FINANCIAL REPORTING COMPARABILITY AND RELATIVE PERFORMANCE
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Dedication

This dissertation is dedicated to my grandmother and parents.

Abstract

There is limited large-sample empirical evidence in the U.S. that CEO compensation contracts use the *accounting* performance of *peer* firms as a benchmark to evaluate the CEO's own-firm accounting performance (i.e., accounting-based relative performance evaluation, RPE). Given the anecdotal and empirical observation that firms do use their own accounting numbers in determining CEO compensation, the lack of evidence of accounting-based RPE presents a puzzle. My study questions whether the lack of evidence is attributable to a limitation of the conventional empirical research design used to test for RPE. I propose that efficient relative evaluation using peer-firm accounting performance requires that the peer firm has a comparable financial reporting system. Thus, I refine the selection of the peer group by matching the firm of interest with industry-size peer firms with high financial reporting comparability. I find strong empirical evidence of accounting-based RPE in determining CEO's total compensation when financial reporting comparability is taken into account in peer selection. Consistent with expectations, I also find that accounting-based RPE is used more in determining cash compensation than equity compensation and its use increases in the fraction of CEO cash compensation to total compensation. I further find that, when the fraction of equity compensation declined during the recent financial crisis, the use of own-firm stock returns and price-based RPE in determining CEO's total compensation declined as expected, but the use of own-firm accounting performance and accounting-based RPE continued to be significant. Overall, my results resolve the apparent inconsistency between the substantial anecdotal evidence and the lack of prior empirical support for accounting-based RPE in determining CEO compensation in the U.S.

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1. Introduction

Do compensation committees consider peer-firm accounting performance in designing executive compensation contracts? Since a firm's operations are affected by factors both within and outside the CEO's control, it is important to distinguish the CEO's contribution to the firm's operational output from the effect of exogenous shocks (e.g., policy changes, inflation, etc.). If exogenous shocks are common across peer firms, theory predicts that an optimal incentive scheme compensates a CEO on the performance of the firm relative to that of its peers, i.e., relative performance evaluation, RPE (e.g., Lazear and Rosen, 1981; Holmstrom, 1982; Nalebuff and Stiglitz, 1983; Holmstrom and Milgrom, 1987).[1] Because own-firm accounting numbers are commonly-used metrics to evaluate CEO performance, one would expect peer-firm accounting numbers to be used as relative assessment metrics in designing executive compensation schemes.

Despite the theoretical appeal, there is surprisingly little large-sample empirical evidence in the U.S. that CEO compensation contracts are written on own-firm *accounting* performance relative to peer-firm *accounting* performance (termed accounting-based RPE). Some empirical studies of RPE in the U.S. (e.g., Gibbons and Murphy, 1990; Albuquerque, 2009) show evidence of the use of peer firms' stock prices as a benchmark in incentive contracts written on the firm's stock price performance (termed price-based RPE). Since own-firm accounting earnings are widely used as performance measures in evaluating CEOs (e.g., Bushman and Smith, 2001), it is

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[1] For example, *the Pacific Gas and Electric (PG&E)*, an energy provider, determines its CEO's bonus based on the firm's performance relative to that of pre-selected competitors like *Consolidated Edison* and *Xcel Energy*. In other words, the more *PG&E* outperforms its peer firms, the higher the bonus that is paid to its CEO.

puzzling that peer firms' earnings appear to be disregarded in CEO compensation contracts. Is this because compensation committees indeed rely on peer firms' stock returns exclusively and pay no attention to peer firms' accounting information? Or can the lack of evidence be attributed to a limitation of the conventional empirical research design used to test for RPE? The purpose of this study is to address this puzzle by refining the selection of the peer group used in empirical tests of RPE and then reexamining the compensation contracting value of peer firms' accounting information.

The paucity of evidence supporting accounting-based RPE could be traced to researchers' reliance on conventional peer definitions which disregard the information-processing costs associated with differences in firms' financial reporting practices. Two firms have comparable accounting systems (i.e., high financial reporting comparability[2]) if, for a given set of economic events, they produce similar financial statements. Therefore, comparable accounting systems facilitate the financial statement users' ability to identify similarities and differences in the economic performance of firms. High financial reporting comparability between the firm and its peers makes it easier for a compensation committee to assess commonalities in the business environment, thereby increasing the effectiveness of accounting-based RPE. If firms consider high financial reporting comparability as one of the criteria for peer selection, then the use of conventional peer definitions, which are often based on industry and/or size (e.g., Joh, 1999; Albuquerque, 2009), could fail to detect the existing use of accounting-based RPE.

I measure financial reporting comparability for pairs of firms in the same industry

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[2] The existing literature interchangeably uses the terms, financial reporting comparability and financial statement comparability, to refer to the comparability of cross-firm accounting systems.

(two-digit SIC), using the method proposed by De Franco, Kothari, and Verdi (2006) (hereafter DKV). The DKV method measures the extent to which two firms' accounting systems produce similar accounting earnings given similar economic events. For each treatment firm, I select ten same-industry peer firms which are closest in size (market capitalization) and financial reporting comparability. To the extent that compensation committees in fact use peer firms with high financial reporting comparability as RPE benchmarks, this peer group selection is expected to enhance the power to detect accounting-based RPE in empirical tests.

The use of accounting-based and/or price-based RPE is expected to vary with CEO compensation structure (e.g., cash or equity). CEO cash compensation typically rewards realized gains rather than expectations of future performance. On the other hand, equity compensation is used to incentivize CEOs to increase future performance. Therefore, accounting performance measures of the firm and its peers are more likely to be used in determining CEO's cash compensation rather than equity compensation (Bushman and Smith, 2001). Thus, I expect that accounting-based RPE is more (less) likely to be adopted in CEO cash (equity) compensation contracts.

For a large sample of U.S. firms, I estimate a regression of compensation variables on firm performance, peer performance and control variables. I find strong empirical evidence of accounting-based RPE in CEO total compensation when financial reporting comparability is taken into account in peer selection.[3] However, when peer firms are selected by the conventional matching on industry and/or size, I find no support

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[3] My results are robust to using an alternative measure of financial reporting comparability based on the Dechow-Dichev accruals generating process rather than the earnings-returns relationship.

for the use of accounting-based RPE, consistent with prior studies. I also show that the specific form of RPE (i.e., accounting- or price-based) is affected by how CEO compensation is structured. My results suggest that accounting-based RPE is used in cash compensation, whereas it has an insignificant effect on equity compensation where price-based RPE plays a significant role. While I find that on average both accounting-based and price-based RPE determine total compensation, subsample analysis reveals that the use of accounting-based (price-based) RPE increases (decreases) in the fraction of CEO cash compensation to total compensation.

In additional tests, I first investigate the cross-sectional variation in the use of RPE based on the degree of a firm's exposure to industry-wide common factors (captured by the R^2 from a time-series regression of firm performance on average industry performance). The results show that the significance of accounting-based RPE in explaining both total and cash compensation is higher for firms with greater exposure to industry-wide common factors. Second, as expected, I find a significant decline in the use of own-firm stock returns and price-based RPE in both total and equity compensation during the recent financial crisis. This is consistent with the shrinking of the equity compensation fraction in the CEO's remuneration package during the crisis. On the other hand, the use of own-firm accounting performance and accounting-based RPE in total and cash compensation continues to be significant during the crisis years.

Prior studies test whether boards of directors identify poor-performing CEOs through RPE. While there is empirical evidence of price-based RPE in CEO termination decisions in the U.S. (e.g., Barro and Barro, 1990; Gibbons and Murphy, 1990), results of

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accounting-based RPE are inconclusive.[4] I find evidence that accounting-based RPE is significantly related to CEO turnover when peer firms of high financial reporting comparability are considered as the RPE benchmarks. However, when I use industry-size peer firms, I find no evidence of accounting-based RPE in CEO turnover. This finding further highlights the role of financial reporting comparability in peer selection for accounting-based RPE.

Following prior RPE studies, I use firm characteristics that capture exposure to common shocks to select peer firms. Effective December 15, 2006, new disclosure rules issued by the Securities and Exchange Commission (SEC) require firms to report detailed RPE practices in proxy statements. Consistent with the sparse reporting of firms' actual RPE peer selection (Gong, Li, and Shin, 2011), I find that only 14% (2%) of firm-year observations from Incentive Lab database disclose their own selection of RPE peer firms after (before) the 2006 SEC rule change.[5] Using the RPE peers disclosed by firms, I find that financial reporting comparability is a significant determinant of actual peer selection after controlling for other selection criteria such as industry and size. This result provides validation for using financial reporting comparability as a peer selection criterion.

My study contributes to the literature on CEO relative performance evaluation. Prior empirical research finds limited support for accounting-based RPE. While small-sample studies in the U.S. (e.g., Antle and Smith, 1986; Vrettos, 2013) and studies of

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[4] DeFond and Park (1999) show that a firm's industry-adjusted accounting performance is inversely related to CEO turnover. Bushman and Smith (2001) question whether this result can be viewed as evidence of RPE given that the effect of peer-performance is not separately tested.

[5] In view of the low number of RPE-peer disclosers, prior studies (e.g., Gong et al., 2011; Ferri, 2009; Matsumura and Shin, 2013) conjecture that non-disclosers could apply RPE implicitly (e.g., boards' discretion or subjective evaluation) rather than pre-committing to formulaic explicit RPE. Consistent with this conjecture, empirical evidence of price-based RPE is found in samples of non-disclosers as well as disclosers (Black, Dikolli, and Hofmann, 2015).

continental European firms (e.g., Ozkan, Singer and You, 2012) find results consistent with accounting-based RPE, there is no evidence of this contracting feature in large-sample studies in the U.S. In contrast with prior results, I find strong empirical evidence of accounting-based RPE in CEO compensation contracts. Given significant anecdotal evidence of accounting-based RPE (Gong et al., 2011), it was surprising that prior empirical studies did not find support for this CEO compensation feature. My results suggest that the lack of prior evidence can be attributed to the use of RPE peer groups that were not matched on financial reporting comparability.

My study also contributes to the literature on CEO compensation structure. Many prior studies of RPE in the U.S. focus on CEO's total compensation and do not examine the effect of accounting- versus price-based RPE on different components of CEO compensation. I provide evidence that CEO compensation structure (e.g., cash or equity) is a significant determinant of RPE design. My results show that accounting-based RPE is more (less) likely to be used in cash (equity) compensation, consistent with the notion that cash bonus rewards realized performance captured by accounting earnings.

My results also speak to the growing literature on financial reporting comparability. De Franco et al. (2011) show that firms whose peers have high financial reporting comparability have higher analyst following and higher analyst forecast accuracy. Thus, they conclude that financial reporting comparability increases the quantity and quality of information available to analysts. Chen, Collins, Kravet, and Mergenthaler (2015) find that acquirers make more profitable acquisition decisions when target firms have peers of high financial reporting comparability. I provide evidence that

high financial reporting comparability also improves compensation contracting decisions by facilitating the implementation of RPE.

The remainder of the study is organized as follows. Section 2 discusses the literature and hypotheses. Section 3 describes the sample selection, variable measurement and research design. The main results are presented in Section 4. Section 5 provides additional evidence on the use of accounting-based RPE. Section 6 concludes.

2. Hypothesis development

2.1 Accounting-based RPE in the extant literature

While prior empirical evidence provides support for price-based RPE (e.g., Gibbons and Murphy, 1990; Janakiraman, Lambert, and Larcker, 1992; Albuquerque, 2009), large-sample evidence of the use of accounting-based RPE in the U.S. is limited. Prior researchers conjecture that the lack of empirical support for accounting-based RPE could be because accounting earnings are available only periodically, making it difficult for firms to use accounting measures to evaluate CEOs (e.g., Albuquerque, 2009). Countering this argument, prior studies find that CEO compensation is in fact positively related to own-firm accounting performance along with other performance measures such as own-firm stock returns (e.g., Lambert and Larcker, 1987; Jensen and Murphy, 1990; Murphy, 1999).[6] Since own-firm accounting performance measures can be influenced by common exogenous shocks, there should be a need for accounting-based RPE in determining CEO compensation. Consistent with this prediction, prior studies find

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[6] Sloan (1993) proposes that own-firm accounting measures are used in CEO compensation contracts mainly to filter out the noise in stock returns. Bushman and Smith (2001) observe that the documented *positive* relation between earnings and CEO compensation is inconsistent with Sloan's argument.

significant evidence of accounting-based RPE using non-U.S. samples (e.g., Ozkan et al., 2012; Wu and Zhang, 2010; Chen, Liang, and Zhu, 2012). Why U.S. firms would not implement accounting-based RPE and would exclusively rely on price-based RPE is a priori unclear.[7]

The scarcity of evidence of accounting-based RPE in the U.S. could be traced to research design limitations in empirical studies of RPE. Since the actual peer selection process in a firm is mostly unobservable, researchers need to specify their own assumptions regarding peer firm characteristics. RPE in CEO compensation contracts would be observed only if (1) compensation committees in fact use peer firms as benchmarks, and at the same time (2) the researcher's definition of RPE peer firms matches the peer firm selection criteria of the compensation committee (Gibbons and Murphy, 1990; Baker, 2002). Any discrepancy in peer selection by an empirical researcher would result in an inability to detect RPE practice (Dikolli et al., 2013).

2.2 Financial reporting comparability and peer selection

Prior research has typically relied on market, industry, or industry-size as criteria for RPE peer selection (see Albuquerque, 2009). When reviewing financial statements of multiple firms, more time and effort is needed to assess relative performance when the firms' financial reporting is not easily comparable. In this regard, the Financial Accounting Standards Board's (FASB) conceptual framework states that *"users' decisions involve choosing between alternatives, for example, selling or holding an*

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[7] Note that I only focus on CEO compensation contracts. There is prior evidence of using RPE based on division-level accounting performance for internal evaluation of managers (e.g., Blackwell, Brickley, and Weisbach, 1994; Matsumura and Shin, 2006; Cichello, Fee, Hadlock, and Sonti, 2009).

investment, or investing in one reporting entity or another. Consequently, information about a reporting entity is more useful if it can be compared with similar information about other entities" (FASB, 2010, p.19). Even under the same accounting standard regime, the degree to which a firm's financial reporting is comparable to its peers will differ (De Franco et al., 2011). Low comparability of the accounting systems of a firm's peers would make it difficult for accounting-based RPE to abstract the effects of common exogenous factors from the firm's accounting performance.

If compensation committees are cognizant of the effectiveness of accounting-based RPE increasing with financial reporting comparability, then peer selection without considering this criterion would result in misspecified tests. Consistent with this view, enhanced comparability resulting from the mandatory adoption of International Financial Reporting Standards (IFRS) gave rise to the use of accounting-based RPE in CEO cash compensation contracts (Ozkan et al., 2012) and CEO turnover (Wu and Zhang, 2010) of continental European firms.[8] I examine the effect of financial reporting comparability on the use of RPE by refining the RPE peer selection in empirical tests. If the information-processing costs in integrating multi-firm accounting information are inversely related to financial reporting comparability, then peer firms with high financial reporting comparability would be more effective accounting performance benchmarks. Thus, my first hypothesis is:

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[8] Although these results could be viewed as a consequence of enhanced comparability, the adoption of IFRS has simultaneously led to changes in other aspects of financial reporting of the adopting firms. Thus, it is difficult to pinpoint the incremental effect of financial reporting comparability on the contracting value of accounting numbers. Moreover, since Cascino and Gassen (2015) show that the effect of mandatory IFRS adoption on comparability is marginal, the post-adoption increase in RPE usage is more likely due to other factors.

H1: In CEO compensation contracts, firm accounting performance is evaluated relative to the accounting performance of industry-size peers with high financial reporting comparability.

2.3 Compensation structure and RPE

The contracting role of accounting performance could vary in relation to cash vs. equity compensation. Prior studies find a strong association between CEO cash compensation and own-firm accounting earnings (e.g., Bushman and Smith, 2001). Since cash (salary plus bonus) is paid to CEOs for *realized* gains for a specific period, own-firm accounting performance would play a significant role in determining cash compensation.[9] On the other hand, equity compensation rewards expected future gains to motivate CEOs to undertake long-term value-maximizing decisions. Thus, equity compensation is expected to be more closely related to own-firm stock price performance, which has a forward-looking perspective as opposed to the accounting perspective which reflects current and past performance (Banker, Darrough, Huang, and Plehn-Dujowich, 2013). To the extent that peer-firm performance is included in contracts to better evaluate own-firm performance, I expect accounting-based RPE to be more useful in determining CEO cash compensation relative to equity compensation. In general, the significance of accounting-based RPE in CEO compensation contracts is likely to increase in the ratio of CEO cash compensation to total compensation. Thus, my second set of hypotheses is:

H2a: Accounting-based RPE is more (less) likely to be used in CEO cash (equity) compensation.

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[9] Cash compensation is less likely to be paid for unrealized gains. If unrealized gains do not materialize later, the firm will have difficulty recovering the already-paid CEO cash compensation (Leone, Wu, and Zimmerman, 2006).

H2b: *The use of accounting-based RPE increases with the ratio of CEO cash compensation to total compensation.*

3. Sample selection, variable measurement, and research design

3.1 Sample selection

I collect annual CEO compensation data of S&P 1500 firms from ExecuComp for the period 1992-2013. The initial dataset contains 37,053 CEO-year observations. I exclude firm-year observations when a firm has more than one CEO in a given year, or when the CEO has been in his/her position for less than 12 months. I also exclude observations with non-positive book value of common equity and missing values for total compensation (TDC1 in ExecuComp), sales, and market value.

For each firm-year observation of CEO compensation, I also collect data for all firms in the same industry (two-digit SIC) from the merged CRSP-Compustat database. This ensures that potential peer candidates are included even if they are not in ExecuComp. Following Albuquerque (2009), I require peer firms to have total assets of at least $10 million. I require that a firm-year observation has at least 20 same-industry peer firms that satisfy the data requirements so as to ensure that peer candidates are not too few (Jayaraman, Milbourn, and Seo, 2015). The final sample consists of 20,008 firm-year observations for 2,626 distinct firms (see Table 1).

3.2 Variable measurement

3.2.1 Financial reporting comparability (FRC)

I follow DKV's approach to empirically measure financial reporting comparability. This measure captures how closely the same economic events (as reflected by stock returns) of two firms are mapped into their accounting earnings.[10] For each firm-year observation of CEO compensation retrieved from ExecuComp, I first estimate the following equation using data from the previous 16 quarters (minimum 12 quarters):

$$Earnings_{it} = \alpha_i + \beta_i * Return_{it} + \varepsilon_{it}, \tag{1}$$

where *Earnings* equals quarterly income before extraordinary items scaled by lagged total assets, and *Return* equals the contemporaneous quarterly stock returns. The coefficient estimates from equation (1), $\hat{\alpha}_i$ and $\hat{\beta}_i$ are firm-specific accounting system parameters that map economic events of firm *i* into reported earnings numbers of firm *i*. Similarly, I estimate $\hat{\alpha}_j$ and $\hat{\beta}_j$, as the parameters of the accounting system of peer firm *j*.[11] I calculate the predicted earnings of firm *i* by applying the parameter estimates of the accounting systems of firm *i* and firm *j*, respectively, to firm *i*'s stock returns as follows.

$$E(Earnings)_{iit} = \hat{\alpha}_i + \hat{\beta}_i * Return_{it}, \tag{2}$$

$$E(Earnings)_{ijt} = \hat{\alpha}_j + \hat{\beta}_j * Return_{it}. \tag{3}$$

Equation (2) estimates the predicted earnings of firm *i* based on the accounting system parameters of firm *i*, whereas equation (3) estimates the predicted earnings of firm *i*

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[10] The DKV measure is an output-based measure of financial reporting comparability. In contrast with measures that compare a broad set of specific accounting choices used by some prior studies (e.g., Bradshaw, Miller, and Sarafeim, 2009), the DKV method does not require data on accounting choices and does not rely on assumptions to develop a composite empirical proxy of comparability. An additional weakness of input-based measures of comparability, pointed out by Daske, Hail, Leuz and Verdi (2011), is that similar accounting inputs may not necessarily result in comparable outputs, in the absence of effective incentive alignment and/or enforcement mechanisms.

[11] Consistent with De Franco et al. (2009), I classify firms into three reporting-interval groups based on the month of the fiscal year-end: group 1 (March, June, September, or December), group 2 (April, July, October or January) and group 3 (May, August, November, or February). To match the timing of estimating accounting system parameters, firm *i* and firm *j* are required to belong to the same reporting-interval group.

based on the accounting system parameters of firm j. Financial reporting comparability between firms i and j, FRC_{ij}, is defined as the absolute difference between the expected earnings estimated from equation (2) and equation (3) averaged over the preceding 16 quarters:[12]

$$FRC_{ijt} = (1/16)*\sum_{t-15}^{t} |E(Earnings)_{iit} - E(Earnings)_{ijt}|. \qquad (4)$$

I estimate FRC for each combination of firm i and its peer firms within the same two-digit SIC group.

3.2.2 Peer selection (SIC2-FRC-Size)

The peer group that I use in my main tests is selected based on industry, firm size, and financial reporting comparability. Albuquerque (2009) selects industry-size peers since different-sized firms are exposed to different exogenous shocks and face different constraints to respond to those shocks.[13] In addition to industry and size, I introduce financial reporting comparability (FRC) as an additional criterion to identify peer firms. Comparable accounting systems enable the integration of multi-firm accounting information and thus facilitate RPE. Specifically, for a firm-year (treatment) observation from ExecuComp, I first select same-industry peer candidates belonging to the top quartile of financial reporting comparability. From this selected pool, I choose the top 10 (minimum 5) peer firms that are closest in size relative to the treatment firm based on beginning-of-year market capitalization. This peer selection procedure (SIC2-FRC-Size)

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[12] Following De Franco et al. (2009), I multiply FRC_{ijt} obtained in equation (4) by -1, so that greater (or less negative) numbers indicate higher accounting comparability between firm i and firm j.

[13] Albuquerque (2009) argues that an ideal peer group is composed of firms not only in the same industry but also similar in various characteristics as the treatment firm. She contends that selecting industry-size peers is a parsimonious way to capture various dimensions of firm characteristics.

results in an RPE peer group consisting of same-industry peer firms which are similar in size and have similar financial reporting systems as the treatment firm.[14] Peer-firm performance is measured as the average performance of the selected peer group.

For comparison purposes, I also use the industry-size peer group (SIC2-Size) consisting of the top 10 (minimum 5) same-industry peer firms that are closest to the treatment firm based on beginning-of-year market capitalization.

3.3 Data description

Panel A of Table 2 reports the descriptive statistics of the sample examined in this study. CEO's total compensation (TDC1 from ExecuComp), cash compensation (salary plus bonus), and equity compensation (stock options plus restricted stock granted) average $4,960,000, $1,849,000, and $2,880,000, respectively.[15] The average cash-paid proportion of CEO total compensation is 53%, similar to prior findings (e.g., Albuquerque, Chen, Dong, and Riedl, 2014). The mean stock price performance of sample firms (12-month buy-and-hold returns, RET) is 5.3% and the mean accounting performance (income before extraordinary items to lagged assets, ROA) is 4.3%. All continuous variables are winsorized at 1% and 99% levels. Definitions of variables are presented in Appendix A.

Panel B of Table 2 presents the Pearson correlation coefficients between compensation and performance variables. I find that there is a significant positive

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[14] My empirical results are robust to (1) selecting peers from the top *quintile* (instead of the top quartile) of financial reporting comparability, and (2) excluding firm-year observations with fewer than 10 SIC2-FRC-Size peers.
[15] The difference between total compensation and cash plus equity compensation equals deferred and other compensation as reported in ExecuComp.

correlation between own-firm and peer-firm performance. The correlation between own-firm's and peer-firms' stock price performance is approximately 0.50 (p<0.01) for both SIC2-FRC-Size and SIC2-Size peer groups. With respect to accounting performance, the own-firm performance correlation with SIC2-FRC-Size (SIC2-Size) peers is 0.68 (0.34), respectively (significant at the 1% level).

3.4 Empirical model

To test the use of RPE in CEO compensation contracts, I estimate the following model:

$$Pay_{it} = \gamma_0 + \gamma_1 * FirmPerf(RET)_{it} + \gamma_2 * PeerPerf(RET)_{it}$$

$$+ \gamma_3 * FirmPerf(ROA)_{it} + \gamma_4 * PeerPerf(ROA)_{it} + \sum_{k=1}^{K} \lambda_k * Controls_{ikt} + \mu_{it} \qquad (5)$$

where *Pay_{it}* is the CEO's total, cash or equity compensation for firm *i* in fiscal year *t*. *FirmPerf_{it}* is firm *i*'s own performance, measured by either stock price performance (RET) or accounting performance (ROA). *PeerPerf_{it}* is measured by the mean performance of selected peer firms for firm *i* in year *t*. The coefficients on *FirmPerf_{it}* and *PeerPerf_{it}* are of primary interest in determining the use of RPE in compensation contracts. To the extent that CEO compensation is determined based on firm performance relative to that of the RPE peer group, the coefficient on own-firm performance is expected to be positive, while that on peer performance is expected to be negative as follows:

$$\gamma_1 > 0 \text{ and } \gamma_2 < 0 \qquad \text{(for price-based RPE)}$$

$$\gamma_3 > 0 \text{ and } \gamma_4 < 0 \qquad \text{(for accounting-based RPE)}$$

Equation (5) also considers firm and CEO characteristics that can influence CEO compensation, namely firm size, growth, CEO tenure, CEO-Chairman duality, interlock relations, CEO stock-ownership, and regulated industry. Firm size (sales) is expected to be positively associated with CEO compensation level (e.g., Smith and Watts, 1992). CEOs of firms with significant growth options (captured by market-to-book ratio and R&D intensity) are expected to earn higher compensation for bearing risk (e.g., Gaver and Gaver, 1993). CEO tenure, CEO-Chair duality and interlock relations (whether a CEO is seated on the compensation committee) are expected to be positively related to compensation level (e.g., Gong et al., 2011; Albuquerque, 2009). The effect of CEO stock ownership on CEO compensation is not clear *ex ante*. Holderness and Sheehan (1988) provide evidence that managers who are major shareholders receive marginally higher salaries. On the other hand, some prior research has documented that CEO compensation is lower when the CEO's stock ownership is higher (e.g., Core, Holthausen, and Larcker, 1999; Li, Minnis, Nagar, and Rajan, 2014). Thus, it is an empirical question whether CEO ownership has a positive or negative effect on CEO compensation. All regressions are estimated including year and industry fixed effects, with standard errors clustered at the firm level.

4. Empirical results

4.1 The use of accounting-based RPE (H1)

Panel A of Table 3 presents the results of estimating equation (5) with industry-comparability-size peers (SIC2-FRC-Size). In the regression of CEO total compensation (column 1), the coefficient estimates on own-firm stock price performance as well as accounting performance are positive and statistically significant ($p<0.01$), consistent with CEO compensation being tied to own-firm performance. Furthermore, the results support both price-based and accounting-based RPE as evidenced by the significant negative coefficient estimates on peer-firm stock price performance as well as accounting performance. This is novel large-sample evidence in support of accounting-based RPE in CEO compensation contracts for U.S. firms.

In contrast, when the conventional industry-size peers (SIC2-Size) are used, panel B of Table 3 provides evidence of price-based RPE but no evidence of accounting-based RPE in CEO total compensation (column 1), consistent with Albuquerque (2009). Thus, my results suggest that disregarding financial reporting comparability in peer selection for empirical RPE tests limits the ability to detect accounting-based RPE.

The impact of control variables on CEO compensation is consistent with prior findings. In column 1 of panel A, total compensation is higher for CEOs of larger firms and firms with more growth opportunities (captured by R&D intensity). As predicted by prior studies, CEOs in Chair positions, with longer tenure, and low equity ownership are more highly compensated.[16]

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[16] My results are unchanged when I estimate year-wise cross-sectional regressions following Fama and MacBeth (1973).

Although this study mainly focuses on accounting-based RPE, the effect of financial reporting comparability on price-based RPE is of interest as well. It is *ex ante* unclear to what extent comparable accounting systems contribute to comparable stock price performance across firms. Considering the low explanatory power of earnings for stock returns (Lev, 1989), financial reporting comparability may not be a relevant peer selection criterion in assessing the contracting value of peer-firm stock price performance in CEO compensation. To address this concern, I estimate equation (5) using industry-size (SIC2-Size) peers for calculating peer stock-price performance and industry-comparability-size (SIC2-FRC-Size) peers for calculating peer accounting performance. This is consistent with anecdotal evidence of the use of alternate peer groups for accounting- versus price-based RPE.[17] Consistent with panel A of Table 3, the results in panel C support the use of both accounting and price-based RPE in CEO total compensation when different peer groups are used for different performance measures (column 1). Overall, the use of financial reporting comparability as a peer selection criterion helps to obtain significant evidence of accounting-based RPE, whereas it does not dilute the empirical support for price-based RPE.

4.2 Compensation structure and RPE (H2)

4.2.1 Cash vs. equity compensation

Using industry-comparability-size peers (SIC2-FRC-Size), panel A of Table 3 also reports the results of the use of RPE in CEO cash (column 2) and equity compensation (column 3). In the regression of CEO cash compensation (column 2), the

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[17] See Appendix B for such an example relating to *International Paper Co.*

coefficient estimate on own-firm accounting performance is significantly higher than that on own-firm price performance (p<0.01), consistent with cash compensation being more tied to accounting performance (e.g., Jayaraman and Milbourn, 2012). Moreover, consistent with H2a, the coefficient estimate on peer-firm accounting performance is significantly negative, supporting the use of accounting-based RPE in CEO cash compensation. On the other hand, the use of price-based RPE is only marginally significant in explaining cash compensation (significant at the 10% level, one-tailed). In contrast, in the regression of CEO equity compensation (column 3), the coefficient estimate on own-firm stock price performance is positive and significant, but that on own-firm accounting performance is insignificant. Consistently, the results support the use of price-based RPE but not accounting-based RPE in determining CEO equity compensation. Overall, the results show that accounting-based RPE is used in CEO cash compensation but not in CEO equity compensation.[18]

Panel C of Table 3 reports results of regressions of cash compensation (column 8) and equity compensation (column 9) using industry-size (SIC2-Size) peers for calculating peer stock-price performance and industry-comparability-size (SIC2-FRC-Size) peers for calculating peer accounting performance. The results are similar to those reported in panel A using industry-comparability-size (SIC2-FRC-Size) peers for both performance measures, in that the use of accounting-based RPE is more prevalent in determining cash compensation than equity compensation.

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[18] In contrast, when I use industry-size peer selection (panel B of Table 3), there is no evidence of accounting-based RPE in either CEO cash (column 2) or equity compensation (column 3), similar to my finding in relation to total compensation (column 1).

4.2.2 Effect of cash relative to total compensation

To further examine the effect of compensation structure (cash versus equity) on accounting-based versus price-based RPE in CEO total compensation, I estimate equation (5) for terciles sorted annually by the ratio of cash compensation to total compensation.[19] Panel A of Table 4 presents the results using industry-comparability-size (SIC2-FRC-Size) peers. For firms in the middle and top terciles of cash-to-total compensation (columns 2 and 3), I find accounting-based RPE to be significantly related to CEO total compensation, but no evidence of price-based RPE. In contrast, for firms in the bottom tercile of cash-to-total compensation (column 1), I find evidence of the use of price-based RPE, but not accounting-based RPE.

Tercile results using industry-size (SIC2-Size) peers are reported in panel B of Table 4. I find that the use of price-based RPE is significant in the bottom and middle terciles (columns 1 and 2), but not in the top tercile (column 3). This implies that prior findings in support of price-based RPE using industry-size peer selection (e.g., Albuquerque, 2009) may not hold for firms compensating CEOs mainly in cash. Consistent with my findings for the full sample (panel B of Table 3), I find no evidence supporting the use of accounting-based RPE in any tercile group when I use industry-size peers (panel B of Table 4).

Panel C of Table 4 reports results using alternate peer groups for accounting-versus price-based RPE – i.e., industry-size (SIC2-Size) peers for calculating peer stock-price performance and industry-comparability-size (SIC2-FRC-Size) peers for calculating

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[19] The results are robust to using quintiles instead of terciles of the ratio of cash compensation to total compensation.

peer accounting performance. Similar to the results reported in panel A, the use of accounting-based RPE is evident in the middle and top terciles but not in the bottom tercile.

Overall, the subsample analysis in Table 4 shows that the significance of accounting-based RPE in CEO total compensation increases in the fraction of cash to total compensation (consistent with H2b) and reaffirms the role of financial reporting comparability in peer selection in empirical tests of accounting-based RPE.

5. Additional analysis

5.1 Cross-sectional variation in the use of RPE

Insofar as RPE is used to filter out the effect of industry common factors, the contractual demand for RPE will increase in a firm's exposure to industry shocks. To empirically measure a firm's exposure to industry common factors, I first estimate a firm-level time-series regression of firm performance (*FirmPerf*) on industry performance (*IndPerf*) as follows.

$$FirmPerf_{it} = \delta_0 + \delta_1 * IndPerf_{it} + \eta_{it} \tag{6}$$

where performance is measured by quarterly ROA, or monthly stock returns, and *IndPerf* is the average performance of firms in the same two-digit SIC group.[20] Equation (6) is estimated using the previous 20-quarters of data on firm and industry accounting performance. I label the adjusted R^2 from regression (6) *Exposure(ROA)*, which captures firm-year exposure to industry common factors as reflected in accounting earnings. Similarly, the price-version of the exposure measure, *Exposure(RET)*, is the adjusted R^2

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[20] The firm of interest (on the left-hand side) is not included in calculating industry performance.

from estimating equation (6) with 60 previous months of firm and industry stock returns.[21]

Table 5 reports that the significance of accounting-based (price-based) RPE increases in the firm's earnings (stock returns) exposure to industry common factors. The coefficient estimate on peer-firm accounting performance interacted with *Exposure(ROA)* is significantly negative in regressions of total and cash compensation (columns 1 and 2). In relation to price-based RPE, the coefficient estimate on peer-firm stock price performance interacted with *Exposure(RET)* is negative and weakly significant in the regression of total compensation (column 1). Overall, these results suggest that firms are more likely to use RPE in determining CEO compensation when their operations are affected by common industry factors, consistent with contracting theory (e.g., Holmstrom, 1982).

5.2 The recent financial crisis and RPE

Plummeting stock prices during the financial crisis led to a decline in equity compensation. It is therefore plausible that the importance of own-firm price performance and price-based RPE as determinants of CEO's compensation would have also declined in the crisis period. Given this scenario, I examine whether own-firm accounting performance and accounting-based RPE still play a significant role in CEO compensation during the recent financial crisis. Table 6 reports the results of regressions of CEO

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[21] I use the mean-centered values of *Exposure* when interacted with own-firm or peer-firm performance. The use of mean-centered values alleviates multicollinearity concerns arising from the introduction of interaction terms among continuous variables and facilitates the interpretation of the results (e.g., Aiken and West, 1991; Albuquerque, 2014).

compensation on firm and peer performance variables, which are separately measured for the crisis years (2008-2010) and the non-crisis years. In line with the decline in the equity fraction of CEO compensation, I find that the use of own-firm stock price performance in determining CEO total compensation declined substantially during the crisis years. Consistently, peer-firm stock price performance was insignificant in determining CEO total compensation as well as its components during the crisis years. In contrast, the use of own-firm as well as peer-firm accounting performance in determining CEO total and cash compensation remained unaffected. And accounting-based RPE continued to be used as evidenced by the significantly negative coefficient estimate on peer accounting performance in determining CEO total and cash compensation.[22] Overall, Table 6 documents that the contracting value of accounting performance (both own-firm and peer-firm) remained significant during the recent financial crisis, whereas that of stock price performance declined sharply.

5.3 CEO turnover and peer performance

Prior empirical studies show that accounting performance significantly explains CEO turnover (e.g., Bushman and Smith, 2001; Engel, Hayes, and Wang, 2003). Hermalin and Weisbach (1998) show analytically that the stock price embeds the market's expectations about hiring a new CEO, so that earnings is a cleaner signal of the current CEO's talent than the stock price. Given that CEO turnover is associated with

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[22] To ensure that the results presented in this section are not simply reflecting a time trend, I estimate the regression with indicator variables for sub-periods: pre-crisis (2006-2007), crisis (2008-2010), and post-crisis (2011-2012) and interact these variables with performance measures (untabulated). I find that the crisis-period effect on RPE design is only temporary. After the crisis period, the use of price-based RPE is again significant as before.

firm accounting performance measures, peer accounting performance measures are expected to help screen out poor-performing CEOs. Using industry-comparability-size (SIC2-FRC-Size) peers, this section examines the relationship between peer group performance and CEO turnover.

I run a logistic regression of CEO turnover on own-firm and peer-firm performance measures. Consistent with prior studies (e.g., Wu and Zhang, 2010; Jenter and Kanaan, 2015), I also control for CEO age, CEO tenure, CEO-Chairman duality, CEO ownership, firm size and market-to-book ratio. CEO turnover is a dummy variable that equals one if the firm's CEO does not continue as CEO or hold any other director or executive position in the same firm in the next year (as reported by ExecuComp). This definition rules out cases such as the former CEO becoming Chairman in the next year after stepping down from the CEO position. The average CEO turnover rate is 5% in my sample.

Table 7 presents the results of the relation between peer-firm performance and CEO turnover. I find that CEO turnover is inversely related to both own-firm accounting and stock price performance. When the peer group is composed of industry-comparability-size (SIC2-FRC-Size) firms (column 1), the role of accounting-based RPE is supported, as evidenced by the significantly positive coefficient on peer-firm accounting performance, whereas the role of price-based RPE is insignificant. For comparison, using the conventional industry-size (SIC-Size) peers, I find no relation between CEO turnover and peer-firm price as well as peer-firm accounting performance (column 2). Thus, similar to the results in relation to CEO compensation, the results of

CEO turnover reaffirm that the use of peer-firm accounting information as an evaluation benchmark is evident only when the peer group includes firms with high financial reporting comparability.

5.4 Proxy statement disclosure of company's RPE peer firms

The SEC's 2006 executive compensation disclosure rules, effective December 15, 2006, require firms to disclose detailed information on the performance targets (e.g., RPE peers) used in setting executive pay. In this section, I investigate the extent to which financial reporting comparability explains the actual choice of RPE peers observed in the Compensation Discussion and Analysis (CD&A) section of proxy statements.

The *Incentive Lab* provides detailed data from proxy statements (DEF 14A) on various aspects of executive compensation contracts for the largest 750 firms in a given year, resulting in 11,920 firm-years during and after fiscal year 2006. Of these, 1,643 firms (about 14%) provide a list of RPE peer firms used in their CEO compensation contracts. If firms implement RPE solely with the market index (e.g., S&P 500) or industry index, or mention the use of RPE without providing details of peer firms, I classify them as non-RPE disclosers. I only retain peer firms whose financial reporting comparability (FRC) is measurable. The final sample of explicit-disclosers of RPE peers contains 1,436 firm-year observations (18,910 firm-year-peers). [23]

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[23] I also examine the extent to which Incentive Lab data overlaps with ExecuComp data with respect to RPE tests, and find the following. i) Firms' disclosed RPE peer selection from Incentive Lab results in a far less comprehensive sample than selecting SIC2-FRC-Size peers using ExecuComp as in my study. Out of 1,643 firm-years, where firms' actual RPE peer selection is available, 861 firm-years also appear in my main ExecuComp-based sample. For the same period (FY 2006-2013), my main ExecuComp-based sample contains 8,814 firm-years, resulting in about a 10% overlap rate (=861/8,841). ii) In comparing SIC2-FRC-Size peers with firms' explicit RPE peers, I find that about 78% (671) of the 861 firms which appear in

The mean (median) number of peers in the disclosed peer groups is about 13 (11) firms. About 71 (38)% of the explicitly-disclosed peer firms are in the same SIC 2-digit (4-digit) industry as the RPE discloser, consistent with firms' preference for selecting peers from the same industry. To test whether explicit RPE peers are selected by firms based on financial reporting comparability (FRC), I estimate the following logistic regression:

$$Prob(Selected_{ijt} = 1) = \Phi(\rho_0 + \rho_1 * FRC_{ijt} + \sum_{k=1}^{K} \upsilon_k * Controls_{ijkt}) \tag{7}$$

where $Selected_{ijt}$ is a dummy variable that equals 1 if firm j is selected to be a member of the RPE peer group by an explicit-discloser i for year t, and 0 otherwise. Because of the highly unbalanced sample of RPE peers selected by a firm compared to the Compustat universe, the estimated coefficients from logistic regressions could be biased and inefficient. To alleviate this concern, I follow the procedure in Gong et al. (2011) to form a control group of potential peer candidates that are not chosen by a certain RPE discloser. Out of the population of Compustat firms that are not chosen by the explicit RPE discloser, I randomly choose the same number of control firms as the number of explicit peers.

Table 8 reports the results of the logistic regression of the determinants of actual RPE peer selection using 37,820 firm-year-peer observations (18,910 disclosed explicit peers and 18,910 matched control firms). I find that financial reporting comparability (FRC) is a significant determinant of the actual RPE peer selection after controlling for

both Incentive Lab and ExecuComp have at least one RPE peer firm in common. iii) And, among firms with overlapping peers, on average, about 33% of SIC2-FRC-Size peer firms are also found in the explicitly disclosed peer list from Incentive Lab.

industry, index, size and profitability.[24] Thus, based on firms' actual peer selection

choice, the results in Table 8 validate the use of financial reporting comparability as a

peer selection criterion for conducting regression-based RPE tests.

5.5 Alternative measure of financial reporting comparability

Since the DKV measure is based on the earnings-returns relation, it might be

affected by factors external to the accounting system. In cases where the relation between

earnings and returns is weak (e.g., high-tech firms), it is questionable to what extent the

DKV measure captures the similarities of two firms' accounting systems. Further,

although earnings are arguably the most important summary measure of accounting

performance, the DKV measure does not capture financial reporting decisions beyond

income statements (p.927, De Franco et al., 2011).

To alleviate these concerns, I replace DKV's base model, equation (1), with the

accruals-cash flows relations. Since accruals and cash flows are direct outputs of a firm's

financial reporting decisions, the mapping of accruals into cash flows can highlight the

effect of accounting factors on cross-firm financial reporting comparability. I first

estimate the following firm-level regressions over previous 16 (minimum 12) quarters.[25]

$$Accruals_{it} = \alpha_i + \beta_{i1}*CFO_{it-1} + \beta_{i2}*CFO_{it} + \beta_{i3}*CFO_{it+1} + \varepsilon_{it} \qquad (8)$$

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[24] Gong et al. (2011) argue that larger or more profitable firms could be more likely to be selected as peer firms (i.e., symbolism). In consistent, column 3 of Table 8 reports that peer-firm size (SALES_peer and MVE_peer) and profitability (RET_peer and ROA_peer) load positively.

[25] Dechow and Dichev (2002) estimate the same model on the annual basis. To make the empirical outputs comparable to DKV's financial reporting comparability, I estimate equation (8) using quarterly data. Cascino and Gassen (2015) similarly estimate financial reporting comparability based on the contemporaneous relation between total accruals and cash flow from continuing operations, but they do not include lagged and lead cash flows.

where *Accruals* is the change in working capital, and *CFO* is the cash flow from operation (OANCFY). [26] The coefficient estimates from equation (8), $\hat{\beta}_{i1}, \hat{\beta}_{i2}$, and $\hat{\beta}_{i3}$ are firm-specific accounting system parameters that map accruals of firm i into firm i's lagged, current, and lead cash flow from operations. Similarly, I estimate $\hat{\beta}_{j1}, \hat{\beta}_{j2}$, and $\hat{\beta}_{j3}$ as the parameters of the accounting system of peer firm j. I calculate the predicted accruals of firm i by applying the parameter estimates of the accounting systems of firm i and firm j, respectively, to firm i's cash flow from operations as follows:

$$\text{E}(Accruals)_{iit} = \hat{\alpha}_i + \hat{\beta}_{i1}*\ CFO_{it-1} + \hat{\beta}_{i2}*\ CFO_{it} + \hat{\beta}_{i3}*\ CFO_{it+1,} \tag{9}$$

$$\text{E}(Accruals)_{ijt} = \hat{\alpha}_i + \hat{\beta}_{j1}*\ CFO_{it-1} + \hat{\beta}_{j2}*\ CFO_{it} + \hat{\beta}_{j3}*\ CFO_{it+1.} \tag{10}$$

Equation (9) estimates the predicted accruals of firm i based on the accounting system parameters of firm i, whereas equation (10) estimates the predicted accruals of firm i based on the accounting system parameters of firm j. Following the original DKV method, the alternative measure of financial reporting comparability, $FRC_{DD,}$ is defined as the negative value of absolute difference between the predicted accruals estimated from equation (9) and equation (10) averaged over the preceding 16 quarters.

From the top quartile of financial reporting comparability measured by FRC_{DD} in the same industry (SIC 2-digit), I choose the top 10 (minimum 5) peer firms that are closest in size relative to the treatment firm based on beginning-of-year market capitalization. Using these selected peer firms (SIC2-FRC_{DD}-Size), Table 9 reports the

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[26]*Accruals* is measured as the increase in account receivable (RECCHY) plus the increase in inventory (INVCHY) plus the decreases in taxes accrued (TXACHY) plus the decrease in accounts payable and accrued liabilities (APALCHY) plus the increase (decreases) in other assets (liabilities) (AOLOCHY) , and multiplied by (-1). Since Compustat provides the year-to-date values of these items, including OANCFY, it is necessary to adjust raw value to quarterly changes before entering into equation (6). The variables are scaled by the lagged total assets.

regression estimation of equation (5). Similar to the case where the original DKV measure is used (Table 3, panel A), I find significant evidence that both accounting-based and price-based RPE are used in total compensation level while accounting-based (price-based) RPE is more prevalent in cash (equity) compensation.

6. Conclusion

Anecdotal evidence suggests that CEO compensation is determined based on own-firm accounting performance relative to peer-firm accounting performance. However, there is limited empirical evidence of accounting-based RPE in the broad cross-section of U.S. firms. The results in this study suggest that the lack of empirical support may be because prior studies disregard financial reporting comparability in selecting RPE peers. In addition to industry and size (e.g., Albuquerque, 2009), I introduce financial reporting comparability as a peer selection criterion. Using industry-size peers with high financial reporting comparability, I provide novel large-sample evidence of the significant use of accounting-based RPE in determining CEO total compensation in the U.S. Further, my results show that the use of accounting-based RPE is more prevalent in CEO cash compensation than in equity compensation, and the use of accounting-based RPE increases with the fraction of CEO cash compensation to total compensation. These results suggest that the RPE design varies with the underlying CEO compensation structure.

Interestingly, I find that the use of own-firm accounting performance measures and accounting-based RPE are significant determinants of CEO total compensation in the

recent financial crisis. Consistent with a decline in equity compensation, the use of own-firm prices and price-based RPE declined sharply during the crisis. Thus, it appears that when stock prices are less reflective of firm performance, accounting performance measures assume greater importance in determining CEO compensation.

Overall, this paper supports the hypothesis that peer-firm accounting measures provide incremental information useful for CEO compensation contracts. Moreover, the results highlight that financial reporting comparability is a key attribute that facilitates the use of multi-firm accounting information in evaluating CEO performance.

Table 1 Sample selection

	CEO-year
CEO-year observations with non-missing total compensation in ExecuComp (FY 1993-2013)	37,053
Less: CEO with tenure less than 12 months or multiple CEOs	5,163
Missing or ambiguous CRSP matching	1,930
Treatment firms with missing variables	6,333
Too few candidate peer firms	3,619
Final sample	20,008

Table 2 Descriptive statistics and correlations
Panel A: Descriptive statistics

Variable	N	Mean	Std Dev	Q1	Median	Q3
CEO characteristics						
Total pay $_{(\$000)}$	20,008	4965.91	9782.97	1361.07	2835.97	5873.82
Cash pay $_{(\$000)}$	20,008	1849	2323.83	717.8945	1225	2217.64
Equity pay $_{(\$000)}$	20,008	2879.74	8897.77	241.28	1170.55	3267.49
Cash/Total	20,008	0.53	0.27	0.32	0.50	0.72
Tenure $_{(months)}$	20,008	106.79	87.73	47	80	139
Chair $_{(dummy)}$	20,008	0.63	0.48	0	1	1
Ownership $_{(\%)}$	20,008	0.023	0.059	0.0011	0.0036	0.0132
Interlock	20,008	0.042	0.200	0	0	0
Turnover $_{(dummy)}$	18,391	0.048	0.214	0	0	0
Age	19,435	56.01	7.064	51	56	61
Own-firm characteristics						
RET	20,008	0.053	0.440	-0.141	0.099	0.298
ROA	20,008	0.043	0.096	0.013	0.046	0.089
SALES	20,008	7.207	1.558	6.135	7.119	8.260
MB	20,008	1.890	1.332	1.098	1.447	2.138
R&D intensity	20,008	0.087	1.395	0	0	0
Regulated industry	20,008	0.063	0.242	0	0	0
Exposure $_{(RET)}$	20,008	0.270	0.175	0.127	0.249	0.393
Exposure $_{(ROA)}$	19,794	0.148	0.185	0.017	0.076	0.212
Peer-firm performance						
RET$_{SIC2\text{-}FRC\text{-}Size}$	20,008	0.107	0.292	-0.029	0.132	0.271
RET$_{SIC2\text{-}SIZE}$	20,008	0.096	0.280	-0.045	0.123	0.263
ROA$_{SIC2\text{-}FRC\text{-}Size}$	20,008	0.038	0.074	0.014	0.042	0.075
ROA$_{SIC2\text{-}SIZE}$	20,008	0.034	0.058	0.015	0.041	0.070

Continuous variables are winsorized at 1% and 99 % levels. Variables are defined in Appendix A.

Table 2 (Continued)

Panel B: Pearson correlation (compensation and performance)

	Total pay	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Cash Pay	**0.434**							
(2) Equity Pay	**0.962**	**0.199**						
(3) RET	**0.036**	**0.109**	0.012					
(4) ROA	**0.074**	**0.113**	**0.053**	**0.303**				
(5) RET$_{\text{SIC2- FRC-Size}}$	-0.012	**0.029**	**-0.020**	**0.502**	**0.151**			
(6) RET$_{\text{SIC2-SIZE}}$	-0.005	**0.032**	-0.014	**0.555**	**0.094**	**0.723**		
(7) ROA$_{\text{SIC2- FRC-Size}}$	0.065	0.097	**0.044**	**0.140**	**0.677**	**0.210**	0.091	
(8) ROA$_{\text{SIC2-SIZE}}$	**0.104**	**0.164**	**0.068**	**0.103**	**0.337**	**0.157**	**0.203**	**0.481**

Coefficient estimates in bold reflect 5% significance level or better.

Table 3 Use of price-based and accounting-based RPE in CEO compensation
Panel A: Industry-Comparability-Size (SIC2-FRC-Size) peers

Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET	+	0.203***	0.203***	0.384***
		(12.73)	(17.65)	(7.41)
PeerRET	-	**-0.102***	-0.026	**-0.177**
		(-4.109)	(-1.432)	(-2.057)
FirmROA	+	0.562***	1.082***	-0.274
		(3.83)	(9.90)	(-0.630)
PeerROA	-	**-0.363**	**-0.671***	-0.148
		(-2.020)	(-5.230)	(-0.285)
Sales	+	0.413***	0.324***	0.621***
		(36.27)	(33.30)	(16.84)
MB	+	-0.112	-0.011	0.001
		(-0.312)	(-1.041)	(1.15)
R&D intensity	+	0.020*	0.017**	0.040*
		(1.86)	(2.42)	(1.93)
Regulated Industry	-	-0.201*	0.051	-0.656
		(-1.837)	(0.67)	(-1.580)
Interlock	+	-0.144**	-0.103**	-0.813***
		(-2.453)	(-2.442)	(-3.793)
CEO tenure	+	0.027*	0.034***	-0.185***
		(1.68)	(2.60)	(-3.539)
CEO-Chair	+	0.128***	0.137***	0.136*
		(5.14)	(6.66)	(1.67)
CEO Ownership	?	0.095***	0.066***	0.361***
		(3.58)	(3.17)	(4.17)
# of obs.		20,008	20,008	20,008
Adj. R^2		0.4869	0.5029	0.1696

Table 3 (continued)

Panel B: Industry-Size (SIC2-Size) peers

Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET	+	0.246***	0.224***	0.467***
		(14.83)	(17.32)	(8.62)
PeerRET	-	**-0.182***	**-0.067***	**-0.500***
		(-7.045)	(-3.368)	(-5.108)
FirmROA	+	0.157	0.749***	-0.306
		(1.26)	(7.90)	(-1.113)
PeerROA	-	0.572*	0.629*	3.736***
		(1.90)	(1.79)	(7.48)
Controls		Yes	Yes	Yes
# of obs.		20,008	20,008	20,008
Adj. R2		0.4948	0.4948	0.1725

Panel C: Industry-Size peers for PeerRET and Industry-Comparability-Size peers for PeerROA

Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET	+	0.214***	0.204***	0.411***
		(13.12)	(16.17)	(7.69)
PeerRET	-	**-0.118***	**-0.035*	**-0.363***
		(-4.669)	(-1.773)	(-3.771)
FirmROA	+	0.631***	1.138***	-0.144
		(4.66)	(11.34)	(-0.361)
PeerROA	-	**-0.442***	**-0.580***	-0.028
		(-2.788)	(-4.987)	(-0.058)
Controls		Yes	Yes	Yes
# of obs.		20,008	20,008	20,008
Adj. R^2		0.4877	0.4984	0.1728

This table presents the results of the OLS estimation of equation (5) testing for the use of RPE in CEO compensation. Panel A reports results using industry-comparability-size peers to measure peer performance. From the same-industry firms in the top quartile of financial reporting comparability, I select the top 10 (minimum 5) peer firms that are closest in size to the treatment firm (SIC2-FRC-Size). In Panel B, I use industry-size peers (SIC2-Size), and in Panel C, I use industry-size peers (SIC2-Size) for peer-firm stock price performance, and industry-comparability-size peers (SIC2-FRC-Size) for peer-firm accounting performance. Coefficients reported in bold are consistent with the existence of RPE. Industry and year fixed effects are included. T-statistics (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 4 Cash fraction of CEO compensation and RPE
Panel A: Industry-Comparability-Size (SIC2-FRC-Size) peers

Pay type = total compensation		Cash to total compensation		
		Bottom Tercile (1)	Middle Tercile (2)	Top Tercile (3)
FirmRET	+	0.239***	0.173***	0.216***
		(11.42)	(9.43)	(10.70)
PeerRET	-	**-0.154***	-0.021	-0.027
		(-4.528)	(-0.816)	(-0.768)
FirmROA	+	0.813***	1.288***	0.762***
		(5.22)	(9.82)	(3.29)
PeerROA	-	-0.251	**-0.693***	**-0.814***
		(-1.212)	(-3.938)	(-3.725)
Sales	+	0.314***	0.392***	0.388***
		(27.30)	(47.21)	(18.14)
MB	+	0.001	0.110*	0.000
		(1.25)	(1.74)	(-0.567)
R&D intensity	+	0.084***	0.063***	0.013***
		(4.02)	(6.04)	(5.19)
Regulated Industry	-	-0.054	-0.241***	-0.08
		(-0.454)	(-3.671)	(-0.818)
Interlock	+	0.059	0.008	-0.134**
		(0.83)	(0.16)	(-2.308)
CEO tenure	+	0.099***	0.026**	-0.005
		(5.48)	(1.97)	(-0.270)
CEO-Chair	+	0.041	0.131***	0.231***
		(1.57)	(7.07)	(6.15)
CEO Ownership	?	-0.001	0.034*	0.093***
		(-0.034)	(1.68)	(2.66)
# of obs.		6,661	6,674	6,668
Adj. R^2		0.4725	0.697	0.5506

Table 4 (continued)

Panel B: Industry-Size (SIC2-Size) peers

Pay type = total compensation		Cash to total compensation		
		Bottom Tercile (1)	Middle Tercile (2)	Top Tercile (3)
FirmRET	+	0.273***	0.213***	0.238***
		(12.65)	(12.04)	(10.93)
PeerRET	-	**-0.244***	**-0.107***	-0.013
		(-6.836)	(-3.948)	(-0.370)
FirmROA	+	0.606***	0.887***	0.325*
		(4.65)	(7.86)	(1.84)
PeerROA	-	1.349***	0.572***	0.507**
		(6.44)	(4.10)	(2.52)
Controls		Yes	Yes	Yes
# of obs.		6,661	6,674	6,668
Adj. R2		0.4752	0.6986	0.5508

Panel C: Industry-Size peers for PeerRET and Industry-Comparability-Size peers for PeerROA

Pay type = total compensation		Cash to total compensation		
		Bottom Tercile (1)	Middle Tercile (2)	Top Tercile (3)
FirmRET	+	0.259***	0.187***	0.195***
		(11.38)	(10.18)	(8.66)
PeerRET	-	**-0.185***	**-0.084***	0.002
		(-4.959)	(-2.914)	(0.069)
FirmROA	+	0.760***	1.260***	0.900***
		(4.93)	(9.52)	(4.06)
PeerROA	-	-0.326	**-0.683***	**-0.751***
		(-1.635)	(-4.080)	(-3.482)
Controls		Yes	Yes	Yes
# of obs.		6,661	6,674	6,668
Adj. R^2		0.4719	0.6975	0.5474

This table presents the results of the OLS estimation of equation (5) for terciles sorted annually by the ratio of cash compensation to total compensation. Panel A reports results using industry-comparability-size peers to measure peer performance. In panel B, I use industry-size peers (SIC2-Size). In panel C, I use industry-size peers (SIC2-Size) for *PeerRET*, and industry-comparability-size peers (SIC2-FRC-Size) for *PeerROA*. Coefficients reported in bold are consistent with RPE usage. Industry and year fixed effects are included. T-statistics (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 5 Cross-sectional variation in the use of RPE: Exposure to industry commonalities

Peer selection		SIC2-FRC-Size		
Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET	+	0.213***	0.204***	0.385***
		(12.75)	(17.25)	(7.22)
PeerRET	-	-0.114***	-0.038**	-0.210**
		(-4.517)	(-2.041)	(-2.398)
PeerRET*Exposure(RET)	**-**	-0.168*	-0.065	-0.06
		(-1.777)	(-0.846)	(-0.162)
Exposure(RET)	?	0.386***	0.019	1.274***
		(5.39)	(0.34)	(5.13)
FirmROA	+	0.566***	1.102***	-0.149
		(3.75)	(9.87)	(-0.336)
PeerROA	-	0.321	-0.235	1.02
		(1.53)	(-1.461)	(1.56)
PeerROA*Exposure(ROA)	**-**	-1.326***	-0.595*	-1.208
		(-2.735)	(-1.759)	(-0.771)
Exposure(ROA)	?	-0.059	-0.086**	-0.308*
		(-1.188)	(-2.154)	(-1.788)
Controls		Yes	Yes	Yes
# of obs.		18,020	18,020	18,020
Adj. R^2		0.4941	0.5012	0.175

This table reports results of the effect of exposure to industry common factors on RPE usage. Exposure(RET or ROA) is the adjusted R^2 obtained from a firm-level regression of firm performance on industry performance (equation 6). Industry and year fixed effects are included. T-statistics (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 6 Recent financial crisis and RPE

Peer selection		SIC2-FRC-Size		
Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET(Non-Crisis)	+	0.242***	0.215***	0.436***
		(13.23)	(16.34)	(7.71)
FirmRET(Crisis)	+	0.066***	0.140***	0.06
		(2.96)	(7.04)	(0.64)
PeerRET(Non-Crisis)	-	**-0.104***	-0.027	**-0.179**
		(-4.041)	(-1.429)	(-2.061)
PeerRET(Crisis)	**-**	0.004	0.027	0.105
		(0.11)	(0.79)	(0.71)
FirmROA(Non-Crisis)	+	0.614***	1.128***	0.112
		(3.92)	(10.21)	(0.25)
FirmROA(Crisis)	+	0.701***	1.181***	-0.703
		(3.87)	(7.37)	(-1.053)
PeerROA(Non-Crisis)	-	**-0.454**	**-0.559***	-0.435
		(-2.373)	(-4.066)	(-0.802)
PeerROA(Crisis)	-	**-0.302*	**-0.644***	1.087
		(-1.753)	(-3.257)	(1.283)
Crisis	**?**	-0.036	0.085***	-0.274***
		(-1.378)	(3.70)	(-2.655)
Controls		Yes	Yes	Yes
# of obs.		20,008	20,008	20,008
Adj. R^2		0.4884	0.4985	0.1728

This table reports results of the effect of the recent financial crisis on RPE use in CEO compensation over the sample period FY 1993 to 2013. Performance variables are separately measured for the crisis years (2008-2010) and non-crisis years (1993-2007 and 2011-2013). CRISIS is equal to 1 for the period 2008-2010, and 0 otherwise. Industry and year fixed effects are included. T-statistics (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 7 CEO turnover and RPE

Peer selection		SIC2-FRC-Size	SIC2-Size
		(1)	(2)
FirmRET	-	-0.698***	-0.707***
		(-3.89)	(-4.05)
PeerRET	+	0.211	0.248
		(1.06)	(1.11)
FirmROA	-	-4.054***	-3.527***
		(-6.55)	(-7.92)
PeerROA	+	**1.480***	0.405
		(2.40)	(0.50)
Age	+	0.083***	0.082***
		(9.92)	(10.40)
Age_6365	+	0.802***	0.754***
		(6.75)	(6.51)
CEO tenure	+	0.115*	0.110*
		(1.67)	(1.70)
CEO-Chair	-	-0.545***	-0.505***
		(-5.16)	(-5.02)
CEO ownership	+	0.973***	0.969***
		(8.18)	(8.47)
Size	?	0.000	-0.013
		(0.00)	(-0.35)
MB	?	0.002	0.002
		(1.01)	(1.27)
# of obs.		16,218	16,218
Pseudo R^2		0.0336	0.0327

This table provides the results of a logistic regression of CEO turnover on performance measures and control variables. The dummy dependent variable, CEO turnover, is equal to 1 in the year in which the current CEO is replaced. Industry and year fixed effects are included. z-stats (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively (P>|z|).

Table 8 Proxy statement disclosure of RPE peer selection (Dep. Var. = Selected)

		(1)	(2)	(3)
FRC	+	25.340***	23.560***	23.208***
		(10.63)	(9.56)	(7.06)
Same_SIC2	+	3.708***	3.083***	3.108***
		(20.28)	(16.59)	(16.72)
Same_SIC4	+	2.355***	1.657***	1.686***
		(15.04)	(11.27)	(11.29)
S&P500	+	0.06	2.324***	1.868***
		(0.47)	(14.81)	(11.90)
SALES_gap	-		-0.055***	-0.124***
			(-2.65)	(-3.17)
MVE_gap	-		-0.008	-0.017
			(-0.69)	(-0.97)
RET_gap	-		-0.629***	-0.726***
			(-7.34)	(-8.35)
ROA_gap	-			-1.146***
				(-2.43)
SALES_peer	+			0.000***
				(4.51)
MVE_peer	+			0.000
				(0.45)
RET_peer	+			0.279***
				(4.94)
ROA_peer	+			2.011***
				(6.25)
# of observations		37,820	37,820	37,820
Pseudo R-Square		0.498	0.5066	0.5165

This table reports the results of the logistic regression of the determinants of actual RPE peer selection using 37,820 firm-year-peer observations (18,910 disclosed explicit peers obtained from Incentive Lab (FY 2006-2013) and 18,910 matched control firms). The dependent variable (Selected) is a dummy variable equal to 1 if a peer firm is listed in the proxy statement of an RPE discloser, 0 otherwise. Year fixed effects are included in the regressions. All variables are defined in Appendix A. z-stats (in parentheses) are based on robust standard errors clustered at the firm level. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively ($P>|z|$).

Table 9 Financial reporting comparability based on accruals-cash flow relation (FRC_{DD})

Peer selection		SIC2-FRC_{DD}-Size		
Pay type		Total	Cash	Equity
		(1)	(2)	(3)
FirmRET	+	0.186***	0.190***	0.339***
		(10.76)	(14.83)	(6.30)
PeerRET	-	**-0.047***	-0.005	**-0.176***
		(-1.855)	(-0.231)	(-1.949)
FirmROA	+	0.360***	0.899***	-0.323
		(2.59)	(8.64)	(-0.774)
PeerROA	-	**-0.099***	**-0.34****	0.428
		(-1.891)	(-3.254)	(0.96)
Controls		Yes	Yes	Yes
# of obs.		15,523	15,523	15,523
Adj. R^2		0.4744	0.5065	0.1622

This table provides the regression estimates of equation (5) testing for the use of RPE in CEO compensation. Industry-comparability-size (SIC2-FRC_{DD}-Size) peers are selected using an alternative measure of financial reporting comparability, FRC_{DD}, which is based on the accruals-cash flow relation (Dechow and Dichev, 2002). Coefficients reported in bold are consistent with the existence of RPE. Industry and year fixed effects are included. T-statistics (in parentheses) are based on firm-level clustered standard errors. Continuous variables are winsorized at 1% and 99% levels. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

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Appendix A - Variable definitions

Variable	Description
Total compensation	TDC1 from ExecuComp, log-transformed in regression. TDC1 comprises salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using the Black-Scholes formula), long-term incentive payouts, and all other compensation, for fiscal years ending before 12/15/2006. (OLD_DATAFMT_FLAG=0). For fiscal years ending after 12/15/2006 (OLD_DATAFMT_FLAG =1), TDC1 is the sum of salary, bonus, non-equity incentive plan compensation, grant-date fair value of stock awards, grant-date fair value of option awards, deferred compensation, and other compensation.
Cash compensation	The sum of salary and bonus. Log-transformed in the regression.
Equity compensation	The sum of the value of restricted stock granted and stock options granted (using the Black-Sholes formula) before 12/15/2006; the sum of grant-date fair value of stock awards and the grant-date fair value of option awards after 12/15/2006. Log-transformed in the regression.
FirmRET	Own-firm stock price performance. $\log(1+retann)$, where retann is the annual compounded stock returns using CRSP monthly returns (Albuquerque, 2014).
PeerRET	Peer-form stock price performance. The average stock returns of firms in an RPE peer group. Log-transformed in the regression.
FirmROA	Own-firm accounting performance. The annual income before extraordinary items divided by lagged total assets (ROA). Natural logarithm of 1 plus ROA in the regression (Albuquerque, 2014).
PeerROA	Peer-firm accounting performance. The average accounting performance of firms in an RPE peer group. Log-transformed in the regression.
SIC2	Two-digit SIC industry group
SIC4	Four-digit SIC industry group
Size	The beginning-of-year market capitalization. Used in RPE peer selection.
FRC	Financial reporting comparability as measured by the procedure in De Franco et al. (2008). See Section 3.2.1.
SIC2-Size	A peer group of the top 10 firms closest in size (beginning-of-year market capitalization) and in the same two-digit SIC industry group as the treatment firm.
SIC2-FRC-Size	A peer group based on industry, financial reporting comparability, and firm size. From the same-industry firms in the top quartile of financial reporting comparability, I select the top 10 (minimum 5) peer firms that are closest in size to the treatment firm.
Sales	The natural logarithm of sales
MB	A proxy for growth options. The ratio of the market value of the firm to the book value of assets. The market value of the firm is the book value of assets (AT) minus the book value of equity (CEQ+TXDITC) plus the market value of equity

	(CSHO*PRCC_F).
Exposure	The adjusted R2 from a firm-level time-series regression of firm performance on industry performance. The regression is estimated using 60 months of stock price performance (RET) or 20 quarters of accounting performance (ROA).
Regulated industry	A dummy variable equal to 1 for firms that are gas and electric utilities with SIC codes 4900-4939, and 0 otherwise (Albuquerque, 2009).
CEO tenure	The number of months between the CEO appointment date (BECAMECEO) in ExecuComp and the fiscal year end date. Log-transformed in the regression.
CEO-Chair	A dummy variable that equals 1 if the CEO is the board chair as identified in the TITLEANN filed of ExecuComp, 0 otherwise.
CEO Ownership	A dummy variable equal to 1 if the CEO ownership share, SHROWN_EXCL_OPTS/(SHROUT*1000), is lower than the median for the year across CEOs in the sample and 0 otherwise.
AGE	CEO age (AGE from ExecuComp)
AGE_6365	A dummy variable equal to 1 if CEO age is between 63 and 65, and 0 otherwise.
CEO turnover	A dummy variable equal to 1 if the current CEO is not included in the executive/director list of the same firm in the following year, and 0 otherwise.
CRISIS	A dummy variable equal to 1 for years 2008, 2009, and 2010, and 0 otherwise.
Selected	A dummy variable equal to 1 if a firm is disclosed as an RPE peer according to the expanded SEC disclosure rule, effective 12/15/2006, 0 otherwise.
Same_SIC2	A dummy variable equal to 1 if a selected peer firm belongs to the same SIC2 group as an RPE discloser.
Same_SIC4	A dummy variable equal to 1 if a selected peer firm belongs to the same SIC4 group as an RPE discloser.
SALES_gap	The absolute difference in sales between an RPE discloser and a selected peer firm, divided by the sales of the RPE discloser.
MVE_gap	The absolute difference in market capitalization between an RPE discloser and a selected peer firm, divided by the market capitalization of the RPE discloser.
RET_gap	The absolute difference in annual stock returns between an RPE discloser and a selected peer firm.
ROA_gap	The absolute difference in ROA between an RPE discloser and a selected peer firm.
S&P500	A dummy variable equal to 1 if a peer firm belongs to S&P 500 in that year.
RPE discloser	A firm which discloses the list of specific firms that are used as RPE peers in the proxy statement. If a firm uses an index to represent peer performance, that firm is not classified as an RPE discloser.

Appendix B - Examples of RPE in CEO compensation contracts

Below are excerpts from the CD&A reports in the proxy statements of two companies for the fiscal year 2013. Pacific Gas and Electric Corp. uses price-based RPE in determining executive compensation. And International Paper Co. applies different peer groups for accounting-based versus price-based RPE. Both firms disclose their RPE peer firms.

Pacific Gas and Electric Corp

Each year, PG&E Corporation and the Utility also identify a Performance Comparator Group that is used only for evaluating the company's relative TSR (total shareholder return) performance to determine payouts for LTIP performance share awards. In determining the composition of the Performance Comparator Group for 2013, the Committee decided that the Performance Comparator Group will include companies (1) that are categorized consistently by the investment community as "regulated," as opposed to "less regulated," based on analysis of revenue sources (i.e., the companies have business models similar to PG&E Corporation and the Utility), and (2) that have a market capitalization of at least $4 billion. The Committee first selected companies listed on the Philadelphia Utility Index that meet these criteria and then selected additional companies that also meet these criteria. A total of 12 companies were included in the 2013 Performance Comparator Group.

> American Electric Power
> CMS Energy
> Consolidated Edison
> DTE Energy
> Duke Energy
> NiSource, Inc.
> Northeast Utilities
> Pinnacle West Capital
> SCANA Corp.
> Southern Company
> Wisconsin Energy Corporation
> Xcel Energy, Inc.

International Paper Co

Our incentive compensation plans are designed around achievement of pre-established performance objectives that will drive improved financial performance of the Company. Each year the Committee assesses the appropriateness of the performance metrics, and makes adjustments based on the financial objectives most critical to the Company's success.

ROIC (Return on invested Capital) Peer Group

ROIC is calculated as operating earnings before interest (including both earnings from continuing and discontinued operations up through the date of sale), and before the impact of special items

and non-operating pension expense, divided by average invested capital. Invested capital is total equity (adjusted for pension) plus interest bearing liabilities.

Boise Inc.
Domtar Inc.
Fibria Celulose S.A.
Klabin S.A.
Metsa Board (formerly M-real Corp)
MeadWestvaco Corp
Mondi Group
Packaging Corporation of America
RockTenn Company
Smurfit Kappa Group
Stora Enso Corp
UPM-Kymmene Corp

TSR (Total Shareholder Return) Peer Group

Alcoa Inc.
Domtar Inc.
Dow Chemical Company
E.I. DuPont de Nemours & Co.
Fibria Celulose S.A.
Klabin S.A.
MeadWestvaco Corp
Mondi Group
Packaging Corporation of America
RockTenn Company
S&P 100 Index
S&P Basic Materials Index
Sappi Limited
Smurfit Kappa Group
Stora Enso Corp
United States Steel Corp
UPM-Kymmene Corp