Relative Performance Evaluation and Peer Quality

by

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ABSTRACT

Relative performance evaluation (RPE) in Chief Executive Officer (CEO) compensation contracts entails the use of peer performance to filter out exogenous shocks and reduce exposure to risk. Theory predicts that high-quality peers can effectively filter out noise from performance measurement, yet prior empirical studies do not examine how differences in peer quality affect the use of RPE in practice. In this study, I propose a model to select peers with the highest capacity to filter out noise and introduce a novel measure of peer quality. Consistent with the theory, I find that firms with high quality peers rely on RPE to a greater extent than firms with few good peers available. I also examine the extent to which peers disclosed in proxy statements overlap with the best peers predicted by my model. I find that the overlap is positively associated with institutional ownership, use of top 5 compensation consultants, and compensation committee competence.

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CHAPTER 1

INTRODUCTION

According to principal-agent theory, CEO compensation should be linked to firm performance to align individual interests with those of shareholders (Holmstrom 1979). The theory also predicts that external shocks to firm performance can be filtered out by means of relative performance evaluation (RPE). Adding peer performance information to compensation contracts provides the principal with more information about the agent's actions and improves risk sharing (Holmstrom 1982, Holmstrom and Milgrom 1987). However, peer performance is informative about the agent's actions only to the extent that the selected peers actually reflect common shocks to performance. In that sense, the effectiveness of peers in filtering out common noise, or peer quality, should be the key determinant of the reliance on RPE in compensation contracts.

Following this theory, early empirical studies examine the reliance on RPE in practice using market indices or industry peers (Murphy 1999, Albuquerque 2009) and, in more recent studies, peers disclosed in proxy statements (Gong, Li, and Shin 2011). However, there is little evidence on whether firms select the best available peers and how the quality of peers affects reliance on RPE. In this study, I propose a model that predicts which peers can best filter out noise from performance evaluations and examine how the choice of peers and the quality of available peers affect the use of RPE.

There are two main approaches to identify whether firms incorporate RPE in executive compensation contracts. The first approach entails regressing executive pay on performance of a select group of firms that are presumably exposed to similar exogenous shocks. A negative relationship between executive compensation and peer performance constitutes evidence that compensation contracts filter out external shocks reflected in peer performance. However, it is not obvious how to select peers in this approach, and the resulting measurement error reduces the power to test the RPE hypothesis. For an example, Albuquerque (2009) shows that peer performance is negatively associated with CEO compensation but only when using peers of similar size and industry.

The second approach is to rely on information about peers available from proxy statement disclosures. Since 2006, publicly listed firms are required to disclose detailed information on executive compensation practices, including the use of RPE and the choice of peers. Gong et al. (2011) show that performance of disclosed peers is negatively associated with CEO pay. They also show that the peer performance measure identified in Albuquerque (2009) no longer provides evidence of RPE in their setting, demonstrating that RPE tests have greater power when they incorporate information about disclosed peers.

However, neither of these two approaches captures the quality of peers, i.e., how effective peers are in filtering out the effect of the shock to firm performance. Public peer disclosures, as used in Gong et al. (2011), do not guarantee that firms use the best available peers because the choice of peers may reflect both efficient contracting and rent-seeking motives. The purpose of this study is to propose a new approach in identifying the best available peers, which could be then be used to measure peer quality and examine how it affects the reliance on RPE.

Particularly, I construct a model to identify peers with the highest capacity to filter out noise in performance evaluation as follows. I use several economic determinants of peer quality including industry, size, covariance in stock returns, and covariance in quarterly sales, which capture exposure to similar exogenous shocks. I use these determinants to predict the choice of disclosed peers. The predicted values from this model capture peer quality in that they remove disclosure biases potentially introduced by firms' self-serving choices and aggregate multiple economic determinants of exposure to common risks. I validate this measure by providing evidence that high-quality peers better predict firm performance in out-of-sample tests.

I use this model to define two new empirical constructs. First, I measure peer availability as the average of predicted values from my model, which captures variation in the extent to which a firm has peers exposed to similar shocks. Second, I measure choice of peers as the overlap between the best peers predicted by my model and actually disclosed peers, which captures the extent to which disclosed peer choice is motivated by efficient contracting considerations.

In my main empirical analysis, I show that the availability of peers is largely dependent on firm characteristics, whereas the choice of peers is associated with measures reflecting the use of compensation consultants, institutional ownership, and compensation committee competence. Specifically, firms that have higher institutional ownership and hire top 5 compensation consultants are more likely to have higher overlap between the model-predicted peers and actual disclosed peers. Similarly, firms with more competent compensation committee members, as captured by committee members' tenure, age, busyness, and number of committee meetings, are also more likely to have higher overlap.

Finally, I compare the two empirical approaches used in prior RPE studies with my new approach in identifying peers. I find that industry-size peer returns (Albuquerque

2009), disclosed peer returns (Gong et al. 2011), and returns of peers predicted by my model are all negative and significantly associated with the CEO compensation. Nevertheless, the RPE effect is weakest for disclosed peers, which suggests that proxy statement disclosures may not be an accurate representation of actual compensation practices. Importantly, I find that the RPE effect is stronger for higher quality peers, which is consistent with the theory that peer quality is an important determinant of the use of RPE in compensation contracts.

My findings contribute to the RPE literature in two ways. First, I develop a model that predicts the choice of peers and can therefore differentiate peers' ability to filter out the effect of common shocks. The theory predicts not only that RPE information should be used but also that higher quality peers should be used to a greater extent. My model allows me to construct an empirical measure of peer quality and to test for the effect of peer quality on the use of RPE. Second, I show that prior studies provide an incomplete picture of how RPE is used in practice. By examining the determinants of peer choice, I show that firms' public disclosures cannot solely be explained by efficient contracting motives, which suggests that without any additional information, proxy statement disclosures cannot directly be interpreted as evidence of effective RPE.

The remainder of the paper is organized as follows. Section II discusses related literature and institutional background. Section III describes the sample, variables, and empirical specification. Section IV provides the results, and Section V concludes.

CHAPTER 2

RELATED LITERATURE AND INSTITUTIONAL BACKGROUND

The informativeness principle suggests that any contradictable information about the agent's effort choice should be incorporated into the compensation contract to improve risk sharing (Holmstrom 1979). RPE is one mechanism to incorporate additional information into contracting, which allows the principal to learn about the agent's effort choice to more accurately evaluate performance (Holmstrom 1982).

Despite the theoretical appeal of RPE, early empirical studies provide only mixed evidence on the use of RPE in compensation contracts — some studies find that peer performance is negatively related to pay while other studies find no such evidence (Aggarwal and Samwick 1999; Antle and Smith 1986; Bertrand and Mullainathan 2001; Garvey and Milbourn 2006; Gibbons and Murphy 1990). These mixed results are largely due to the difficulty in identifying proper peers for RPE purposes that can filter out exogenous shocks. Albuquerque (2009) finds peers composed of similar industry-size firms provide results consistent with the use of RPE in executive compensation design. Chen (2016) and Drake and Martin (2016) also follow the approach used in Albuquerque's study and find that considering exposure to exchange rate risk and firm life cycles increases the power of the RPE test.

Starting in 2006, firms are required to disclose detailed information on how performance targets are used in executive compensation, which includes information on the use of RPE and the firm's peers. Since then, RPE research uses disclosed peers to find the effect of RPE on compensation contracts. Gong et al. (2011) is the first paper to provide the evidence on the use of disclosed peers in executive compensation and on the extent to which efficient contracting and rent extraction considerations influence peer selection. They also find that the approach in Albuquerque (2009) no longer supports the use of RPE in their sample, further emphasizing the importance of choice of peers in testing RPE.

As the disclosure of detailed information on executive compensation plans provides explicit evidence on whether firms incorporate RPE, recent research on the topic utilizes information on the disclosed peers to examine selection of peers and its consequences. For examples, several studies show that exogenous shocks alter CEO turnover decisions (Jenter and Kanaan 2015) and RPE influences risk-taking incentives and corresponding firm performance (Park and Vrettos 2015; Francis, Hasan, Mani, and Ye 2016). On the other hand, Black, Dikoli, and Hofmann (2015) suggest that relying on explicit mandated disclosures of RPE may understate the prevalence of RPE in practice as they also detect implicit RPE in RPE-non-disclosers using more sophisticated peer performance aggregation measures.

Disclosure of peers used for RPE, however, does not assure that firms select their best available peer groups. For example, Gong et al. (2011) documents that along with industry membership, performance comovement, and size similarity, self-serving bias and symbolism of a firm also affect the peer-selection process, supporting both efficient-contracting and rent-seeking behavior in the RPE peer-selection process. If firms have strategic motives regarding the peer selection and disclosure, then the information from the disclosed peers in the proxy statements may not accurately represent their actual RPE practice. Ma et al. (2018) also test the extent to which boards' choices of relative total shareholder returns measures evaluate managers on the basis of the idiosyncratic component of total shareholder returns, following the informativeness principle. They use relative total shareholder returns as a measure of systematic performance in relative performance contracts and document that firms that choose specific peers do a better job of capturing the systematic components of returns, whereas firms that choose index-based benchmarks retain substantial systematic noise in their RPE metrics, highlighting the importance of peer choice in the efficacy of RPE. They also find that firms' choice of indexes as relative performance benchmarks, which may indicate board-level monitoring weaknesses, is associated with lower future ROA.

In summary, prior studies use implicit and explicit tests of RPE to find evidence of RPE in practice, but they fall short in identifying the conditions in which the effect of RPE is more pronounced. As RPE is intended to filter out the effect of common shocks from CEO compensation contracts, it is important to understand which peers have the ability to best filter out the noise and whether firms use their best available peers in practice. In this study, I develop a model to predict novel measure of peer quality, defined as the ability to filter out noise in the performance measurement, and use the measure to examine firms' choice of peers and its effect on RPE. Specifically, I hypothesize that the effect of RPE, which is the negative association between peer return and CEO compensation, is more pronounced for firms that have higher quality peers. Higher quality peers are incrementally informative about managerial actions, therefore the weight on the peer performance measure should be higher.

H: The RPE effect is more pronounced for firms with higher quality peers.

CHAPTER 3

RESEARCH DESIGN

Data and Sample Composition

I begin my sample period in 2007 to allow one year after the start of required peer information disclosure on proxy statements and extend through 2012. This sample choice also includes the financial crisis period where the use or effect of RPE may be most pronounced. To predict peer quality, I use the entire Compustat and CRSP database in order to retain the most number of firms that can be chosen as a peer. To run the subsequent RPE test, I closely follow the sample selection process in Gong et al. (2011) that is also largely based on Albuquerque (2009), providing an opportunity to compare the implicit and the explicit approaches suggested by these two papers. Specifically, I begin with the S&P 1500 firms and retrieve CEO and compensation related information from ExecuComp for fiscal years 2007 through 2012. I exclude observations with multiple CEOs or CEO appointments of less than the full year. After merging with Compustat and CRSP, I also limit the sample to firm-year observations that explicitly stated the use of RPE in proxy statements. A firm is categorized as using RPE in its compensation contract if at least one component of the CEO compensation is determined based on firm performance relative to a group of peers. For such case, information on the composition of the disclosed peers are also collected. This sample choice allows examines whether the peer performance measures in both the implicit and the explicit approaches are indeed identifying the use of RPE. I use the period between 2007 and 2012 with an assumption that firms' RPE use and model-predicted peer choices are the same throughout the period. Table 1 describes the sample selection process.

(Insert Table 1 about here)

Research Method

In order to test whether the RPE effect is stronger for firms with higher quality peers, I first construct a measure of peer quality based on a model predicting the best choice of peers.

In particular, I first estimate the following logistic model to predict the probability of a company-peer match:

$$Pr(Company\text{-}PeerMatch) = \alpha_0 + \alpha_1 SIC1 + \alpha_2 SIC2 + \alpha_3 SIC3 + \alpha_4 SIC4 + \alpha_5 SIC2 \times Size + \alpha_6 Size + \alpha_7 Size4 + \alpha_8 Size10 + \alpha_9 DailyStockCorr + \alpha_{10} DSC\_Neg + \alpha_{11} DailyStockCorr \times DSC\_Neg + \alpha_{12} WeeklyStockCorr + \alpha_{13} WSC\_Neg + \alpha_{14} WeeklyStockCorr \times WSC\_Neg + \alpha_{15} QuarterlySalesCorr + \alpha_{16} QSC\_Neg + \alpha_{17} QuarterlySalesCorr \times QSC\_Neg + e_{it} \quad (1)$$

To develop the peer quality measure, I start by matching each firm in Compustat with every other firm in Compustat as a potential company-peer match. In the model, the dependent variable is a binary variable equal to one if a firm lists a potential peer in its proxy statement as its RPE peer and zero for all other potential peers not listed as disclosed peers. Disclosed peers have valuable information about the peer quality because, although not perfect, they are presumably affected by common shocks in more similar ways compared to all the other potential firms that were not disclosed as peers. Therefore, the higher probability on the company-peer match from the model would indicate that the potential peer is of higher quality. The regressors include several economic determinants of peer choice including industry and firm size indicators and their interaction, as suggested by Albuquerque (2009). Specifically, SIC1 to SIC4 each indicate whether a firm and a potential peer are in the same SIC 1 to SIC 4 digit code.

Size, Size4, and Size10 are indicator variables that equal to one if the ratio of market value of equity of a firm and a potential peer is within 2, 4, and 10, respectively, which pick up the similarity in the firm sizes. I also include daily and weekly stock return correlations and quarterly sales correlation, similar to the peer group quality measure used in Casas Arce, Holzhacker, Mahlendorf, and Matejka (2017). Specifically, I calculate correlations between focal firm returns and returns of all other sample firms between 2007 and 2012. These correlations pick up the performance comovements they have under shocks over different periods, therefore a higher correlation would indicate that they are more similarly affected by shocks and that the peer return can be an incrementally informative signal. I also include negative dummies related to these performance comovements to check whether highly negative correlation also provide information on the quality of peers.

The predicted value from the model aggregates the factors that affect how effective peers are into one composite score variable for each potential company-peer match, or the *PeerScore* variable, where a higher score indicates better ability to filter out the shock. With the peer score, I can sort all potential peers from ones that have higher scores to ones with lower scores, which then allows me to define a set of best possible peers. I apply multiple thresholds to define the best possible peers. First is the maximum number of peers a company can have because it is not efficient for a firm to have too many peers, and second is the minimum peer score a peer should have in order to be effective enough in filtering out the shock. Peers that meet these criteria are defined as the predicted peers.

I validate the peer quality measure by analyzing how well the peer return explains the firm return in the out-of-sample period. I estimate the following out-of-sample model (2) for sample period between 1992 and 2017, excluding years between 2007 and 2012 that were used to calculate the peer quality measure.

$$FirmReturn_{it} = \alpha_0 + \alpha_1 PeerReturn_{it} + \alpha_2 FirmSize_{it} + \alpha_3 MTB_{it} + \alpha_4 ROA_{it} + \alpha_5 Leverage_{it} + \alpha_6 ReturnVolatility_{it} + \alpha_7 Loss_{it} + e_{it} \quad (2)$$

In this model, *PeerReturn* is one of three peer return measures: industry-size peer return; disclosed peer return; or predicted peer return. The coefficient on *PeerReturn* examines whether the return of the peers can predict the concurrent period's firm return. I expect all three measures of peer return to be positively associated with the firm's return, but the magnitude of the coefficient should differ depending on peer quality as peer quality captures comovements in stock prices due to common shocks. If predicted peers have the highest peer quality among the three peer measures, then its association with the firm return should be the strongest among the three.

Next, I run determinants model (3) to test the availability and choice of peers. The dependent variable in this model is either *Availability* or *Choice*, where *Availability* is the average peer score of predicted peers. Higher average peer score indicates that a firm can select a set of high quality peers that can filter out the common shocks. *Choice*, on the other hand, is firms' deliberate, strategic, or inadequate choice of peers, measured by the overlap ratio between the disclosed peers and the predicted peers. *Choice* measures whether firms differ in including their best available peers in the disclosed peer group. The following model examines whether firm fundamentals, CEO, governance, or compensation consultant characteristics affect the availability or the choice of peers. Detailed variable definition is provided in the appendix at the end of the paper.

$$\begin{aligned} \textit{Availability/Choice}_{it} = {} & \alpha_0 + \alpha_1 \textit{FirmSize}_{it} + \alpha_2 \textit{IdiosynVar}_{it} + \alpha_3 \textit{Return}_{it} + \alpha_4 \textit{ROA}_{it} \\ & + \alpha_5 \textit{BigConsultant}_{it} + \alpha_6 \textit{BonusRatio}_{it} + \alpha_7 \textit{CEOChair}_{it} + \alpha_8 \textit{CEOTenure}_{it} \\ & + \alpha_9 \textit{CEOShare}_{it} + \alpha_{10} \textit{CommSize}_{it} + \alpha_{11} \textit{CommBusy}_{it} + \alpha_{12} \textit{CommTenure}_{it} \\ & + \alpha_{13} \textit{CommAge}_{it} + \alpha_{14} \textit{CommMeet}_{it} + \alpha_{15} \textit{InstOwnership}_{it} + \alpha_{16} \textit{NumDiscPeers}_{it} + e_{it} \end{aligned} \quad (3)$$

While model (3) uses the same independent variables for both availability and choice specifications, their predictions and interpretations may differ because the dependent variables represent different constructs. For example, testing for the availability of high quality peers means that the availability is exogenous from the firm or the CEO's influence. Any significant result from the CEO, governance, or compensation consultant variables would indicate that firms operating in certain environments have higher quality peers available. On the other hand, the model testing for choice examines whether firms are strategic or effective when either choosing or disclosing their peers. Therefore, I test whether firms that have CEOs with less opportunistic motives or firms with better governance or consultant engagement have higher overlap between the best possible peers and disclosed peers.

Lastly, I run the following RPE test using models (4) and (5) to examine whether the different measures of peers' returns are negatively associated with CEO compensation.

$$\begin{aligned} \textit{CEOComp}_{it} = {} & \alpha_0 + \alpha_1 \textit{FirmReturn}_{it} + \alpha_2 \textit{PeerReturn}_{it} + \alpha_3 \textit{LagSale}_{it} + \alpha_4 \textit{LagMTB}_{it} \\ & + \alpha_5 \textit{RegulatedInd}_{it} + \alpha_6 \textit{IdiosynVar}_{it} + \alpha_7 \textit{CEOTenure}_{it} + \alpha_8 \textit{CEOChair}_{it} \\ & + \alpha_9 \textit{CEOShare}_{it} + e_{it} \end{aligned} \quad (4)$$

$$
\begin{aligned}
CEOComp_{it} = {} & \alpha_0 + \alpha_1 FirmReturn_{it} + \alpha_2 PeerReturn\_Predicted_{it} + \alpha_3 PeerScore_{it} \\
& + \alpha_4 PeerScore_{it} \times PeerReturn\_Predicted_{it} + \alpha_5 LagSale_{it} + \alpha_6 LagMTB_{it} \\
& + \alpha_7 RegulatedInd_{it} + \alpha_8 IdiosynVar_{it} + \alpha_9 CEOTenure_{it} + \alpha_{10} CEOChair_{it} \\
& + \alpha_{11} CEOShare_{it} + e_{it} \qquad (5)
\end{aligned}
$$

In these models, the dependent variable is the log of the CEO's annual total compensation. The key independent variable is the peer stock return, where the coefficient is expected to be negative suggesting that relatively better performance by the focal firm compared to its comparable peers results in higher compensation of the CEO through performance pay. Like model (2), I use three different measures for peer return: average stock return of industry-size matched peers as used in Albuquerque (2009); average stock returns of actual RPE peers disclosed in proxy statements as in Gong et al. (2011); and average stock returns of the predicted peers found in model (1). In an implicit model, the challenge is to identify the set of peers that are exposed to similar exogenous shocks and also share similar ability and constraints in responding to the shocks. Albuquerque (2009) shows that peers matched on two-digit SIC level and industry-size quartiles by beginning-of-the-year market value of equity captures several characteristics similar to the matching firm. I also follow recommendations of prior studies and control for firm characteristics and governance attributes. Specifically, I include firm size, growth options, regulated industry membership, idiosyncratic variance, CEO/chairman duality, CEO tenure, and CEO stock ownership variables in the model.

Following the main hypothesis of this paper, I expect that the magnitude of the coefficient on the peer stock return to be the greatest for the model-predicted peers, which should have the highest peer quality among the three peer measures. As industry-size peers are an estimate of peers through implicit approach and disclosed peers may suffer from strategic choice by the firm or CEO, the model-predicted peers by design should represent the best possible peers for each firm. To further examine the impact of peer quality on the RPE effect, I use model (5) to test the interaction effect between the peer quality and peer return and expect that the RPE effect to be more pronounced for high quality peers.

Descriptive Statistics

Table 2 provides the descriptive statistics for the sample. The average of *Choice* is 0.48 suggesting that about half of the model-predicted peers are overlaps with disclosed peers. *FirmReturn* and all three measures of *PeerReturn* are around 0.2 in their averages. Roughly 92% of firms in the sample engage with a compensation consultant, and 22% of firms are engaged with the top 5 compensation consultants. The number of disclosed peers in the main sample varies from 2 to 54 with the mean around 15. However, the number of peers in the raw sample is between 2 and 190 with the mean around 18, indicating that some firms use a broad index of firms as their peer group instead of handpicking individual peers. Such practice of using indices as peer groups may be associated with firms strategic of selecting peers, therefore I control for such firms in the determinant models. Table 3 provides Pearson correlation coefficients among variables.

(Insert Table 2 about here)

(Insert Table 3 about here)

CHAPTER 4

RESULTS

Replication of Gong et al. (2011) and Comparison to Alternative Fiscal Year

Before I run the main analyses, I first replicate the Gong et al. (2011) and employ an implicit approach to examine the extent to which incorporating details of explicit RPE information affects the inferences of RPE use. While this method uses the disclosed peers in addition to the industry-size matched peers as in Albuquerque (2009), it still relies on assumptions regarding how RPE is actually set in the compensation design. Nevertheless, comparison of the two measures would highlight limitations or advantages of each measure and provide insights on importance of correctly identifying the peer information in tests of RPE use.

Table 4 presents the results on the implicit and explicit tests of RPE. Column 1 uses peer stock returns measured by industry-size matched firms. While Albuquerque (2009) suggests this to be a measure consistent with the use of RPE, I do not find a significant coefficient on the peer stock return variable. However, this is the same result as in Gong et al. (2011) where they also find no significant relation between CEO total compensation and industry-size matched peer returns. Furthermore, as reported in Column 2, I find a significantly negative coefficient on the peer stock return variable using the disclosed peer stock returns as in Gong et al. (2011), consistent with the theory on use of RPE. Taken together, these results suggest that inaccurate specification of RPE peers is likely to affect the empirical test on the use of RPE, which was highlighted as a weakness in the early literature. Results other than the main independent variables are also similar to that of Gong et al. (2011). The coefficient on firm stock return is significantly positive as better performance is linked to higher compensation. Firm size measured by sales is also positively related to compensation as CEOs of larger firms earn higher pay. Furthermore, a CEO holding the chairman position of the board is also able to earn more compensation.

While these results show that the implicit test is likely to produce misleading results due to inaccurate identification of RPE peers employed in the pay-setting process, one of the caveats in Gong et al. (2011) is that is sample is limited to fiscal year 2006, which was the first year of the disclosure rule change. Such setting has potential to have noise in firms' disclosure practice. Therefore, I replicate the same test using different fiscal years, and Columns 3 and 4 report the findings using 2009 as the sample year. Unlike year 2006, significance on the coefficients on the two peer stock returns flipped: I find strong evidence for the use of RPE with industry-size matched peers, whereas no support is provided by the disclosed peers. This is a surprising result to the extent that the explicit disclosure of peers is expected to be more accurate identification of the compensation design and therefore should have larger coefficient with higher significance. However, it also suggests that inferences on the test of RPE using a one year sample may be misleading because firms may employ different types or extent of RPE depending on changing environments. In order to better understand how the opposite results in these tests hold throughout different periods, I extend the study using time-series data on the peer stock return measures.

(Insert Table 4 about here)

Logistic Regression on Predicted Peer Choice

I start the analysis of peer choice prediction and peer quality by running the logistic regression on the availability and choice of peers. Table 5 shows the results from model (1), where each of the four columns runs the regression with size only, industry and size only, performance correlations only, and industry, size, and performance correlations together. While the pseudo R^2 is not the best measure to compare the incremental power across the model specifications, it shows that including stock and sales correlations in addition to industry and size measures provide the best outcome in predicting the company-peer match. All variables are positive and highly significant in the model.

The model predicts all company-peer matches where the peer score value is greater than a certain threshold. The higher peer score indicates a higher probability that a given model-predicted peer is an overlap with the disclosed peers. Individual peer scores are driven from the model for each firm in the sample, and each predicted-peer with peer score higher than the threshold are together defined as model-predicted peers for the following analyses. While not in the descriptive statistics, the average of number of predicted peers is 6.9 with standard deviation of 4.8 and range of 1 to 24. Compared to the number of disclosed peers, predicted peers are smaller in both average and maximum numbers. The average peer score of the predicted peers equals the Availability measure, where higher value indicates higher probability that a model-predicted peer is also a disclosed peer, and thus availability of higher quality peers. The Choice measure, which is the overlap between disclosed and predicted peers, is also constructed using the model-predicted peers resulting from this regression.

(Insert Table 5 about here)

Out-of-Sample Validation of Peer Quality Measure

Next, I run out-of-sample validation tests of the peer quality measure. Using model (2), I regress *FirmReturn* on the three measures of *PeerReturn* for fiscal years between 1992 and 2017. These tests use monthly data as the comovements in performance due to external shocks can be best captured in monthly data rather than annual data. The coefficient on *PeerReturn* measures whether the peer return can predict concurrent firm return, as RPE peers are expected to be affected by the common shocks and therefore have comovements in returns. If model-predicted peers have the highest peer quality among the three peer measures, then I expect its coefficient to have the highest magnitude.

Table 5 reports the result from the out-of-sample validation test. Panel A of Table 5 shows the results using the full sample period, whereas Panel B shows the results using only fiscal year 2008 when the comovements of peer performance may have been higher due to the extent of exogenous shocks. After controlling for a number of firm fundamental variables, I find a significant and positive association between the predicted peers' returns and the firm's return. The size and significance of the coefficient is larger compared to industry-size or actual disclosed peers' returns, suggesting the model-predicted peers have the highest peer quality and thus the highest correlation of returns. I also confirm that the performance comovement is higher for higher quality peers, captured by *PeerScore*. When I include all three measures of peer returns in one regression in Column 6, I find that predicted peers yield the largest correlation with the firm return. Furthermore, the result in Column 7 shows that, among the predicted peers, those who fall in the same industry-size category with the firm have the highest correlation, whereas peers uniquely identified by the peer prediction model also have high comovements with the firm performance.

(Insert Table 6 about here)

Determinants of Peer Availability and Choice of Peers

I next run determinant models to test peer availability and choice of peers. By using *Availability* as the dependent variable, I examine whether firms operating in certain environments have higher quality peers available compared to others. On the other hand, using *Choice* as the dependable variable allows me to test whether firms are strategic or competent in their choice or disclosure of peers. Columns 1 and 2 in Table 7 report the results on the *Availability* model, and Columns 3 and 4 show the results on the *Choice* model. Columns 1 and 3 use the full sample to run the regression whereas Columns 2 and 4 reports the regressions in the firm level by averaging each variables within a firm across years.

The results suggest that firms with larger size and CEO-Chairman duality have higher quality peers available. On the other hand, firms with higher industry-adjusted returns are less likely to have higher quality peers available. Because *Availability* is an exogenous measure from firm choices, these factors do not indicate causal relationships.

Interestingly, I find that the choice of peers is affected by the use of compensation consultants, institutional ownership, and compensation committee competence. Specifically, firms that hire top 5 compensation consultants and have more shares held by top 5 institutional investors are associated with higher overlap between the predicted peers and disclosed peers. Firms with more competent compensation committees, captured by less busy, longer tenure and lower age of committee members and holding more committee meetings, are also associated with higher overlap. On the other hand, CEO characteristics are insignificant in the model, indicating that CEO's strategic motives may not affect the choice of RPE peers. While this result suggests that the governance strength and external guidance may influence the choice of peers, it does not suggest whether the choice is driven by efficient-contracting or rent-seeking motives as suggested by Gong et al. (2011).

(Insert Table 7 about here)

Test of RPE Use with Implicit, Explicit, and Predicted Measures of Peer Returns

Lastly, I run the RPE test using returns from implicit, explicit, and predicted peers to investigate whether the effect of RPE is affected by the choice and quality of peers. I expect the magnitude of the coefficient on *PeerReturn* to be the highest for the predicted peers as it by design should have the highest peer quality compared to industry-size and disclosed peers. I also include an interaction term between the peer score and peer return when testing for the predicted peers to examine the differential effects of peer quality on RPE.

Table 8 reports the results from the RPE tests using models (4) and (5). The results indicate industry-size peer return, disclosed peer return, and model-predicted peer return are all negative and significantly associated with CEO compensation. More importantly, I find support that RPE effect is stronger for higher quality peers when measured by the interaction term in Column 4. This supports the hypothesis that higher quality peers can be incrementally informative about the managerial effort in setting compensation contracts. The sum of coefficient on the main and the interaction effects on Column 4 is larger than the magnitude of industry-size peer or disclosed peer return, further providing evidence that high quality predicted peers may be the best set of peer groups among the three peer group measures in capturing the effect of RPE. Given that by design the predicted peers should identify higher quality peers than the implicit industry-size or explicit disclosed peer measure, this result also suggests that the predicted peers may more closely reflect actual peers chosen for performance evaluation in a given fiscal year than industry-size or disclosed peers. Furthermore, small RPE effects using disclosed peers suggest that the explicit disclosure of RPE use and peers may not be a complete representation of the actual compensation practices.

(Insert Table 8 about here)

CHAPTER 5

CONCLUSION

In this paper, I design a model to measure and predict peer quality and examine how firms' choice of peers affects their RPE practice. Specifically, I develop a model to predict peer choice and measure peer quality, where higher covariance in past stock returns and sales, along with industry and size match indicates that the company-peer match is of higher quality in capturing effect of common shocks. Using the peer quality measure, I find evidence that firms' choice of peers is influenced by their governance and external guidance characteristics, suggesting firms may not be choosing their best possible peers. Furthermore, the test of RPE shows that the stock return of predicted peers is negative and significantly correlated with the CEO pay, and the result is stronger for firms with higher quality peers. The results suggest that higher quality peers can be incrementally informative about the managerial effort in setting compensation contracts.

This paper contributes to the RPE literature as it tests the theory on RPE suggesting that higher quality peers are incrementally informative about managerial effort, and the model allows me to identify such setting and examines how RPE tests differs by peer quality. I also show that implicit and explicit tests of RPE provide an incomplete picture of how RPE is used in practice. By examining determinants of peer choice and testing RPE using three different measures of peers, I show that firms can be strategic in choosing and disclosing peers. Instead of taking the information in the proxy statements at face value as the evidence of effective RPE, carefully examining alternative peer selection based on theory of RPE can provide incremental information on whether firms are implementing appropriate RPE in practice.

This paper also has several opportunities for improvements. While I find that compensation committee, institutional investors and compensation consultant characteristics may affect whether firms choose best available peers, it may be lack of efficiency in modeling peer quality that leads to the smaller-than-expected RPE effect using the predicted peer returns. Future improvement of the paper can work on modifying the company-peer match model to better capture the peer quality and thus strengthen the results.

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APPENDIX A

VARIABLE DEFINITIONS

Variable	Description
Availability =	Average of the predicted values from the logistic regression of peer choice, where higher value indicates higher probability that a model-predicted peer is also a disclosed peer, and thus availability of higher quality peers
Choice =	Ratio indicating the overlap between disclosed peers and model-predicted peers, calculated as the number of overlapping peers over the number of model-predicted peers
PeerScore =	Indicator variable equals to 1 if the average predicted value of peer quality of predicted peers (i.e. *Availability* measure) is greater than the median predicted value of peer quality of the sample, 0 otherwise
FirmReturn =	12-month buy-and-hold stock returns of own firm
PeerReturn =	Measured in three ways: 1. Industry/size peer stock return is average 12-month returns excluding own firm for industry-size matched peers, where industry is classified as two digit SIC codes and size matched with within-industry market value of equity quartiles 2. Disclosed peer stock return is average 12-month returns for peers disclosed on proxy statements 3. Predicted peer stock return is average 12-month returns for peers that are predicted from the model
PeerReturn_IndSizeOnly =	Average return of peers that are identified as industry-size peers only and not as predicted peers
PeerReturn_Common =	Average return of peers that are identified as both industry-size peers and predicted peers
PeerReturn_PredictedOnly =	Average return of peers that are identified as predicted peers only and not as industry-size peers
FirmSize =	Natural logarithm of market value of equity
IdiosynVar =	Difference between firm-level stock return variance and industry's average return variance, calculated over previous 36 months
Return =	12-month buy-and-hold stock returns minus the median buy-and-hold annual stock returns for the same industry (two-digit SIC code)
ROA =	Return on assets minus the median return on assets for the same industry (two-digit SIC code)

MTB =	Ratio of market value of equity to book value of assets at the end of the fiscal year
Loss =	Indicator variable equals 1 if the firm has negative net income in the fiscal year, 0 otherwise
ConsultantUse =	Indicator variable equals 1 if the firm engages with a compensation consultant, 0 otherwise
BigConsultant =	Indicator variable equals 1 if the compensation consultant is top 5 consultant in market shares, 0 otherwise
BonusRatio =	Ratio of CEO's bonus payment over the total compensation
CEOChair =	Indicator variable equals 1 if CEO also holds the chairman position of the board, 0 otherwise
CEOTenure =	Natural logarithm of number of years CEO was in the appointment
CEOShare =	Indicator variable equals 1 if proportion of shares held by CEO is lower than the sample median, 0 otherwise
CommSize =	Number of members serving on compensation committee
CommBusy =	Ratio of number of compensation committee members that also hold board position in other firms over the total number of compensation committee members
CommTenure =	Average tenure of compensation committee members
CommMeet =	Number of compensation committee meetings during the fiscal year
InstOwnership =	Percent of shares held by top 5 institutional investors
NumDiscPeers =	Number of disclosed peers
NumPredPeers =	Number of predicted peers
CEOComp =	Natural logarithm of annual total compensation of CEO (TDC1 on ExecuComp)
LagSale =	Natural logarithm of sales at the beginning of the fiscal year
LagMTB =	Ratio of market value of equity to book value of assets at the beginning of the fiscal year
RegulatedInd =	Indicator variable equals to 1 if firm is in the gas and electric industries with SIC codes from 4900 to 4939, 0 otherwise
SIC1 =	Indicator variable equals 1 if a firm and its potential peer are within the same SIC 1-digit classification, 0 otherwise
SIC2 =	Indicator variable equals 1 if a firm and its potential peer are within the same SIC 2-digit classification, 0 otherwise

SIC2 =	Indicator variable equals 1 if a firm and its potential peer are within the same SIC 2-digit classification, 0 otherwise
SIC4 =	Indicator variable equals 1 if a firm and its potential peer are within the same SIC 4-digit classification, 0 otherwise
Size =	Indicator variable equals 1 if the ratio of the market value of equity of a firm and its potential peer are smaller or equal to 2, where the numerator is the larger market value equity between the two, 0 otherwise
Size4 =	Indicator variable equals 1 if the ratio of the market value of equity of a firm and its potential peer are smaller or equal to 4, where the numerator is the larger market value equity between the two, 0 otherwise
Size10 =	Indicator variable equals 1 if the ratio of the market value of equity of a firm and its potential peer are smaller or equal to 10, where the numerator is the larger market value equity between the two, 0 otherwise
DailyStockCorr =	Indicator variable equals 1 if the daily stock correlation between a firm and its potential peer calculated over 6-year period between fiscal year 2007 and 2012 is greater than 0.15, 0 otherwise
DSG_Neg =	Indicator variable equals 1 if *DailyStockCorr* is negative, 0 otherwise
WeeklyStockCorr =	Indicator variable equals 1 if the weekly stock correlation between a firm and its potential peer calculated over 6-year period between fiscal year 2007 and 2012 is greater than 0.22, 0 othewise
WSG_Neg =	Indicator variable equals 1 if *WeeklyStockCorr* is negative, 0 otherwise
QuarterlySalesCorr =	Indicator variable equals 1 if the quarterly sales correlation between a firm and its potential peer calculated over 6-year period between fiscal year 2007 and 2012 is greater than 0.3, 0 otherwise
QSG_Neg =	Indicator variable equals 1 if *QuarterlySalesCorr* is negative, 0 otherwise

APPENDIX B

TABLES

Table 1
Sample Selection

Panel A: Sample Selection Process

Sample of S&P 1500 Firms for Fiscal Years between 2007 and 2012	Firm–Year Observations
ExecuComp (Initial S&P 1500 firm-year observations)	**8,748**
Deduct observations with first and last years of CEO appointment	(1,735)
Deduct observations lost in merging Compustat and CRSP	(115)
Deduct observations lost in generating variables	(508)
Merged databases	**6,390**
Deduct observations without disclosed peer information	(1,570)
Final sample	**4,820**
Fiscal years 2007-2012	

Panel B: Composition of Disclosed and Predicted Peers

Disclosed Peers		**Within same industry**: Yes	**Within same industry**: No
Within same size quartile	Yes	35.9%	41.5%
	No	22.6%	

Predicted Peers		**Within same industry**: Yes	**Within same industry**: No
Within same size quartile	Yes	65.1%	6.7%
	No	28.2%	

Table 2
Descriptive Statistics

Variables	(1) *N*	(2) *Mean*	(3) *SD*	(4) *Min*	(5) *Max*
Availability	4,820	0.036	0.021	0.015	0.228
Choice	4,820	0.480	0.310	0	1
PeerScore	4,820	0.499	0.500	0	1
FirmReturn	4,820	0.212	0.388	-0.786	3.105
PeerReturn_IndSize	4,820	0.197	0.228	-0.510	1.488
PeerReturn_Disclosed	4,820	0.222	0.245	-0.482	1.442
PeerReturn_Predicted	4,820	0.230	0.399	-0.750	9.901
FirmSize	4,820	8.014	1.375	3.896	10.879
IdiosynVar	4,820	0.035	0.043	-0.029	0.429
Return	4,820	0.068	0.348	-0.871	2.936
ROA	4,820	0.021	0.072	-0.698	0.292
ConsultantUse	4,820	0.915	0.279	0	1
BigConsultant	4,820	0.223	0.416	0	1
BonusRatio	4,820	0.025	0.078	0	0.801
CEOChair	4,820	0.078	0.268	0	1
CEOTenure	4,820	1.789	0.909	0	3.584
CEOShare	4,820	0.013	0.034	0	0.324
CommSize	4,820	3.836	1.064	1	9
CommBusy	4,820	0.552	0.301	0	1
CommTenure	4,820	9.845	3.951	1	33.25
CommMeet	4,820	6.219	2.594	1	23
InstOwnership	4,820	1.710	0.797	0.801	3.932
CEOComp	4,820	8.404	0.845	5.005	10.363
LagSale	4,820	7.693	1.392	1.157	10.586
LagMTB	4,820	1.153	1.047	0.025	9.510
RegulatedInd	4,820	0.063	0.243	0	1
NumDiscPeers	4,820	15.567	5.977	2	54
NumPredPeers	4,820	22.581	7.964	3	40

All continuous variables are winsorized at top and bottom one percentile

Table 3
Pearson Correlation Matrix

Panel A: Pearson Correlation Matrix for the Logistic Regression of Peer Choice Sample

	SIC1	*SIC2*	*SIC3*	*SIC4*	*Size*	*Size4*	*Size10*	*DailyStock Corr*	*DSC_Neg*	*WeeklyStock Corr*	*WSC_Neg*	*QuartSales Corr*
SIC2	0.506											
	0.000											
SIC3	0.351	0.694										
	0.000	0.000										
SIC4	0.265	0.522	0.753									
	0.000	0.000	0.000									
Size	0.000	0.001	0.000	-0.002								
	0.582	0.001	0.171	0.000								
Size4	-0.001	0.000	0.000	-0.002	-0.193							
	0.000	0.559	0.701	0.000	0.000							
Size10	-0.002	0.000	0.000	-0.001	-0.219	-0.215						
	0.000	0.425	0.661	0.073	0.000	0.000						
DailyStockCorr	0.112	0.107	0.095	0.099	0.136	0.088	0.008					
	0.000	0.000	0.000	0.000	0.000	0.000	0.000					
DSC_Neg	-0.061	-0.051	-0.043	-0.030	-0.114	-0.079	-0.015	-0.724				
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
WeeklyStockCorr	0.102	0.097	0.086	0.091	0.097	0.068	0.017	0.699	-0.497			
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
WSC_Neg	-0.064	-0.052	-0.043	-0.037	-0.081	-0.058	-0.016	-0.499	0.447	-0.760		
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
QuartSalesCorr	0.071	0.079	0.083	0.078	-0.002	0.001	0.001	0.071	-0.043	0.074	-0.050	
	0.000	0.000	0.000	0.000	0.003	0.097	0.253	0.000	0.000	0.000	0.000	
QSC_Neg	-0.051	-0.055	-0.055	-0.052	0.003	0.000	-0.001	-0.054	0.032	-0.056	0.040	-0.745
	0.000	0.000	0.000	0.000	0.000	0.976	0.133	0.000	0.000	0.000	0.000	0.000

The number in the bottom indicates significance level.

Panel B: Pearson Correlation Matrix for the Main Sample

	CEO Comp	*Firm Return*	*PeerReturn IndSize*	*PeerReturn Disclosed*	*PeerReturn Predicted*	*PeerScore Dummy*	*LagSale*	*LagMTB*	*Regulated Industry*	*Idiosyn Var*	*CEO Tenure*	*CEO Chair*
FirmReturn	0.047											
	0.001											
PeerReturn IndSize	0.007	0.630										
	0.640	0.000										
PeerReturn Disclosed	0.003	0.679	0.833									
	0.848	0.000	0.000									
PeerReturn Predicted	0.010	0.603	0.745	0.752								
	0.487	0.000	0.000	0.000								
PeerScore Dummy	0.268	-0.027	-0.025	-0.046	-0.049							
	0.000	0.058	0.083	0.001	0.001							
LagSale	0.658	-0.034	0.000	-0.028	-0.002	0.424						
	0.000	0.018	0.987	0.052	0.884	0.000						
LagMTB	0.036	-0.090	-0.103	-0.106	-0.080	-0.171	-0.198					
	0.012	0.000	0.000	0.000	0.000	0.000	0.000					
Regulated Industry	-0.018	-0.019	-0.009	-0.014	-0.019	0.222	0.095	-0.139				
	0.205	0.196	0.531	0.345	0.181	0.000	0.000	0.000				
Idiosyn Var	-0.244	0.067	0.003	0.024	0.012	-0.074	-0.225	-0.239	0.012			
	0.000	0.000	0.815	0.091	0.400	0.000	0.000	0.000	0.416			
CEO Tenure	-0.050	-0.018	-0.011	-0.011	-0.012	-0.012	-0.110	0.057	-0.090	-0.051		
	0.001	0.206	0.459	0.453	0.420	0.424	0.000	0.000	0.000	0.000		
CEO Chair	0.196	0.002	0.027	0.018	0.026	0.170	0.231	-0.066	0.060	-0.086	0.310	
	0.000	0.910	0.066	0.210	0.068	0.000	0.000	0.000	0.000	0.000	0.000	
CEO Share	-0.178	0.002	-0.004	0.011	0.006	-0.092	-0.143	0.102	-0.076	0.010	0.368	0.156
	0.000	0.890	0.761	0.446	0.681	0.000	0.000	0.000	0.000	0.494	0.000	0.000

The number in the bottom indicates significance level.

Table 4
Replication of Gong et al. (2011) and Comparison to Alternative Fiscal Year

VARIABLES	(1) *FY 2006*	(2) *FY 2006*	(3) *FY 2009*	(4) *FY 2009*
FirmReturn	0.198*	0.253**	0.226***	0.164***
	(1.78)	(2.30)	(4.08)	(2.88)
PeerReturn_IndSize	0.461		-0.162*	
	(1.43)		(-1.71)	
PeerReturn_Disclosed		-0.459*		0.074
		(-1.71)		(0.95)
LagSale	0.452***	0.458***	0.370***	0.378***
	(19.08)	(19.05)	(15.45)	(15.85)
LagMTB	0.109***	0.105***	0.195***	0.205***
	(3.06)	(3.00)	(3.97)	(4.20)
RegulatedInd	-0.188	-0.201	-0.126	-0.128
	(-0.91)	(-0.98)	(-1.06)	(-1.04)
IdiosynVar	-0.260	-0.117	-1.747***	-1.715***
	(-0.30)	(-0.14)	(-4.26)	(-4.16)
CEOTenure	0.024	0.018	-0.027	-0.023
	(0.59)	(0.45)	(-0.71)	(-0.60)
CEOChair	0.174***	0.163***	0.199***	0.194***
	(2.95)	(2.74)	(3.79)	(3.71)
CEOShare	-1.463	-1.373	-2.715**	-2.766**
	(-1.53)	(-1.42)	(-2.21)	(-2.21)
Constant	3.615***	4.595***	4.809***	5.102***
	(16.87)	(19.51)	(17.64)	(21.00)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	708	708	838	838
Adjusted R-squared	0.549	0.550	0.515	0.514

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The t-statistics are reported in parentheses under the estimated coefficients. Standard errors are corrected for heteroskedasticity using Huber-White robust standard errors. All continuous variables are winsorized at the top and bottom one percentiles to mitigate the influence of outliers. The superscripts *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels for two-tailed t-tests, respectively.

Table 5
Logistic Regression of Peer Choice

VARIABLES	(1) *PeerMatch*	(2) *PeerMatch*	(3) *PeerMatch*	(4) *PeerMatch*
SIC1	1.736***	1.737***		1.520***
	(102.72)	(102.02)		(64.34)
SIC2	1.641***	1.530***		1.105***
	(79.46)	(65.61)		(33.52)
SIC3	0.788***	0.873***		0.601***
	(29.79)	(32.10)		(13.53)
SIC4	1.201***	1.257***		0.710***
	(50.45)	(50.21)		(15.01)
Size		3.305***		2.269***
		(126.59)		(58.75)
SIC2 × *Size*		0.242***		0.275***
		(10.49)		(7.69)
Size4		2.953***		2.039***
		(123.82)		(55.85)
Size10		2.098***		1.464***
		(83.81)		(38.78)
DailyStockCorr			14.025***	9.040***
			(90.71)	(54.36)
DSC_Neg			-0.236***	-0.147***
			(-4.78)	(-2.96)
DailyStockCorr × *DSC_Neg*			-17.948***	-11.248***
			(-28.00)	(-17.51)
WeeklyStockCorr			1.704***	1.345***
			(13.06)	(9.70)
WSC_Neg			-0.081*	-0.022
			(-1.95)	(-0.53)
WeeklyStockCorr × *WSC_Neg*			-3.514***	-2.907***
			(-7.81)	(-6.29)
QuarterlySalesCorr			3.115***	2.196***
			(59.50)	(38.77)
QSC_Neg			-0.046	-0.022
			(-1.53)	(-0.70)
QuarterlySalesCorr × *QSC_Neg*			-4.416***	-3.020***
			(-37.72)	(-24.60)
Observations	13,011,203	11,645,520	2,449,687	2,449,687
Pseudo R2	0.216	0.306	0.278	0.396

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

$$Pr(Company\text{-}PeerMatch) = \alpha_0 + \alpha_1 SIC1 + \alpha_2 SIC2 + \alpha_3 SIC3 + \alpha_4 SIC4 + \alpha_5 SIC2 \times Size + \alpha_6 Size + \alpha_7 Size4 + \alpha_8 Size10 + \alpha_9 DailyStockCorr + \alpha_{10} DSC\_Neg + \alpha_{11} DailyStockCorr \times DSC\_Neg + \alpha_{12} WeeklyStockCorr + \alpha_{13} WSC\_Neg + \alpha_{14} WeeklyStockCorr \times WSC\_Neg + \alpha_{15} QuarterlySalesCorr + \alpha_{16} QSC\_Neg + \alpha_{17} QuarterlySalesCorr \times QSC\_Neg + e \quad (1)$$

Table 6
Out of Sample Validation of Peer Quality Measure

Panel A: Full sample (1992-2017)

VARIABLES	(1) *FirmReturn*	(2) *FirmReturn*	(3) *FirmReturn*	(4) *FirmReturn*	(5) *FirmReturn*	(6) *FirmReturn*	(7) *FirmReturn*
PeerReturn_IndSize		0.787***				0.150***	
		(71.53)				(14.64)	
PeerReturn_Disclosed			0.816***			0.404***	
			(97.29)			(35.65)	
PeerReturn_Predicted				0.866***	0.818***	0.406***	
				(100.03)	(66.45)	(30.13)	
PeerScore					-0.003***		
					(-4.52)		
PeerReturn_Predicted					0.101***		
× *PeerScore*					(6.27)		
PeerReturn_IndSizeOnly							0.522***
							(43.18)
PeerReturn_Common							0.228***
							(25.26)
PeerReturn_PredictedOnly							0.200***
							(18.44)
FirmSize	0.003***	0.003***	0.003***	0.002***	0.003***	0.003***	0.003***
	(17.29)	(17.07)	(16.27)	(14.41)	(14.05)	(15.58)	(15.14)
MTB	-0.007***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(-13.98)	(-13.14)	(-13.62)	(-13.05)	(-13.03)	(-13.23)	(-12.78)
ROA	0.117***	0.099***	0.093***	0.092***	0.092***	0.090***	0.093***
	(14.00)	(13.68)	(13.92)	(13.56)	(13.54)	(13.73)	(13.19)

Leverage	-0.009***	-0.008***	-0.005***	-0.006***	-0.006***	-0.006***	-0.007***
	(-4.94)	(-5.07)	(-3.63)	(-3.91)	(-3.86)	(-3.86)	(-4.34)
ReturnVolatility	0.178***	0.164***	0.146***	0.141***	0.141***	0.142***	0.145***
	(27.01)	(26.74)	(24.22)	(22.81)	(22.86)	(23.69)	(23.02)
Loss	-0.003***	-0.003***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(-2.82)	(-3.16)	(-4.32)	(-4.25)	(-4.21)	(-4.34)	(-3.80)
Constant	-0.001	-0.005	-0.010	-0.002	-0.016*	-0.006	-0.003
	(-0.17)	(-0.66)	(-1.21)	(-0.26)	(-1.79)	(-0.87)	(-0.43)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	219,366	219,366	219,366	219,366	219,366	219,366	219,366
Adjusted R-squared	0.031	0.230	0.277	0.283	0.284	0.309	0.263

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B: Financial crisis (Fiscal year 2008)

VARIABLES	(1) *FirmReturn*	(2) *FirmReturn*	(3) *FirmReturn*	(4) *FirmReturn*	(5) *FirmReturn*	(6) *FirmReturn*	(7) *FirmReturn*
PeerReturn_IndSize		0.740***				-0.117***	
		(29.25)				(-4.35)	
PeerReturn_Disclosed			0.786***			0.197***	
			(43.88)			(8.41)	
PeerReturn_Predicted				0.979***	0.936***	0.898***	
				(62.68)	(45.04)	(31.47)	
PeerScore					-0.003		
					(-1.39)		
PeerReturn_Predicted					0.069***		
× *PeerScore*					(3.22)		
PeerReturn_IndSizeOnly							0.561***
							(26.51)
PeerReturn_Common							0.255***
							(15.05)
PeerReturn_PredictedOnly							0.226***
							(13.85)
FirmSize	0.004***	0.003***	0.004***	0.003***	0.004***	0.004***	0.003***
	(4.30)	(4.13)	(5.12)	(4.66)	(5.31)	(4.88)	(4.08)
MTB	-0.007***	-0.008***	-0.007***	-0.007***	-0.007***	-0.007***	-0.008***
	(-5.66)	(-5.80)	(-5.75)	(-6.44)	(-6.47)	(-6.39)	(-6.80)
ROA	0.038**	0.035**	0.035**	0.035**	0.035**	0.035**	0.039***
	(2.28)	(2.07)	(2.24)	(2.43)	(2.45)	(2.44)	(2.63)
Leverage	-0.047***	-0.046***	-0.044***	-0.038***	-0.038***	-0.039***	-0.039***
	(-8.51)	(-8.05)	(-8.12)	(-7.49)	(-7.49)	(-7.56)	(-7.32)
ReturnVolatility	-0.078	-0.069	-0.019	0.036	0.036	0.040	0.026

	(-1.60)	(-1.41)	(-0.42)	(0.85)	(0.85)	(0.94)	(0.60)
Loss	-0.019***	-0.021***	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***
	(-5.62)	(-5.85)	(-4.58)	(-4.48)	(-4.45)	(-4.26)	(-4.41)
Constant	-0.033***	-0.012	-0.013	-0.019**	0.015	-0.018**	-0.015*
	(-3.51)	(-1.29)	(-1.48)	(-2.30)	(0.99)	(-2.24)	(-1.73)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,794	15,794	15,794	15,794	15,794	15,794	15,794
Adjusted R-squared	0.294	0.375	0.421	0.477	0.478	0.481	0.458

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The t-statistics are reported in parentheses under the estimated coefficients. Standard errors are corrected for heteroskedasticity using Huber-White robust standard errors. All continuous variables are winsorized at the top and bottom one percentiles to mitigate the influence of outliers. The superscripts *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels for two-tailed t-tests, respectively.

$$FirmReturn_{it} = \alpha_0 + \alpha_1 PeerReturn_{it} + \alpha_2 FirmSize_{it} + \alpha_3 MTB_{it} + \alpha_4 ROA_{it} + \alpha_5 Leverage_{it} + \alpha_6 ReturnVolatility_{it} + \alpha_7 Loss_{it} + e_{it} \quad (2)$$

Table 7
Determinants of Peer Availability and Choice of Peers

VARIABLES	(1) *Availability*	(2) *Availability*	(3) *Choice*	(4) *Choice*
FirmSize	0.008***	0.008***	0.028***	0.019***
	(15.21)	(7.06)	(10.71)	(3.55)
IdiosynVar	-0.005	-0.014	-0.072	-0.237
	(-0.36)	(-0.37)	(-0.96)	(-1.29)
Return	-0.003	0.003	-0.009	0.086*
	(-1.41)	(0.34)	(-0.96)	(1.94)
ROA	-0.032***	-0.034	-0.059	-0.099
	(-3.22)	(-1.34)	(-1.21)	(-0.83)
BigConsultant	-0.002	0.001	0.029***	0.049***
	(-1.18)	(0.17)	(4.29)	(2.93)
BonusRatio	0.003	0.015	0.007	0.021
	(0.38)	(0.94)	(0.20)	(0.28)
CEOChair	0.004***	0.003	-0.002	-0.024
	(2.95)	(1.03)	(-0.28)	(-1.64)
CEOTenure	-0.000	-0.000	-0.000	-0.000
	(-0.40)	(-0.00)	(-0.51)	(-0.19)
CEOShare	0.003	0.050	-0.063	0.197
	(0.14)	(0.95)	(-0.54)	(0.79)
CommSize	0.001	0.002	0.003	0.005
	(1.57)	(1.54)	(0.91)	(0.85)
CommBusy	-0.000	-0.000	-0.017***	-0.017*
	(-0.47)	(-0.07)	(-3.26)	(-1.66)
CommTenure	0.000*	0.000	0.004***	0.003*
	(1.86)	(0.94)	(4.25)	(1.94)
CommAge	-0.000	-0.000	-0.002**	-0.002
	(-0.74)	(-0.88)	(-2.46)	(-1.44)
CommMeet	-0.000	-0.000	0.003**	0.003
	(-0.43)	(-0.54)	(2.57)	(1.28)
InstOwnership	0.004	0.006	0.102***	0.101**
	(0.90)	(0.69)	(4.73)	(2.42)
NumDiscPeers	0.000	0.000*	0.006***	0.011***
	(1.43)	(1.88)	(13.57)	(10.03)
Constant	-0.040**	-0.034	-0.004	0.096
	(-2.45)	(-1.07)	(-0.06)	(0.64)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Observations	3,169	799	3,169	799
Pseudo R2	-0.154	-0.147	-4.570	-4.252

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The t-statistics are reported in parentheses under the estimated coefficients. Standard errors are corrected for heteroskedasticity using Huber-White robust standard errors. All continuous variables are winsorized at the top and bottom one percentiles to mitigate the influence of outliers. The superscripts *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels for two-tailed t-tests, respectively.

$$\begin{aligned} \mathit{Availability/Choice}_{it} = {} & \alpha_0 + \alpha_1 \mathit{FirmSize}_{it} + \alpha_2 \mathit{IdiosynVar}_{it} + \alpha_3 \mathit{Return}_{it} + \alpha_4 \mathit{ROA}_{it} \\ & + \alpha_5 \mathit{BigConsultant}_{it} + \alpha_6 \mathit{BonusRatio}_{it} + \alpha_7 \mathit{CEOChair}_{it} + \alpha_8 \mathit{CEOTenure}_{it} \\ & + \alpha_9 \mathit{CEOShare}_{it} + \alpha_{10} \mathit{CommSize}_{it} + \alpha_{11} \mathit{CommBusy}_{it} + \alpha_{12} \mathit{CommTenure}_{it} \\ & + \alpha_{13} \mathit{CommAge}_{it} + \alpha_{14} \mathit{CommMeet}_{it} + \alpha_{15} \mathit{InstOwnership}_{it} + \alpha_{16} \mathit{NumDiscPeers}_{it} + e_{it} \end{aligned} \quad (3)$$

Table 8
Test of RPE Use with Implicit, Explicit, and Predicted Measures of Peer Returns

VARIABLES	(1) *CEOComp*	(2) *CEOComp*	(3) *CEOComp*	(4) *CEOComp*
FirmReturn	0.242***	0.224***	0.232***	0.234***
	(8.94)	(8.24)	(9.36)	(9.26)
PeerReturn_IndSize	-0.154***			
	(-4.37)			
PeerReturn_Disclosed		-0.103***		
		(-3.03)		
PeerReturn_Predicted			-0.129***	-0.083**
			(-4.15)	(-2.22)
PeerScore				0.068*
				(1.76)
PeerReturn_Predicted × *PeerScore*				-0.107**
				(-2.33)
LagSale	0.411***	0.411***	0.412***	0.405***
	(28.35)	(28.28)	(28.36)	(25.03)
LagMTB	0.151***	0.152***	0.152***	0.151***
	(6.50)	(6.56)	(6.57)	(6.44)
RegulatedInd	0.026	0.029	0.023	0.003
	(0.22)	(0.25)	(0.20)	(0.03)
IdiosynVar	-0.987***	-0.968***	-0.967***	-0.948***
	(-3.70)	(-3.62)	(-3.62)	(-3.56)
CEOTenure	0.032	0.032	0.032	0.031
	(1.47)	(1.44)	(1.44)	(1.39)
CEOChair	0.119***	0.118***	0.119***	0.117***
	(3.70)	(3.66)	(3.69)	(3.61)
CEOShare	-3.415***	-3.395***	-3.395***	-3.365***
	(-4.50)	(-4.46)	(-4.44)	(-4.46)
Constant	5.201***	5.177***	5.168***	4.995***
	(29.52)	(29.50)	(29.53)	(22.45)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4,820	4,820	4,820	4,820
Adjusted R-squared	0.551	0.549	0.550	0.551

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The t-statistics are reported in parentheses under the estimated coefficients. Standard errors are corrected for heteroskedasticity using Huber-White robust standard errors. All continuous variables are winsorized at the top and bottom one percentiles to mitigate the influence of outliers. The superscripts *, **, and *** correspond to 10 percent, 5 percent, and 1 percent significance levels for two-tailed t-tests, respectively.

$$CEOComp_{it} = \alpha_0 + \alpha_1 FirmReturn_{it} + \alpha_2 PeerReturn_{it} + \alpha_3 LagSale_{it} + \alpha_4 LagMTB_{it} + \alpha_5 RegulatedInd_{it} + \alpha_6 IdiosynVar_{it} + \alpha_7 CEOTenure_{it} + \alpha_8 CEOChair_{it} + \alpha_9 CEOShare_{it} + e_{it} \quad (4)$$

$$CEOComp_{it} = \alpha_0 + \alpha_1 FirmReturn_{it} + \alpha_2 PeerReturn\_Predicted_{it} + \alpha_3 PeerScore_{it} + \alpha_4 PeerScore_{it} \times PeerReturn\_Predicted_{it} + \alpha_5 LagSale_{it} + \alpha_6 LagMTB_{it} + \alpha_7 RegulatedInd_{it} + \alpha_8 IdiosynVar_{it} + \alpha_9 CEOTenure_{it} + \alpha_{10} CEOChair_{it} + \alpha_{11} CEOShare_{it} + e_{it} \quad (5)$$