greater growth opportunities, and have higher CEO compensation than sample firms relative to other unselected peers. We run the following multivariate logit regressions separately for ExecuComp and non-ExecuComp firms:

$$\begin{aligned}
 \text{Peer}_{ij} = & a_0 + a_1 \times \text{P\_minus\_F\_sale}_{ij} + a_2 \times \text{P\_minus\_F\_ROA}_{ij} + a_3 \times \text{P\_minus\_F\_mtb}_{ij} \\
 & + a_4 \times \text{P\_minus\_F\_pay}_{ij} + a_5 \times \text{industry controls}_{ij} + a_6 \times \text{customer/supplier relation}_{ij} \\
 & + a_7 \times \text{executive transfer}_{ij} + a_8 \times \text{credit market characteristics}_{ij} \\
 & + a_9 \times \text{product/market diversification}_{ij} + e_{ij}
 \end{aligned} \tag{1}$$

where Peer = A dummy variable equal to one if a potential peer  $j$  is chosen as a peer by the sample firm  $i$  and zero otherwise;  $P\_minus\_F\_sale = \text{Log}(\text{Potential peer sales}) - \text{Log}(\text{Firm sales})$ ;  $P\_minus\_F\_ROA = \text{Potential peer ROA} - \text{Firm ROA}$ ;  $P\_minus\_F\_mtb = \text{Potential peer market-to-book ratio} - \text{Firm market-to-book ratio}$ ; and  $P\_minus\_F\_pay = \text{Log}(\text{Potential peer CEO total compensation}) - \text{Log}(\text{Firm CEO total compensation})$ .

Table 5 reports the logit regression results. For ExecuComp firms, the positive coefficient on  $P\_minus\_F\_sale$  (p-value < 0.0001) suggests that actual peers are relatively larger than sample firms, compared with other firms in the labor market. In addition, the positive coefficient on  $P\_minus\_F\_ROA$  (p-value < 0.0001) and  $P\_minus\_F\_mtb$  (p-value < 0.0001) suggests that actual peers have relatively better performance and higher growth opportunities than do potential peers, compared with the sample firm. When we include compensation, we find evidence that actual peer firms have relatively higher CEO total compensation after controlling for other characteristics that represent labor market (the coefficient on  $P\_minus\_F\_pay$  is positive and significant at p-value < 0.0001). These findings provide some evidence consistent with opportunism. Firms not only choose peers of larger size but also hand-pick peers with higher compensation from potential peers of similar size. Interestingly, while ExecuComp firms opportunistically choose peers as demonstrated by selecting larger, better-performing, and higher-growth peers with greater CEO compensation, non-ExecuComp firms appear to select as peers, from all the potential peer firms, smaller firms with inferior performance. This result is puzzling and is different from the univariate results we previously documented.

In the regression, we also control for industry variables, customer or supplier relations, executive transfer, credit market characteristics, and product and market diversification. The results suggest that sample firms are more likely to select firms in the same industry as peers. If the potential peer firm is not in the same industry, then sample firms tend to select those firms from industries that have higher stock-return correlations with their own industry. Following Lemelin (1982) and Fan and Lang (2000), we compute the fraction of output that the firm's industry sells to the potential peer's industry and the fraction of input that the firm's industry buys from the potential peer's industry. For non-ExecuComp firms, the coefficient on the fraction of output that the firm's industry sells to the potential peer's industry is positive and statistically significant, suggesting customer/supplier relations are important for recruiting executives. Following Bizjak et al. (2011), we compute the fraction of external hires in the firm's industry that come from or leave for the potential peer firm's industry. The results indicate that both ExecuComp and non-ExecuComp firms are more likely to select, as peers, those firms that come from industries that either hire or supply executive talent to the firm's industry. Compensation peers are also more likely to come from firms that share the same credit rating with sample firms. Single-segment firms are more likely to choose other single-segment firms; firms that report multiple business or geographic segments are more likely to choose other diversified firms.

**Table 5**  
Logit analysis

	Dependent variable is one if a potential peer is chosen as a peer by the sample firm and zero otherwise			
	ExecuComp		Non-ExecuComp	
	(1)	(2)	(3)	(4)
Intercept	-9.908 (0.000)	-9.907 (0.000)	-11.371 (0.000)	-11.382 (0.000)
<i>Compensation measure:</i>				
P_minus_F_pay		0.187 (0.000)		0.082 (0.000)
<i>Sales and performance measures:</i>				
P_minus_F_sale	0.411 (0.000)	0.336 (0.000)	-0.047 (0.000)	-0.080 (0.000)
P_minus_F_ROA	0.013 (0.000)	0.013 (0.000)	-0.004 (0.023)	-0.003 (0.111)
P_minus_F_mtb	0.101 (0.000)	0.085 (0.000)	0.107 (0.000)	0.096 (0.000)
<i>Industry variables:</i>				
Dummy equal to one if both firm and peer are in the same Fama-French industry	2.164 (0.000)	2.174 (0.000)	1.644 (0.000)	1.653 (0.000)
Correlation of firm's industry return and potential peer's industry return	3.872 (0.000)	3.895 (0.000)	4.833 (0.000)	4.842 (0.000)
<i>Customer or supplier relation:</i>				
Fraction of output (in dollars) that firm's industry sells to potential peer's industry	-0.053 (0.678)	-0.085 (0.507)	2.984 (0.000)	2.999 (0.000)
Fraction of input (in dollars) that firm's industry buys from potential peer's industry	-0.211 (0.122)	-0.273 (0.046)	0.158 (0.604)	0.093 (0.762)
<i>Executive transfers:</i>				
Fraction of external hires for CEO positions over the last 5 years that firm's industry made from potential peer's industry.	0.822 (0.000)	0.833 (0.000)	0.949 (0.000)	0.953 (0.000)
Fraction of executive talent loss that potential peer's industry hired from firm's industry for CEO positions over the last 5 years.	0.714 (0.000)	0.722 (0.000)	0.469 (0.005)	0.462 (0.006)
<i>Credit market characteristics:</i>				
Dummy equal to one if both firm and peer have the same credit rating	1.005 (0.000)	0.999 (0.000)	0.682 (0.000)	0.691 (0.000)
<i>Product diversification and market diversification:</i>				
Dummy equal to one if both firm and peer have multiple business segments	0.384 (0.000)	0.374 (0.000)	0.330 (0.000)	0.332 (0.000)

Dummy equal to one if both firm and peer have only one business segment	0.233 (0.000)	0.245 (0.000)	0.219 (0.000)	0.215 (0.000)
Dummy equal to one if both firm and peer are geographically diversified	0.755 (0.000)	0.756 (0.000)	0.571 (0.000)	0.571 (0.000)
Dummy equal to one if both firm and peer have only one geographical location	0.162 (0.000)	0.172 (0.000)	0.297 (0.000)	0.302 (0.000)
Fixed effects	Yes	Yes	Yes	Yes
Number of observations	707x3353	707x3353	237x3353	237x3353
Number of event occurs	11,570	11,570	3,314	3,314
McFadden's pseudo $R^2$	31.1%	31.3%	29.3%	29.4%

Logit regressions of the factors that determine the characteristics of the firms that are contained in the compensation peer group. The dependent variable is one if a potential peer is chosen as a peer by the sample firm and zero otherwise. The coefficients are estimated for 707 ExecuComp firms and 237 non-ExecuComp firms separately. The set of potential peers includes the union of all sample firms (both ExecuComp and non-ExecuComp firms) and their chosen peers. Each sample firm is excluded from its own set of potential peers.  $P\_minus\_F\_sale$  is the difference in log of potential peer sales and log of firm sales.  $P\_minus\_F\_ROA$  is the difference in potential peer ROA and firm ROA.  $P\_minus\_F\_mtb$  is the difference in potential peer market-to-book ratio and firm market-to-book ratio.  $P\_minus\_F\_pay$  is the difference in log of potential peer CEO total compensation and log of firm CEO total compensation.  $p$ -values are reported in parentheses.

### C. Determinants of Peer Groups: Using New Sets of Potential Peers

Table 4 shows that non-ExecuComp firms choose peers, on average, 35% bigger than themselves. On the other hand, Table 5 shows that non-ExecuComp firms slightly favor smaller firms in choosing their peers. What explains the difference in inference based on univariate and multivariate logit regression? In the above logit regressions, the set of potential peer firms includes all sample firms, both ExecuComp and non-ExecuComp, and all of the peer firms disclosed by these firms. As Cadman and Carter (2014) point out, defining the pool of potential peers in this way may introduce noise in the selection process as it would introduce a potential peer likely not in the CEOs' labor market. For example, if tests of peer selection for relatively big ExecuComp firms include a small non-ExecuComp firm and its peers in the pool of potential peers, then the selection of actual peers may appear biased toward larger firms. Similarly, if tests of peer selection for small non-ExecuComp firms include a big ExecuComp firm and its peers in the pool of potential peers, then the selection of actual peers may appear to be biased toward smaller firms. Therefore, the inference from tests of opportunistic peer selection may be biased if the pool of potential peers includes firms unsuitable for benchmarking. To address this issue, we redefine the pool of potential peers for sample firms: the set of potential peers for ExecuComp firms includes only ExecuComp sample firms and their chosen peers; the set of potential peers for non-ExecuComp firms includes only non-ExecuComp firms and their chosen peers. From here, we re-run the logit regression.

Table 6 reports the logit regression results. We find that ExecuComp firms continue to exhibit opportunism in peer selection: they select peers that are larger, are better-performing, have higher growth opportunities, and pay greater compensation than other firms in the labor market. However, the degree of opportunism is reduced when using the new pool of potential peers that better reflect the CEO labor market. For example, the coefficient on  $P\_minus\_F\_sale$  is reduced from 0.411 (Table 5) to 0.341

(Table 6); the coefficient on  $P\_minus\_F\_ROA$  is reduced from 0.013 (Table 5) to 0.010 (Table 6). Non-ExecuComp firms, on the other hand, appear to opportunistically pick up peers that are larger, have higher growth opportunities, and have greater CEO compensation. For example, the coefficient on  $P\_minus\_F\_sale$  changed from -0.0465 (Table 5) to 0.1485 (Table 6), suggesting non-ExecuComp firms also exhibit opportunistic behavior in selecting peers. Now, this evidence is consistent with that shown by univariate comparison in Table 4.

**Table 6**  
Logit analysis using modified set of potential peers

	Dependent variable is one if a potential peer is chosen as a peer by the sample firm and zero otherwise			
	ExecuComp		Non-ExecuComp	
	(1)	(2)	(3)	(4)
Intercept	-9.732 (0.000)	-9.732 (0.000)	-10.998 (0.000)	-11.010 (0.000)
<i>Compensation measure:</i>				
P_minus_F_pay		0.174 (0.000)		0.057 (0.004)
<i>Sales and performance measures:</i>				
P_minus_F_sale	0.341 (0.000)	0.270 (0.000)	0.148 (0.000)	0.127 (0.000)
P_minus_F_ROA	0.010 (0.000)	0.011 (0.000)	-0.010 (0.000)	-0.010 (0.000)
P_minus_F_mtb	0.107 (0.000)	0.094 (0.000)	0.089 (0.000)	0.082 (0.000)
<i>Industry variables:</i>				
Dummy equal to one if both firm and peer are in the same Fama-French industry	2.151 (0.000)	2.162 (0.000)	1.780 (0.000)	1.784 (0.000)
Correlation of firm's industry return and potential peer's industry return	3.800 (0.000)	3.821 (0.000)	4.943 (0.000)	4.949 (0.000)
<i>Customer or supplier relation:</i>				
Fraction of output (in dollars) that firm's industry sells to potential peer's industry	-0.064 (0.621)	-0.090 (0.483)	3.446 (0.000)	3.462 (0.000)
Fraction of input (in dollars) that firm's industry buys from potential peer's industry	-0.113 (0.408)	-0.180 (0.189)	-0.600 (0.059)	-0.647 (0.042)
<i>Executive transfers:</i>				
Fraction of external hires for CEO positions over the last 5 years that firm's industry made from potential peer's industry.	0.847 (0.000)	0.857 (0.000)	0.661 (0.001)	0.667 (0.001)

Fraction of executive talent loss that potential peer's industry hired from firm's industry for CEO positions over the last 5 years.	0.714 (0.000)	0.721 (0.000)	0.659 (0.000)	0.656 (0.000)
<i>Credit market characteristics:</i>				
Dummy equal to one if both firm and peer have the same credit rating	0.995 (0.000)	0.991 (0.000)	0.657 (0.000)	0.667 (0.000)
<i>Product diversification and market diversification:</i>				
Dummy equal to one if both firm and peer have multiple business segments	0.385 (0.000)	0.378 (0.000)	0.237 (0.001)	0.238 (0.001)
Dummy equal to one if both firm and peer have only one business segment	0.244 (0.000)	0.251 (0.000)	0.263 (0.000)	0.260 (0.000)
Dummy equal to one if both firm and peer are geographically diversified	0.705 (0.000)	0.708 (0.000)	0.528 (0.000)	0.526 (0.000)
Dummy equal to one if both firm and peer have only one geographical location	0.195 (0.000)	0.202 (0.000)	0.292 (0.000)	0.295 (0.000)
Fixed effects	Yes	Yes	Yes	Yes
Number of observations	707x2677	707x2677	237x1938	237x1938
Number of event occurs	11,570	11,570	3,314	3,314
McFadden's pseudo $R^2$	30.1%	30.3%	30.5%	30.6%

This table reports coefficients of table 5's logistic regression when estimated using modified sets of potential peers. The set of potential peers for ExecuComp firms includes the union of only ExecuComp firms and their chosen peers. The set of potential peers for non-ExecuComp firms includes the union of only non-ExecuComp firms and their chosen peers. Each sample firm is excluded from its own set of potential peers.  $P\_minus\_F\_sale$  is the difference in log of potential peer sales and log of firm sales.  $P\_minus\_F\_ROA$  is the difference in potential peer ROA and firm ROA.  $P\_minus\_F\_mtb$  is the difference in potential peer market-to-book ratio and firm market-to-book ratio.  $P\_minus\_F\_pay$  is the difference in log of potential peer CEO total compensation and log of firm CEO total compensation.  $p$ -values are reported in parentheses.

The analyses in this section reveal how differences in the pool of potential peers may lead to different conclusions. For ExecuComp firms, there is less evidence of opportunism when small non-ExecuComp firms and their peers that likely do not represent the ExecuComp firms' labor market are excluded from the pool of potential peers. For non-ExecuComp firms, there is greater evidence of opportunism when big ExecuComp firms and their peers that likely do not reflect characteristics of the non-ExecuComp sample firms are excluded from the pool of potential peers. Overall, consistent with Cadman and Carter (2014), our results suggest that researchers' choice of the pool of potential peers influences their conclusions.<sup>11</sup> Using a group of potential peers that better reflects the CEO labor market, we find both ExecuComp and non-ExecuComp firms opportunistically select peer firms to inflate CEO pay.

#### D. Determinants of CEO Pay

If opportunism describes the selection of peer firms, then the compensation of chosen peers should be related to CEO pay in the sample firms. By benchmarking themselves against more highly paid peers, CEOs can attempt to negotiate a compensation package that could lead to unjustified pay increases. To examine this issue, we regress the observed CEO compensation in the fiscal year 2006 on peer-group median pay and other economic determinants of pay that have been documented in prior literature. The

coefficient estimate on the median pay shows how firms adjust the CEO compensation in 2006 as a function of the chosen benchmark:

$$\text{Pay}_{it+1} = a_0 + a_1 \times \text{median peer total pay}_{it} + a_2 \times \log(\text{sale})_{it} + a_3 \times \text{ROA}_{it+1} + a_4 \times \text{ROA}_{it} + a_5 \times \text{market-to-book}_{it} + a_6 \times \text{stock price volatility}_{it} + e_{it} \quad (2)$$

where Pay = logarithm of CEO total pay in year t+1; and Median peer total pay = logarithm of median of peer group total pay.

Table 7 reports the regression results. Our control variables include the log of sales, market-to-book ratio, return on assets, and stock volatility (Smith and Watts, 1992; Gaver and Gaver, 1993; Gaver et al., 1995; Core and Guay, 1999). We find the log of median compensation is positively related to CEO pay for both types of firms. The coefficient estimates are positive and significant ( $p$ -value<0.0001). For ExecuComp firms, a 1% increase in the median total pay of compensation peers leads to 0.57% increase in sample firms' CEO compensation. For non-ExecuComp firms, it leads to a 0.53% increase in CEO pay. The results indicate that peer-group benchmarking is an important determinant of CEO compensation; the degree of benchmarking is similar in ExecuComp and in non-ExecuComp firms.

**Table 7**  
Determinants of CEO pay

	Dependent variable: CEO compensation at a disclosing firm	
	ExecuComp	Non-ExecuComp
	(1)	(2)
Intercept	1.814 (0.000)	2.398 (0.000)
Log of median peer total pay	0.573 (0.000)	0.532 (0.000)
Log of sales revenue <sub>2005</sub>	0.221 (0.000)	0.186 (0.003)
ROA <sub>2006</sub>	0.013 (0.070)	0.007 (0.502)
ROA <sub>2005</sub>	-0.017 (0.007)	-0.014 (0.162)
Market-to-book <sub>2005</sub>	0.083 (0.094)	0.099 (0.109)
Stock price volatility <sub>2005</sub>	-0.083 (0.591)	-0.279 (0.239)
Adjusted R-squared	0.555	0.319
Number of observations	707	237

The effect of peer group compensation on sample firm compensation. The dependent variable is log of total compensation of sample firms in 2006 fiscal year.  $p$ -values are reported in parentheses.

### E. Peer-Group Size and Peer Selection Bias

Having shown that both ExecuComp and non-ExecuComp firms opportunistically select peers and that both benefit from having higher-paying peers, we next analyze the

difference in median size (compensation) of chosen peers and sample firms. We want to determine whether this difference is related to the number of peers in the peer groups. Using a sample of S&P 900 firms, Faulkender and Yang (2010) show peer selection bias is more severe in smaller peer groups than in larger peer groups. We define the size (compensation) bias as the difference of sales revenue (total compensation) between the peer-group median and the sample firm. Each group of sample firms, ExecuComp or non-ExecuComp, is divided into two sub-groups based on sample firm's peer-group size. Large (small) peer-group size refers to sample firms that have peer-group size above (below) the median peer-group size. Median values of size and compensation bias are then reported for each sub-group in Table 8.

**Table 8**  
Peer group size and peer selection bias

	ExecuComp		Non-ExecuComp	
	Large peer group size (N=363)	Small peer group size (N=344)	Large peer group size (N=120)	Small peer group size (N=117)
Peer group median size minus firm size (\$ million)	111	207***	50	103**
Log of peer group median size minus log firm size	0.089	0.173***	0.224	0.422***
Peer group median total compensation minus firm total compensation (\$ 000)	16	424***	222	274
Log of peer group median total compensation minus log firm total compensation	0.007	0.112*	0.171	0.187

The effect of peer group size on the size bias and compensation bias. The size (compensation) bias is the difference of sales revenue (total compensation) between the peer group median and the sample firm. The sample consists of 707 (237) ExecuComp (non-ExecuComp) firms that reported peer groups in their 2006 fiscal year proxy statements where we have full data on sales and compensation for all peer firms. Each group of sample firms, ExecuComp or non-ExecuComp, is divided into two sub-groups based on sample firm's peer group size. Large (small) peer group size includes sample firms that have peer group size above (below) the median size. Median values are then reported for each sub-group. The Wilcoxon rank-sum test is used to compare the two subsamples. \*\*\*, \*\*, and \* represent differences at the 1%, 5%, and 10% levels, respectively.

As shown in Table 8, the size bias in firms with small peer groups is significantly higher than that in firms with large peer groups for both ExecuComp and non-ExecuComp firms. The results hold for both dollar values and the logarithm measures of the size bias. For example, the median size bias is \$207 million in ExecuComp firms with small peer groups; this figure is almost twice as large as that in firms with large peer groups (\$111 million). The results suggest that larger potential peers are more likely to be chosen as compensation peers by firms when the peer group is smaller. Moving to compensation bias measures, for ExecuComp firms, we find compensation bias is significantly larger in firms with small peer groups than those with large peer groups (i.e., \$424 million vs. \$16 million using the dollar measure of compensation bias). For the non-ExecuComp group, we find small peer groups associated with larger compensation bias, but the difference is not statistically significant. Faulkender and Yang (2010) suggest a potential explanation for the relation between peer-group size and peer selection bias. It is easier to manipulate median size (compensation) when the peer group is small. For

example, fewer large (highly paid) peers are needed to inflate the median size (compensation) of smaller peer groups. It is also easier for the board of directors to justify including fewer, rather than more, large (highly paid) peers.

#### IV. CONCLUSION

An extensive body of literature exists that examines the compensation peer group benchmarking of CEO pay for Standard and Poor's ExecuComp companies. However, because of data constraints, there is almost no evidence regarding compensation peer-group selection in non-ExecuComp companies in the United States. We try to fill this void.

In this paper we provide some of the first comparisons of compensation peer-group selection and use in ExecuComp and non-ExecuComp firms by using a hand-collected peer-group database of 707 ExecuComp firms and 237 non-ExecuComp firms in 2006. On the one hand, firms select peers based on characteristics that signify efficient contracting such as industry affiliation, capital market competition, and organization complexity. On the other hand, ExecuComp firms choose peers that are larger and higher-paying than themselves; the biases are even larger for non-ExecuComp firms. By benchmarking against biased peer groups, self-serving executives in both ExecuComp and non-ExecuComp firms receive unjustified pay increases. The degree of benchmarking is similar in both groups of firms.

We also contribute to the debate in the literature on whether firms opportunistically select compensation peers by demonstrating that the researcher choice of the pool of potential peers influences the conclusions that researchers draw. When the pool of potential peers includes all sample firms and their peers, we find ExecuComp firms are opportunistic in selecting peers, while non-ExecuComp firms are not. However, when the pool is reduced to a group of firms that better reflect the labor market where firms compete for managerial talents, non-ExecuComp firms also appear to opportunistically pick peers that are larger, have higher growth opportunities, and have greater CEO compensation. Given that non-ExecuComp firms play an important role in the economy, studying their compensation peer groups enhances our understanding of the CEO contract design in relation to environment characteristics, and is therefore useful to regulators in making regulatory decisions.

#### ENDNOTES

1. See, for example, Albuquerque et al. (2013), Bizjak et al. (2008, 2011), Cadman and Carter (2014), and Faulkender and Yang (2010, 2013).
2. According to the user's manual, the ExecuComp database covers firms that are currently and historically part of the S&P 1500 index.
3. We thank the Russel Investment Group for providing the historical membership list of Russell 3000 index.
4. As an alternative to peer-group benchmarking, some firms set executive pay using one or more compensation surveys. These surveys usually include a list of hundreds

- of firms or more. Other firms use firms in specific indexes. We exclude these firms from our sample.
5. Our sample of firms and chosen peers consists of 3,354 unique firms. The ExecuComp database covers about 2,000 firms, and we hand-collect compensation data for about 1,300 firms.
  6. For example, Faulkender and Yang (2010), Bizjak et al. (2011), and Cadman and Carter (2014) focus on the 2006 fiscal year.
  7. For the most part, we report the results in term of medians. The results based on means are similar.
  8. Other criteria include customer and supplier relationships, capital market, labor market flow, and firm diversification. For detailed discussion, please refer to Bizjak et al. (2011).
  9. Smith and Watts (1992) find that firms with similar profitability may be exposed to similar demand shocks.
  10. For firms where we hand-collect compensation data, we estimate TDC1 by closely following the ExecuComp database's methodology; this includes valuing the Black-Scholes value of option grants.
  11. Cadman and Carter (2014) suggest defining a unique pool of potential peers for each sample firm. The pool includes chosen peers by the sample firm, peers of the chosen peers, and all firms that choose this sample firm as a peer. We cannot replicate this exercise for our sample because of the additional effort needed to collect information about peers of all the chosen peers. Our entire sample of firms, both ExecuComp and non-ExecuComp, consists of 3,279 unique peers. Of these 3,279 peers, only 1,695 are among the firms for which we have collected information about peer groups.

## APPENDIX

### Variable definitions

Variable name in parentheses refer to the annual Compustat's XPF variable name. Other data sources are given in the variable definition.

Variable names	Variable definition and data sources
<i>Firm/peer characteristics:</i>	
Sales revenue	Sales/Turnover (SALE)
Log of sales revenue	Log(Sales revenue)
Total assets	Assets (AT)
ROA (%)	Return on assets = $100 * \text{Operating income after depreciation (OIADP)} / \text{Assets (AT)}$
Market-to-book	Market-to-book (MTB) = $[\text{market equity} + \text{total debt} + \text{preferred stock liquidating value (PSTKL)} - \text{deferred taxes and investment tax credits (TXDITC)}] / \text{Assets (AT)}$ where: Market equity = Price Close (PRCC_F) * Common shares outstanding (CSHO) Total debt = Long-term debt (DLTT) + Debt in current liabilities (DLC)
Stock price volatility	Annualized stock volatility calculated using 60 month stock returns from CRSP database

Institutional ownership	Percentage of common shares outstanding held by all institutional owners, Thomson Reuters
Institutional ownership concentration	Ratio of top five institutional ownership to total institutional ownership, Thomson Reuters
Salary and bonus	Salary + Bonus, ExecuComp or hand-collected from proxy statements
Total compensation	Total compensation = (Salary + Bonus + Other annual + Restricted stock grants + LTIP payouts + All other + Value of options granted for 2005 fiscal year; and Salary + Bonus+ Non-equity incentive plan compensation + Value of options granted + Grant-date fair value of stock awards + Deferred compensation earnings reported as compensation + Other compensation for 2006 fiscal year), ExecuComp or hand-collect from proxy statements
<i>Peer group variables:</i>	
Fraction of peers in the same Fama-French industry	Fama and French's (1997) 49-industry classification
Fraction of peers in the industry-size group	A peer is considered in the sample firm's industry-size group if the peer is in the sample firm's industry and has sales between 0.5 to 2.0 times that of the sample firm's sales
<i>Firm-peer variables:</i>	
Correlation of firm's industry return and potential peer's industry return	Correlations were calculated using 2004–2005 industry daily return. Data are from Ken French's website.
Customer/Supplier relation	Data from Bureau of Economic Analysis, 2002 Benchmark Input Output account, 'USE' table
Executive transfers	Turnover data from ExecuComp, 2001–2005
Credit market characteristics	Firm credit rating is determined based on Compustat's S&P domestic long term issuer credit rating (SPLTCRM). Credit rating has four possible values: 'investment grade' if SPLTCRM in [2,12], 'junk' if SPLTCRM in [13,23], 'default' if SPLTCRM in [27,29], and 'unrated' if SPLTCRM is missing
Product diversification and Market diversification	Data from Compustat segment dataset

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