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Preaching Water But Drinking Wine? Relative Performance Evaluation in International Banking

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Abstract

Relative performance evaluation (RPE) is, at least on paper, enjoying widespread popularity in determining the level of executive compensation. Yet existing empirical evidence of RPE is decidedly mixed. Two principal explanations are held responsible for this discord. A constructional challenge arises from intricacies of identifying the correct peers. And on a simpler note, corporate commitments to RPE could be mere exercises in empty rhetoric. We address both issues and test the use of RPE in a new sample of large international non-U.S. banks. Taken as a whole, the banks in our sample show moderate evidence consistent with RPE. We report stronger evidence once we investigate the subsample of banks that disclose the use of peers in their compensation schemes. This finding lends support to the credibility and thus informational value of RPE commitments. Digging deeper, we find that RPE usage is driven by firm size and growth options.

Keywords: Relative Performance Evaluation, Executive Compensation, Peers, Banks, Disclosure

JEL classification: J33, D86, G3, G21

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1 Introduction

The rise in executive compensation in international banking in the last two decades has been striking. By the end of 2003 Citigroup, Lehman Brothers, and Bear Stearns, large players in the banking industry at that time, were run by CEOs whose earnings were among the top ten in the S&P 500 (Hodgson 2004). Two of these banks - Lehman Brothers and Bear Stearns - happened to collapse in 2008, triggering a global economic panic and unfolding the recent financial crisis. According to Bebchuk et al. (2010), in spite of obvious mismanagement the executives of these banks had received considerable performance-based compensation packages during the years preceding the financial crisis. It stands to reason that the effectiveness of such compensation schemes have since become subject of ever more heated discussions. Sure enough, the recent rise in executive compensation is not confined to the banking industry. Other industries have been following the same trend. Murphy (2012) documents that total pay for executives in the S&P 500 exploded in the late 2000s.

This development has also piqued the interest of economists, who are particularly intrigued by the underlying pay-setting mechanism. Executive compensation is a classic example of a principal-agent problem and lies at the heart of the controversy of corporate separation of ownership and control (Jensen and Meckling 1976). Put succinctly, the challenge lies in motivating the CEO (the agent) to act in the best interest of the shareholder (the principal). Because the effort of the agent is not perfectly observable, the principal is not able to force the agent to choose the action that would be optimal from the principal's perspective. This invokes a moral hazard problem. There has been much discussion how and in what way firms are to solve this agency problem (Ross 1973, Gjesdal 1982, Mahoney 1995). A straightforward solution would involve a compensation scheme which provides desirable incentives for the CEO. Economic intuition would suggest tying compensation to firm performance. However, firm performance is also influenced by a myriad of factors that are beyond the control of the agent. This exogeneity introduces undesirable risk into contracting.

This is where relative performance evaluation (RPE) comes in (Holmstrom 1982). RPE implies that compensation contracts should be linked to firm performance in relation to peers with similar characteristics. Such contracts account for common shocks that are out of the agent's control and thus offer a more conclusive way to assess the agent's individual performance. Moreover, RPE contracts offer the same incentives as contracts based on absolute performance. The case for employing RPE in executive compensation contracts seems clear-cut. Indeed, RPE has become seemingly popular in practice. Recent studies suggest, for example, that roughly every fourth firm in the S&P 1500 openly claim to use RPE in their compensation contracts (Carter et al. 2009, Gong et al. 2011). In this paper, we test the existence of RPE in international banking and pay particular attention to banks who purport its usage.

RPE has been extensively investigated empirically. Most studies try to infer its usage by regressing executive compensation on the performance of a target firm and some measure of peer group performance.[1] A negative and statistically significant coefficient on peer performance is indication that common shocks are being removed from compensation contracts, constituting evidence of RPE. The scope of the existing studies is limited. They focus attention on compensation practices of industrial firms, and most of the studies make exclusively use of U.S. data.[2] This regional limitation comes as no real surprise. It is difficult to obtain comprehensive data on executive compensation outside of the U.S.

Despite the ubiquitously proclaimed use of RPE in practice, the empirical results of these studies have been a mixed bag.[3] This is partly owed to the fact that the post hoc construction of the peer groups

[1] Depending on the dataset, researchers also include control variables such as governance and ownership variables.

[2] Antle and Smith (1986) examine RPE in a sample of chemical, aerospace, and electronics firms. Rajgopal et al. (2006) cover a wide range of industries with the three largest groups being Electric, Gas, and Sanitary Services, Chemicals and Allied Products, and Depository Institutions. Aggarwal and Samwick (1999b) and Aggarwal and Samwick (1999a) exploit ExecuComp data, restricting them to U.S. firms. Joh (1999) tests RPE on a sample of Japanese firms in the manufacturing sector.

[3] For example, Gibbons and Murphy (1990), Albuquerque (2009), and Black et al. (2011) find empirical support for the

is rarely open to scrutiny. If the econometrician identifies a different peer group than the target firm itself had actually used, inferences on RPE are no longer meaningful. Yet peer group identification is only one reason why one may fail to find evidence of RPE. A simpler explanation would be that the RPE claims are merely empty rhetoric to appease proponents of good corporate practice. As Albuquerque (2009) puts it, any empirical tests of RPE are, in this sense, joint tests.

This paper embraces this duality and tests for RPE in a new sample of large and globally operating non-U.S. banks.[4] We contend that the global banking industry is an ideal playground to test the usage of RPE for at least three reasons. First, RPE makes especially sense for firms that are exposed to common shocks. This applies particularly well to international banking. The main reason for this exposure is that banks are highly leveraged institutions. Around 90 percent of their assets come from debt, making them more prone to exogenous volatility (Houston and James 1995, Chen et al. 2006). Second, the barriers to global integration in the banking industry have been significantly trimmed in the last two decades, shifting banks from once highly centralized domestic organizations to global behemoths. In turn, the structure of competition in the industry has adjusted (Berger and Smith 2003). Large banks operating on the international level are now dealing with intense competition.[5] Third, the recent financial crisis was characterized by failures of large international banks such as Northern Rock, Bear Stearns, or Lehman Brothers. The downfall of these banks has drawn increasing attention to corporate governance issues in remuneration policy.[6] If anything, this pressure has prompted banks to make more efficient use of RPE.

Our study tackles the caveat that the soundness of empirical tests on RPE critically hinges on the identification of the peer groups. We follow the sophisticated approach by Albuquerque (2009) and aggregate peer performance on the basis of industry and industry/size peer groups.[7] Aggregating in this manner accounts for the observation that industry affiliation and firm size are informative proxies for the common market risks that RPE-setting firms face. This approach, then, takes up Holmstrom's (1979) theoretical requirement of common uncertainties. Our study also deals with the potential issue of RPE being corporate cheap talk. If that were the case then signaling the disclosure of RPE would be mere noise and should not alter our results qualitatively. To test this hypothesis, we differentiate between disclosing and non-disclosing banks.

We collect a new data set with information of 42 large international banks. The results of our basic regression specification document negative and insignificant parameter estimates in industry peers. Taken by itself, this casts doubt on the use of RPE in our sample. However, when we perform tests of RPE on more nuanced industry/size peers, we find moderate evidence consistent with RPE. When, in addition, restricting attention to the subsample of RPE-disclosing banks, there is stronger and more conclusive evidence that systematic risk is filtered out from CEO compensation. Strong-form RPE tests support this conclusion. This finding stands in contrast to Gong et al. (2011), who do not find informational value in disclosure among U.S. firms. To gain more insight, we disentangle the main drivers of RPE. A logistic regression indicates that firm size and growth options play a major role in determining the likelihood of RPE usage. The results imply that the greater a bank is, the higher is the probability that it will use RPE

RPE hypothesis. In contrast, Janakiraman et al. (1992), Antle and Smith (1986), Aggarwal and Samwick (1999b), Jensen and Murphy (1990), and Antle and Smith (1986) fail to provide evidence for RPE or present mixed results.

[4] U.S. banks were excluded in our analysis because of a regulatory event during the observed timeframe (see Section 3.1 for details). To our knowledge, there are only two studies that test RPE on U.S. banks, Barro and Barro (1990) and Crawford (1999). We elaborate on them in Section 2.2.

[5] Bikker and Haaf (2002) investigate the competitive conditions and concentration in banking markets of 23 industrialized countries inside and outside Europe over 10 years. They form three sub-markets in terms of bank sizes for each country and estimate their competition. They show that large banks operate mostly in international markets and are exposed to strong competition. On the other hand, smaller banks operate mainly in local markets and are thus facing less competition.

[6] Bebchuk et al. (2010) find that the pay structures in Bear Stearns and Lehman Brothers had provided top executives with overbearing risk-taking incentives. This misalignment let them focus on a company's short-term performance while paying too little attention to the long term value of the company.

[7] In addition, we employ a novel Kernel-based approach that represents a generalization of the method presented in Albuquerque (2009). For more details on this approach see A.1.

in its compensation contracts. On the other hand, the probability of using RPE is decreasing with the magnitude of growth options.

Our paper contributes to the ongoing discussion on RPE along several dimensions. Existing studies testing RPE on banks have focused solely on U.S. data. This is hard to square with an industry that is characterized by pronounced international competition. We provide broader evidence by conducting tests on a newly collected sample of large international banks. In addition, we determine the main drivers of RPE in this global industry. Both tasks rely on a sound and accountable peer group construction mechanism, adding to the conclusiveness of our findings. We also shed light on the informative value of RPE disclosure. Our results suggest that the banks in our sample which proclaim the use of peers in assessing the performance of their CEOs are not merely window dressing: We do find stronger evidence for RPE usage among disclosing banks. For our sample, this would imply that lumping together disclosing and non-disclosing firms can be detrimental to the conclusiveness of RPE tests.

The rest of the paper is organized as follows. Section 2 outlines the theoretical background of RPE and describes the main characteristics of the banking industry. The section also introduces the empirical model and depicts the peer group construction mechanism. Section 3 presents our novel dataset of international banks. Section 4 reports summary statistics and regression results. In Section 5, we identify the main drivers of RPE in our sample. Section 6 concludes.

2 Relative performance evaluation and the banking industry

2.1 Relative performance evaluation

This section summarizes the theoretical foundation of relative performance evaluation (RPE). In a first step, we outline the principal-agent framework that underlies the relation between executive compensation and the performance of the firms they manage.[8] We then briefly discuss the seminal theoretical works of Holmstrom (1979, 1982) as well as the essay of Holmstrom and Milgrom (1987) on contracting, which has had useful applications in the RPE literature.

Holmstrom (1979) analyzed the principal-agent problem in a theoretical framework. In his setting only the noisy outcome of an agent's action is observable, so optimal contracts are bound to be second-best because of moral hazard. To ameliorate the effect of negative incentives, a principal can use other available information about the agent's action or other agents' state of nature. Holmstrom (1982) refines his earlier results and shows that an "agent's sharing rules can, without loss in welfare, be written on a statistic of all observations if and only if this statistic is sufficient in the sense of statistical decision theory." (p.325). One application can be found in the use of relative performance evaluation in incentive contracts. Holmstrom concludes that "relative performance evaluation will be valuable if one agent's output provides information about another agent's state uncertainty. Such will be the case if and only if agents face some common uncertainties." (p.325). He goes on to show that compensation schemes that compare the agent's performance with aggregate measures such as peer averages are more efficient since they provide more information on common uncertainties.

Following Holmstrom (1979), Holmstrom (1982), Holmstrom and Milgrom (1987), and Gibbons and Murphy (1990), we now present a simple model of relative performance evaluation. Assume that y denotes a measurable output, a represents an effort of the agent, and ϵ is observational noise with zero mean. Let output be directly linked to effort as follows:

$$y = a + \epsilon \tag{1}$$

[8] For more information on the basic moral hazard problem and its applications to wage contracts see Salanie (2005). For more details see also Gibbons and Roberts (2013)

If output is the only observable variable, the principal will make the agent's wage contingent on it, so $w(y)$. The principal observes outcome y, pays wage $w(y)$ to the agent, and keeps $y - w(y)$ for himself. Holmstrom (1979) assumes that the agent receives the wage contingent on one additional variable, z. This makes the agent's wage a function of two variables, so we denote the wage with $w(y, z)$. z is a noisy but informative signal. It provides additional information for evaluating the agent's unobservable effort. In practice this signal can be a market index or the output of some other agents. As stressed by Gibbons and Murphy (1990), the inclusion of z provides greater incentives without increasing risk exposure.

Holmstrom and Milgrom (1987) assume that y and z are jointly normally distributed. The expected value of the new information is zero ($E[z] = 0$), the variance of the new signal is $Var[z] = \sigma^2$, the variance of the output $Var[y] = \sigma_y^2$ and the covariance between the output and the informative signal is $Cov(z, y) = \rho$. Finally, ϵ denotes an error term. In this model, the optimal sharing rule is linear in y and z:[9]

$$s(y, z) = \alpha_1 \cdot y + \alpha_2 \cdot z + \epsilon \tag{2}$$

Holmstrom and Milgrom (1987) calculate the regression coefficients as well as the action and profit level and observe that the additional signal z is equivalent to a reduction in the variance of y.[10] Equation (2) represents a simple model of relative performance evaluation, a model that has been widely used in empirical papers to test the presence of RPE.

Holmstrom (1982) suggests that the necessary information regarding the common uncertainty can be captured by an aggregate measure such as the weighted average of peer performance. RPE is thus an application of the informativeness principle: Tying the income of an agent relative to their peer group filters out exogenous sources of randomness from the agent's compensation. The main advantage of relative performance evaluation is that it provides the same incentives as compensation based on absolute performance while isolating the agent from exogenous sources of randomness that influence the observed performance.

2.2 Banking industry

This section summarizes the economic particularities of banks and discusses current executive compensation practices in the banking industry. Banks are institutions that differ from other businesses in many aspects. To gain more insight into the practices of executive compensation in the banking industry, it is instructive to understand the particularities of banks, especially their governance structures.

The literature stresses three characteristic features of banks (John and Qian 2003, Macey and O'Hara 2003, Tung 2011). First, banks have a peculiar capital structure. They hold less equity than other companies, rendering them highly leveraged. Roughly 90 percent of funds in banks comes from debt. Moreover, a bank's assets and liabilities are mismatched.[11] This makes them vulnerable to bank runs if all the customers' deposits were to be called at once (Diamond and Dybvig 1983). Second, federal guarantees of bank deposits are a public measure to protect private depositors from losses in case of insolvency. These guarantees make both managers and shareholders more likely to pursue risk-taking investment strategies. Deposit insurance disincentivizes depositors from monitoring the actions taken by the managers or shareholders of the bank. This leaves wiggle room for risky investment strategies by bank managers.[12] Third, Macey and O'Hara (2003) point out that deposit insurance can increase the

[9] The optimal sharing rule in this context represents the wage of an agent.

[10] The reduced variance is the conditional variance of y given z (Holmstrom and Milgrom 1987).

[11] The assets of a bank are in form of loans that have mid- to long-term maturity while its liabilities are mostly in form of deposits that must be repaid on depositors' demand.

[12] Insolvency of a firm is a typical example that illustrates the difference between banks and traditional firms. If a bank is on the brink of insolvency, managers have an incentive to undertake risky actions because any possible loss is allocated to a third party while the managers still have a chance of making profit. Nearly insolvent banks still have the opportunity to collect

risk of fraud and self dealing in the banking industry because it reduces the incentives for monitoring. Ironically enough, the reduced monitoring triggered by the deposit insurance can increase the risk of bank runs, the very risk that the insurance is meant to address.[13]

The literature on executive compensation in the banking industry attends to these particularities. Two main branches have evolved (Houston and James 1995). The first branch discusses how the sensitivity of executive compensation to the bank's performance was affected by the U.S. corporate control market deregulation (Crawford et al. 1995, Hubbard and Palia 1995, Cuñat and Guadalupe 2009). Since 1980 many states in the U.S. have passed so-called interstate banking laws that allow local banks to be acquired by out-of-state banks. This has led to higher competition among banks on the interstate market and has had consequences on the pay-performance relation. The second branch in the literature questions whether the existing compensation policies promote risk-taking in the banking sector. These studies examine the relation between the specific component of the compensation and market measures of risk (Houston and James (1995), Chen et al. (2006)). The results are inconclusive.[14]

Though limited, the empirical literature on CEO pay in the banking industry provides some insight about their remuneration practice. Data show that bank CEOs receive less cash compensation on average, are less likely to participate in a stock option plan, and hold fewer growth options than CEOs in other industries. These differences are likely to stem from different investment opportunities of banks (Houston and James 1995). But not all is different in the banking industry. Houston and James (1995) do not find any differences between banking and non-banking industries regarding the overall sensitivity of pay to performance. They presume that the factors that influence compensation in the banking industry are similar to those in non-banking industries despite differences in the compensation structure. Adams and Mehran (2003) suggest that the difference in the governance structures between manufacturing firms and banks are industry-specific. Furthermore, the differences seem to be mostly due to different investment opportunities of bank holding companies (BHCs) and pertinent regulation.[15] Adams and Mehran's study questions if firm performance measures are influenced by the governance structure. Their results indicate that differences between the board structures of manufacturing firms and banks might not be a reason for concern in this respect. Aebi et al. (2012) study the strength of incentive features of top management compensation contracts in banks. They compare the pay-performance sensitivity in banks with those in manufacturing firms and show that debt ratio, firm size, risk, and regulation are important determinants of pay-performance sensitivity in banks. Finally, the executive compensation structure and the governance structure of banks differ from firms in other industries. Even so, the factors that influence the overall pay-performance sensitivity do not seem to differ significantly across industries.

Studies testing RPE in the banking industry are rare. Barro and Barro (1990) test RPE on a data set that covers 83 commercial banks in the U.S. between 1982 and 1987. They regress the growth rate of real compensation on the average of the total real rate of return from the current period and the previous period, the first difference of accounting based returns, regional averages for both accounting-based return, and the average of total real rate of return. This effectively compares the performance of banks relative to the performance of other banks in the same region. Their evidence is not consistent with the use of RPE. Crawford (1999) tests two hypotheses on 215 executives from 118 U.S. commercial banks

deposits and, by doing so, they can raise their funds and increase liquidity. Non-financial firms that are close to becoming insolvent might also have an incentive to undertake risky investment strategies but they would likely face liquidity constraints. They are also often constrained by contractual obligations. Hence, a bank near insolvency is not burdened with the same constraints as a non-financial firm in the same situation (Tung 2011).

[13] "Not only does the protection afforded by the FDIC remove any incentive for insured depositors to control excessive risk-taking, it also removes their incentive to monitor in order to reduce the incidence of fraud and self-dealing." (Macey and O'Hara (2003), p. 98)

[14] For example, Saunders et al. (1990) find evidence for this hypothesis and observe a positive and statistically significant relation between bank risk and stock held by the executive. In contrast, Houston and James (1995) provide results that are inconsistent with this hypothesis.

[15] Adams and Mehran (2003) investigate the governance of BHCs (and not banks) due to availability of data regarding governance structures.

from 1976-1988. He regresses change in CEO pay for a specific bank on a change in shareholder wealth for that bank, industry relative performance measure, and market performance measure using S&P 500 returns.[16] His findings suggest that relative compensation is negatively related to market and industry returns and positively related to shareholder returns. In addition, in his sample the use of RPE increases when the banking deregulation was introduced. Crawford reports evidence consistent with RPE if CEO compensation is evaluated relative to industry peers. He does not, however, find evidence of RPE when using relative market performance measures.

To sum up, the academic literature on CEO compensation in banking addresses the industry's characteristics. First, banks differ from other firms in terms of capital structure. Second, deposit insurance, which is a particularity of banks, can increase the risk of fraud and self dealing since it reduces the incentives for monitoring. Against this background, two branches in the academic literature on CEO pay have evolved. The first one tries to identify the effect of U.S. corporate control market deregulation on the sensitivity of executive compensation to bank performance. The second branch investigates whether compensation policies promote risk taking in the banking sector. The literature on RPE in the banking industry is scarce. With this paper, we aim to fill this gap.

2.3 Empirical model

We employ a model that is based on Holmstrom and Milgrom (1987). Specifically, we use the following weak-form test of RPE:[17]

$$Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it} \tag{3}$$

$Comp_{it}$ measures executive compensation in monetary terms, $FirmPerf_{it}$ stands for the performance of firm i measured as the continuously compounded gross real rate of return to shareholders (assuming that dividends are reinvested), and $PeerPerf_{it}$ denotes the performance of firm $i's$ peer group. In order to account for variation not included in the firm's and the peer groups' performances we control for several control variables, subsumed in the control variable column vector C_{it}, which accounts for firm size and growth options. In addition, we include time, industry, and country dummies. The subscript t denotes the respective year and ϵ_{it} represents an independent firm specific white noise process. $\alpha_0, \alpha_1, \alpha_2$ and α_3 denote model parameters.[18]

In this model, rejecting the null hypothesis $H_0 : \alpha_2 \geq 0$ against the one-sided alternative $H_1 : \alpha_2 < 0$ provides evidence of RPE in executive compensation contracts. In that case, exogenous shocks outside of the control of the executive management are filtered out of the compensation contract.

The first step in conducting the so-called strong-form test is to regress firm performance on peer performance.[19] For this purpose, we employ a battery of peer performance aggregation methods (see the next section). The first step regression model is:

$$FirmPerformance_{it} = \gamma_i + \beta_i \cdot PeerPerformance_{it} + \epsilon_{it} \tag{4}$$

The unsystematic and systematic performance are obtained from the equation above in the following manner:

$$UnsysFirmPerformance_{it} = \widehat{\epsilon_{it}} \text{ and } SysFirmPerformance_{it} = \widehat{\gamma_i} + \widehat{\beta_i} \cdot PeerPerformance_{it} \tag{5}$$

[16] Shareholder wealth is defined as beginning-of-year market value of equity.

[17] Originally, Holmstrom and Milgrom (1987) defined RPE as $\frac{\alpha_2}{\alpha_1}$. They test $H_0 : \frac{\alpha_2}{\alpha_1} \geq 0$ against the alternative $H_1 : \frac{\alpha_2}{\alpha_1} < 0$. Since α_1 is expected to be positive, most of the literature that uses the model proposed by Holmstrom and Milgrom test whether $\alpha_2 < 0$. We follow their approach.

[18] Note that α_3 is a row vector.

[19] For more details on strong-form RPE tests see Antle and Smith (1986).

Since the goal is to differentiate between systematic and unsystematic firm performance, we do not account for control variables in this step. The second step estimates the sensitivity of CEO compensation with respect to the unsystematic and systematic components of firm performance, that is:

$$Comp_{it} = \delta_0 + \delta_1 \cdot UnsysFirmPerformance_{it} + \delta_2 \cdot SystFirmPerformance_{it} + \delta_3 \cdot C_{it} + \epsilon_{it} \quad (6)$$

If the systematic risk is filtered out of the compensation contract, the systematic performance $\widehat{\delta_2}$ in equation (6) should not be significantly different from zero.

2.3.1 Peer group composition

This section introduces our peer group aggregation method. We adapt the effective industry/size approach by Albuquerque (2009).

RPE companies assess their CEOs' compensation levels based on performance in relation to their respective peers. These peers are not simply a random draw of the market. RPE companies follow a specific methodology in selecting their peers. Because researchers usually do not know an RPE company's peers, they follow a different approach. Most studies accessing RPE use broad industry or market indices as a comparison group for peer performance. This is not without problems. Firms within an industry are hardly homogenous in their characteristics, so simple benchmarks are not able to adequately capture common shocks (Albuquerque 2009).[20] This introduces a bias in the statistical estimation and can distort inferences. An inappropriate comparison group can lead to a higher (or lower) recommended level of CEO pay, skewing the desired incentives for CEOs. An expedient and replicable comparison group based on a reasonable and objective criterion is therefore the key element when empirically testing for RPE.

Albuquerque (2009) provides a pragmatical solution for the composition of RPE peer groups. She constructs groups based on both the two-digit Standard Industrial Classification System (SIC) level and firm size. The first step in the construction sorts firms by beginning-of-year market value into size quartiles within an industry. This yields four peer groups per industry. Each firm is then matched with an industry-size peer group. It turns out that this approach yields stronger empirical support for the use of RPE in executive compensation than sorting by industry classification alone, an improvement that is due to the information that firm size captures. Firms of similar size are also similar along several other characteristics that proxy for systematic risk. Albuquerque shows how the levels of diversification, financing constraints, and operating leverage vary with industry-size-ranked portfolios and provides evidence that firm size subsumes these characteristics. She finds that larger firms tend to be more diversified, have greater operating leverage, and smaller financing constraints. This claim is supported by other literature. Demsetz and Strahan (1997), for example, construct a measure of diversification of BHCs. Their results establish a strong, positive effect of bank size on the diversification of BHCs. Moreover, small firms tend to face bigger financial constraints in comparison to large ones.

In agreement with Albuquerque we do not argue that firm size fully captures systematic risk. But it is a proxy with high explanatory power for the common uncertainty which Holmstrom (1982) insinuated.

3 Data description

This section describes the data preparation process in creating our sample of international banks. Subsection 3.1 reports the collection of the international compensation data, Subsection 3.2 provides details

[20] Jensen and Murphy (1990) aggregate peer performance based on the two-digit SIC level or a market index, Janakiraman et al. (1992) match their peers on the same two-digit SIC industry level. Aggarwal and Samwick (1999a) use two-, three-, and four-digit SIC levels in order to compose a peer group, and Aggarwal and Samwick (1999b) choose peers in the same two-, three- and four-digit SIC level industry or a market index.

about the sample that we use in the regression analysis, and Subsection 3.3 documents the peer group data selection process.

3.1 Compensation data

There is no standardized database for international corporate compensation. We collect data from several sources for the years 2003-2014. Financial and accounting data are obtained from Thomson Reuters Datastream and Thomson Reuters Worldscope. Compensation data are collected manually either from annual reports or management proxy circulars available online, except for the U.S. which we exclude from our analysis. In August 2006 a new regulatory requirement by the U.S. Securities and Exchange Commission mandated, among other things, full disclosure of peer group compositions (if applicable) for fiscal years ending on or after December 15, 2006. In a recent study, Faulkender and Yang (2013) suggest that this event generated a structural break in peer group selection, discouraging the use of U.S. compensation data for our purpose.[21] For the other countries in our sample, we could not find any corresponding regulation that was introduced in our observed timeframe.[22]

Our initial data set is composed of firms classified as banks from the FTSE All World Index with an index weight higher than 0.02. This yields 75 firms. Based on this list we collect remuneration data for 42 different firms with a total of 318 firm-year observations (henceforth dubbed the "full sample"). In line with the source information, we quantify the compensation in nominal terms. As CEO compensation we define the compensation paid by the parent company as well as the one paid by subsidiaries (for the CEO position). In rare cases firms only provide a certain wage range. In that case we always include the higher bound as the actual compensation. We do not include the measure of CEO compensation changes in the value of existing firm options and stock holdings owned by the CEO.[23]

In order to collect the total compensation data we focus on the amount the firm itself defines as the "total". This always includes all the positions used for the fixed compensation amount as well as performance-related components. The name and the exact composition of this performance-related components vary significantly between firms. For example, some firms differentiate between long-term and short-term incentives, whereas others just talk about bonuses. This seems to be related to the pertaining country and its national regulations. We ignore any extraordinary compensation such as restricted shares which had been allocated when starting as CEO, payment in lieu of notice, or buyout. We also exclude all amounts received related to the holding of a director position in addition to the CEO position.

Total compensation consists of the positions salary, bonus, stock awards, option awards, non-equity incentive plan compensation, change in pension value and non-qualified deferred compensation, and all other compensation.

3.2 International banking sample

We convert all compensation data into U.S. Dollars by using exchange rates from Thomson Reuters Datastream. The exchange rate is determined by the day after the end of the fiscal year (e.g., if the fiscal year ends on December 31, 2010 we take the exchange rate on January 1, 2011). We measure firm performance with stock market return data from Thomson Reuters Datastream. Following the literature, we control for firm size (sales) (Smith and Watts 1992, Fama and French 1992) and growth opportunities (Fama and French 1992). In addition, we include dummies to control for year-specific differences in the

[21] We retain U.S. banks as possible peers, however.

[22] For E.U. firms, for example,Ferrarini and Moloney (2005, p. 318) point out that peer group disclosure is not required. We are not aware that this has changed since 2005.

[23] Because disclosure of certain positions is not always part of the firms remuneration disclosure we either choose to include those observations with the information available in our data set or we do not include a position altogether. This depends on the significance a certain position seems to have according to its contribution to the total compensation. We make sure to always use the same components for total compensation in relation to one specific firm over the observable time span.

level of compensation, industry dummies that capture unobservable variation at the industry level, and country dummies that capture any country specific variation (e.g., due to different regulations or legal directives). In order to control for this possible country specific heterogeneity, we only keep banks from non-U.S. countries with at least two banks.

Table 1 shows the sample frequency for each year. The data are mostly equally well distributed over the years 2004-2013, though the frequency of the data tends to increase over time.[24]

[Insert Table 1 about here]

Table 2 displays the sample frequency by industry group within the banking industry. Subsector 6029 (Commercial Banks) dominates the sample with more than 80% of all observations. The other subsectors are National Commercial Banks (6021), State Commercial Banks (6022), Federal Saving Institutions (6035), and Security Brokers and Dealers (6211).

[Insert Table 2 about here]

Table 3 depicts the sample frequency by country. Among the 14 countries in the sample, Canada together with Australia, Singapore, Sweden, and the United Kingdom provide the largest shares of the banks in our sample.

[Insert Table 3 about here]

Table 4 shows Pearson correlation coefficients between performance measures and the control variables firm size and growth options.

Firm stock returns and industry as well as industry/size peers display positive correlations (0.73 and 0.80, respectively). The correlation of firm stock returns with its industry peer is lower than the correlation of firm stock returns with its industry/size peer, which is consistent with previous evidence (Albuquerque 2009). The statistically significant correlation coefficients increase our confidence that that industry and industry/size peers are eligible candidates to filter out noise from the individually observed firm performance measures.

[Insert Table 4 about here]

3.3 Peer Group Composition

For the selection of possible peer firms, we start with a comprehensive list of 4,228 firms, most of which are financials. We use SIC-codes to remove firms which do not pertain to the banking industry.[25] In addition, we exclude other firms which we do not consider valid peers, such as the Allied Irish Banks, which technically became state-owned during the financial crisis. We then apply a number of screens to the return data to obtain a qualitatively sound data set (Ince and Porter 2006). First, we delete any consecutive zero returns at the end of the sample period. Second, we remove returns below -80% and

[24]The low number of firms in the last year is because not all firms in our sample had yet released proxy circulars by the time we collected the data.

[25]Datastream provides up to five different SIC codes for each firm, in order of relevance. We include a firm if the first SIC code is one of the following: 6021 (National Commercial Banks), 6022 (State Commercial Banks), 6029 (Commercial Banks, Nec), 6035 (Federal Savings Institutions), 6036 (Savings Institutions, Except Federal), 6061 (Federal Credit Unions), 6062 (State Credit Unions), 6081 (Foreign Bank and Branches and Agencies), 6082 (Foreign Trade and International Banks), 6091 (Nondeposit Trust Facilities), 6111 (Federal and Federally Sponsored Credit), 6141 (Personal Credit Institutions), 6159 (Miscellaneous Business Credit), 6162 (Mortgage Bankers and Correspondents), or 6712 (Bank Holding Companies). If the first SIC code is either 6311 (Life Insurance), 6211 (Security Brokers and Dealers), 6153 (Short-term Business Credit), 6163 (Loan Brokers), or 6221 (Commodity Contracts Brokers, Dealers), we include the firm only if one of the four other SIC-codes is in the previous list.

above 300%. We also require that the one-year continuously compounded return obtained from monthly data is available. We end up with 1,570 firms which form the pool of potential peers in our analyses. Note that this sample also contains so-called "dead stocks" which were delisted from the stock market during the sample period to mitigate survivorship bias.

4 Results

4.1 Full sample results

This section presents the results for the full sample of banks. First, we show descriptive statistics of compensation data, performance measures, and firm characteristics (subsection 4.1.1) for the 42 firms across the 2004-2013 time span. Subsection 4.1.2 documents the regression results. We regress the logarithm of total CEO compensation on firm stock performance, peer return, and several control variables.

4.1.1 Summary statistics

Table 5 presents descriptive statistics for the full sample. We report two measures of compensation: total compensation and the logarithm of total compensation. In the regression analysis, we use the logarithm of total compensation as a dependent variable because its empirical distribution is more symmetrical than the one for total compensation. This mitigates heteroscedasticity as well as extreme skewness and allows the comparison with results from previous studies (Murphy 1999). We aggregate peer performance based on industry affiliation and on the industry/size quartile approach (Albuquerque 2009). Summary statistics for the control variables firm size (log of sales and sales) and growth options are also reported.

The results show that the average (median) total compensation of an executive in our sample is USD 5.44 million (USD 4.31 million), which is not all that surprising in a sample that largely consists of the major global players in the banking industry.[26] Firm performance is measured using log-returns. The mean firm stock return is 6% and the median is 14%. Averages of peer returns hover around 8%. The average (median) size of a bank in our full sample is USD 30,240 million (USD 19,225).

[Insert Table 5 about here]

4.1.2 Regression results

We proceed to test the use of RPE in CEO compensation with equation (3). Peer groups are constructed with the industry and industry/size approach. We then regress the logarithm of total CEO compensation on firm stock return, peer return, growth options, and log of sales. Year, country, and industry dummies are also included in the regression.

Table 6 shows the sensitivity of CEO total compensation to RPE when using industry and industry/size peer groups. The coefficient on firm stock return is positive and statistically significant for both peer group specifications. The coefficients are 0.47 and 0.56 for the industry and industry/size specifications, respectively. Both coefficients are statistically significant at the 1% level.

When the peer group consists of the firms within the same industry group the coefficient of the peer portfolio is negative, but insignificant (-0.06 with a p-value of 0.78).[27] Put differently, the performance of these peers does not seem to be filtered out from the CEO compensation contracts. However, if we include size into sorting and consider industry/size peers, the parameter estimates are negative and statistically significant (with a coefficient of -0.31 and a p-value of 0.09). Even so, we consider this result

[26] See A.4 for a list of the banks in our analysis.

[27] We always report two-sided p-values. Using one-sided p-values would be more appropriate to test the hypotheses postulated in Section 2 but do not change the results qualitatively.

only as moderate evidence of RPE. The peer group coefficient is only significant at the 10 % level, and robustness checks with proprietary size sorting algorithms yield mixed results.[28]

[Insert Table 6 about here]

By and large, the results for our international banks dovetail with previous findings for U.S. firms, which also showed that studies-industry/size peers are better able to capture exogenous shocks than industry peers alone (Albuquerque 2009).

4.2 RPE subsample results

4.2.1 Weak tests of RPE

The results above are moderately consistent with the notion that the banks in our full sample compensate according to an RPE scheme. We now turn to the informational value of disclosure. Some banks openly purport the use of RPE. Although there is a risk of taking such disclosure at face value, we exploit this information to sharpen our sample's profile. In this subsection we test the sensitivity of CEO pay to RPE in the subsample of banks that explicitly state the use of peers in determining the performance of their CEOs in their statement proxies. We follow the same empirical specification used in the previous section and take a closer look at 25 disclosing banks, which form 156 firm-year observations from 2004-2013.

Panel A of Table 7 shows the sensitivity of CEO total compensation to RPE when using industry and industry/size peers. The subsample reveals positive and statistically significant parameter estimates on firm stock performance for every specification of the peer group. The estimates range from 0.49 to 0.68, indicating that a CEO is being rewarded for positive firm performance. Hence on average, CEO compensation increases with firm performance. When the peer groups are composed of banks within the same industry, the coefficient on the peer portfolio is negative and statistically insignificant (with a coefficient of -0.30 and a p-value of 0.40). The industry/size parameter estimate is also negative but statistically significant at the 5% level (with a coefficient of -0.64 and a p-value of 0.03). This goes hand in hand with our previous results and once again suggests that the industry/size approach captures more variation.[29]

[Insert Table 7 about here]

The results for the subsample of disclosing banks constitute evidence consistent with RPE, more strikingly so than the results for the full sample did. In the subsample, the coefficient on the peer portfolio doubles in size and increases sharply in statistical significance. Accounting for disclosure increases the precision of the estimates, implying that disclosure holds informational value. One might also say that the inclusion of non-disclosing banks in the full sample dilutes the statistical inference and renders it less conclusive.[30] In contrast, Gong et al. (2011) find no informational value of RPE disclosure among U.S. firms. However, their sample only comprises the year 2006.

[28]The results are robust across different treatments of standard errors (for more details see A.3). But we are not able to document robustness when we generalize Albuquerque's (2009) simple sorting specification. Specifically, we implement a novel Kernel-based peer group construction approach with three different Kernel-functions: a standard normal pdf (Knor), a "cosine" pdf (Kcos), and a uniform distribution pdf (Kuni). These generalized approaches give different weights depending on the peers' size "distance" from the target firm's size. The results from these new specifications are reported in Table A.1 in A.2.

[29]This result is robust across different specifications of peer groups. For more details see Table A.2 in A.2.2.

[30]Untabulated results for the *non-disclosing* subsample support this reasoning. On their own, non-disclosing banks do not seem to make use of RPE.

4.2.2 Strong-form test of RPE

Following Antle and Smith (1986), we perform so-called strong-form tests of RPE on the subsample of RPE disclosures to verify the robustness of our results. Strong-form tests of RPE examine whether all the noise that can be removed is indeed filtered out from the compensation contracts. Details on the construction of systematic and unsystematic firm performances and the employed empirical model are reported in Section 2.3. In a nutshell, the results are consistent with RPE if only the unsystematic performance exerts influence on CEO pay, and not the systematic one.

Panel B of Table 7 documents the regression results from equation (6) for the subsample of disclosing banks. Here we regress the logarithm of CEO compensation on unsystematic firm performance, systematic firm performance, and control variables for 156 firm-year observations over the time span 2004-2013. In that specification we rely on industry/size groups for constructing the systematic performance variable.

The systematic component is insignificant for industry/size peer specification in Table 7 with a coefficient estimate of 0.14 (p-value = 0.47). The unsystematic performance variable, however, is positive and statistically significant with a coefficient of 0.68 (p-value = 0.00). This suggests that the CEOs in our subsample are being compensated for unsystematic performance only.[31]

These results provide evidence in accord with the use of strong-form RPE and reinforce the previous finding that CEOs are not being compensated for systematic performance in the subsample of RPE disclosures. Our results suggest that the CEOs in the subsample are being paid for unsystematic firm performance only.

5 What drives RPE in the banking industry?

Prior studies have put forth a variety of factors that influence the usage of RPE in compensation contracts (Carter et al. 2009, Gong et al. 2011, Albuquerque 2014). These studies focus on RPE usage in U.K. or U.S. firms. They do not, however, examine the influence of one factor at a time on the usage of RPE while controlling for other factors. Gong et al. (2011) investigate explicit disclosures on RPE in the U.S. to identify the factors that prompt the use of RPE in compensation contracts in 2006. Carter et al. (2009) examine the use of RPE in performance-vested equity grants in a sample of U.K. firms in 2002. None of them investigate the use of RPE on an international level or over a longer time span. This section addresses this gap. Understanding what drives RPE is instructive to scholars because it affects RPE testing and could offer yet another reason for the mixed evidence in existing empirical studies.

In order to determine possible RPE drivers we conduct a logit regression. The dependent variable y_{it} is an indicator variable that equals 1 for banks that disclose information in their proxy statements on the use of peer groups to determine the level of executive compensation, and 0 otherwise. The independent variables include CEO pay ($Comp_{it}$), firm performance ($FirmPerf_{it}$), various specifications of peer return ($PeerPerf_{it}$), and control variables. We control for firm size ($FirmSize_{it}$) and growth options ($GrowthOptions_{it}$) and include year ($YearDummy_{it}$), industry ($IndustryDummy_{it}$), and country ($CountryDummy_{it}$) dummies to control for cross-sectional variation. Sales are used as proxy for the firm size. Growth options are calculated as follows: $(Market\ Equity + Total\ Assets - Common\ Equity)/Total\ Assets$.

We estimate our logit model based on the following latent variable model:

$$\begin{aligned} y_{it} = {} & \gamma_0 + \gamma_1 \cdot Comp_{it} + \gamma_2 \cdot FirmPerf_{it} + \gamma_3 \cdot PeerPerf_{it} + \gamma_4 \cdot FirmSize_{it} \\ & + \gamma_5 \cdot GrowthOptions_{it} + \gamma_7 \cdot YearDummy_{it} + \gamma_8 \cdot IndustryDummy_{it} \\ & + \gamma_9 \cdot CountryDummy_{it} + \epsilon_{it}. \end{aligned} \tag{7}$$

[31] These results are again robust. See Table A.3 in A.2.3.

In order to estimate equation (7), we use the full sample of 318 firm-year observations over the time span 2004-2013. Table 8 reports the results. We find that the likelihood of using RPE is positively related to firm size and negatively related to growth options for industry and industry/size peers.[32] In other words, the probability that a bank will use RPE is increasing with firm size. The opposite holds for growth options. None of the other predictors are statistically significant, suggesting that size and growth options are the main drivers of RPE in our sample.[33]

[Insert Table 8 about here]

These results are in line with existing evidence. Gong et al. (2011) find that larger firms are more likely to use RPE. Firm size could represent a crude proxy for public scrutiny and shareholder concerns about compensation practices. Large firms are also more exposed to monitoring pressure in comparison to smaller ones. This might well force them to be more committed to RPE (Bannister and Newman 2003). Albuquerque (2014) and Gong et al. (2011) find that the level of RPE in CEO compensation contracts is negatively associated with a firm's level of growth options. Carter et al. (2009) examine the disclosure of performance-based conditions in equity grants and document that growth options are inversely related to the performance-based conditions. Albuquerque (2014) argues that high growth options firms have to bear more risks and thus exhibit a higher idiosyncratic variance. These firms are also characterized by firm-specific know-how and operate in markets with high barriers to entry. As a consequence, these characteristics make peer performance non-informative with respect to capturing external shocks. This eventually leads to less usage of RPE among high growth options firms (Albuquerque 2014, p.1).

6 Conclusion

This papers tests the presence of RPE in a novel sample of 42 international non-U.S. banks from 2004 through 2013. To that end, we regress the logarithm of total compensation on firm performance, industry and industry/size peer performance, and control variables such as firm size and growth options. We control for unobservable variation in the level of compensation across years, industries, and countries. When we account for peer groups, with peer selection based on industry and firm size, we find weak evidence for the use of RPE in international banking. This evidence becomes much stronger once we focus on banks who openly disclose the use of peers in their renumeration practice. Our results are robust across different peer group specifications and different forms of RPE tests.

These overarching findings suggest four things. First, large international banks seem to entertain the use of RPE in assessing the performance of their CEOs. This holds even more likely for disclosing banks. The latter implies the second point: RPE statements seem to have some merit, at least in our sample, and credibly reflect good corporate practice on that score. The RPE-boasting firms do not seem to limit themselves to preaching water; they likely drink it, too. Third, in our sample empirical evidence on RPE runs the risk of diluting in undifferentiated data. It is worthwhile, if nothing else for robustness, to stratify by RPE disclosure. Finally, our evidence indicates that industry/size peers are better able to capture exogenous shocks than industry peers alone. This observation complements previous studies.

In order to identify possible drivers of RPE in international banking, we employ a logit regression model. The evidence supports the working theory that growth options and firm size play a crucial role in banks' decisions to use RPE. Our results dovetail with existing evidence and are robust to different model specifications. We find that the likelihood of RPE usage is decreasing with growth options. The implementation of RPE in high growth option banks might be too costly due to difficulties in identifying

[32] We obtain qualitatively the same results when using a probit or linear probability specification instead of a logit specification.

[33] The regression results based on our extended Kernel-based peer group specifications are presented in Table A.4 in A.2.4 and are similar to the results in this section.

the correct peer group, rendering such banks less likely to use RPE. We also find that larger banks are more inclined to use RPE in their compensation contracts. This is hardly surprising. In light of the recent financial crisis, high levels of CEO compensation have attracted a lot of attention and large banks in particular have been under significant monitoring and shareholder pressure. In response to such pressure, large banks are more likely to have become incentivized to be committed to RPE use in determining the level of CEO pay.

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Table 1: Sample frequency by year

Year	Frequency	Percent
2004	14	4.40
2005	22	6.92
2006	26	8.18
2007	32	10.06
2008	33	10.38
2009	38	11.95
2010	40	12.58
2011	42	13.21
2012	41	12.89
2013	30	9.43

Note: The table shows the sample frequency by year for the full sample. We report the year, the frequency of the sample observation for each year, and the the yearly percentage of the overall sample.

Table 2: Sample frequency by SIC level

SIC Level	Frequency	Percent
6021	21	6.60
6022	8	2.52
6029	272	85.53
6035	10	3.14
6211	7	2.20

Note: The table shows the sample frequency by SIC level for the full sample. We report the SIC level, the frequency of the sample observation for each SIC level, and the SIC percentage of the overall sample.

Table 3: Sample frequency by country

Year	Frequency	Percent
Australia	30	9.43
Canada	52	16.35
China	16	5.03
France	24	7.55
Germany	19	5.97
Hong Kong	9	2.83
Malaysia	19	5.97
Norway	10	3.14
Singapore	30	9.43
South Africa	14	4.40
Spain	20	6.29
Sweden	33	10.38
Switzerland	13	4.09
United Kingdom	29	9.12

Note: The table shows the sample frequency by country for the full sample. We report the country, the frequency of the sample observation for each country, and the country percentage of the overall sample.

Table 4: Pearson correlation coefficients

	Firm stock return	Industry Peer Return	Industry/Size Peer Return	Log(Sales)
Firm stock return	1.00			
Industry Peer Return	0.73^{*}	1.00		
Industry/Size Peer Return	0.80^{*}	0.96^{*}	1.00	
Log(Sales)	-0.19^{*}	-0.09	-0.08	1.00
Growth Options	0.42^{*}	0.29^{*}	0.28^{*}	-0.48^{*}

Note: This table shows Pearson product moment correlation coefficients between performance measures and control variables. The sample consists of 318 observations covering time period 2004-2013.* indicates significance at the 1% level.

Table 5: Descriptive statistics

Variable	N	Mean	St.Dev.	Min	Q1	Median	Q3	Max
Total Compensation	318	5.44	4.07	0.24	2.05	4.31	8.41	20.40
Log(Total Compensation)	318	8.25	0.93	5.46	7.62	8.37	9.04	9.92
Firm stock return	318	0.06	0.43	-1.59	-0.06	0.14	0.29	1.24
Peer return (Industry)	318	0.09	0.26	-0.72	-0.12	0.15	0.25	0.86
Peer return (Industry/Size)	318	0.08	0.31	-0.83	-0.07	0.16	0.27	0.53
Firm size (Sales)	318	30,240	33,396	1,011	7,450	19,225	49,384	142,752
Firm size (log(Sales))	318	16.76	1.12	13.83	15.82	16.77	17.72	18.78
Growth options	318	1.04	0.04	0.96	1.00	1.03	1.06	1.19
Firm Stock Return Variance	318	0.14	0.16	0.00	0.02	0.09	0.19	1.09

Note: The table shows descriptive statistics of the compensation data, firm performance measures, and control variables. Specifically, we document firm stock return and peer return. We report summary statistics for peer groups based on an industry affiliation and an industry/size quartiles approach. We report the number of firm observations (N), mean (Mean), minimum (Min), standard deviation (St.Dev.), 25th Percentile (Q1), median (Median), 75th Percentile (Q3), and maximum (Max) for the time span 2004-2013. Total Compensation and Sales are in million USD.

Table 6: Regressions estimating the sensitivity of CEO compensation to RPE

Independent Variables	Industry Peer Group	Industry/Size Peer Group
Intercept	3.18*	3.22*
	(0.08)	(0.08)
Firm stock return	0.47***	0.56***
	(0.00)	(0.00)
Peer return (Industry)	-0.06	
	(0.78)	
Peer return (Industry/Size)		-0.31*
		(0.09)
Firm size (sales)	0.37***	0.37***
	(0.00)	(0.00)
Growth options	-0.59	-0.61
	(0.65)	(0.64)
Year dummies	yes	yes
Industry dummies	yes	yes
Country dummies	yes	yes
Adjusted R^2	76.31%	76.53%
Number of observations	318	318

Note: The table shows OLS regression results for the equation $Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it}$. The first column shows the results from regressing log of total CEO compensation on stock return, peer performance composed of the firms within the same industry, and control variables. The second column documents regression results based on the industry/size quartiles peer group approach by Albuquerque (2009). We also include year, industry, and country dummies. Significance levels are denoted as follows: 1% ($***$), 5% ($**$) and 10% ($*$).

Table 7: Regressions estimating the sensitivity of CEO compensation to RPE in the subsample of RPE-disclosures

	Panel A: Weak-Form RPE Tests		Panel B: Strong-Form RPE Tests
Independent Variables	Industry Peer Group	Industry/Size Peer Group	Industry/Size Peer Group
Intercept	-3.37	-2.78	-2.81
	(0.34)	(0.42)	(0.42)
Firm stock return	0.49**	0.68***	
	(0.02)	(0.00)	
Peer return(Industry)	-0.30		
	(0.40)		
Peer return (Industry/Size)		-0.64**	
		(0.03)	
Unsystematic Firm Perf			0.68***
			(0.00)
Systematic Firm Perf			0.14
			(0.47)
Firm size (sales)	0.70***	0.68***	0.68***
	(0.00)	(0.00)	(0.00)
Growth options	0.17	-0.03	-0.03
	(0.95)	(0.99)	(0.99)
Year dummies	yes	yes	yes
Industry dummies	yes	yes	yes
Country dummies	yes	yes	yes
Adjusted R^2	63.47%	64.64%	64.64%
Number of observations	156	156	156

Note: The Panel A of the table shows OLS regression results for the equation $Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it}$ on the subsample of RPE-disclosing banks. The first column shows the results from regressing log of total CEO compensation on the stock return, peer performance of the firms within the same industry, and control variables. The second column documents the results based on industry/size peer group approach by Albuquerque (2009) approach. We also include year, industry, and country dummies. The Panel B of the table documents OLS regression results for the equation $Comp_{it} = \delta_0 + \delta_1 \cdot UnsysFirmPerformance_{it} + \delta_2 \cdot SystFirmPerformance_{it} + \delta_3 \cdot C_{it} + \epsilon_{it}$ on the subsample of RPE-disclosing banks. We regress logarithm of CEO compensation on the unsystematic firm performance, systematic firm performance, and control variables for 156 firm-year observations over the time span 2004-2013. We use industry/size peer group specification in order to construct a systematic performance variable. For more details on systematic and unsystematic variable construction see Section 2.3. Significance levels are denoted as follows: 1% ($***$), 5% ($**$) and 10% ($*$).

Table 8: Logit regression of RPE use in executive compensation contracts

Independent Variables	Industry Peer Group	Industry/Size Peer Group
Intercept	-25.52	-26.08
	(0.13)	(0.12)
Compensation	0.47	0.46
	(0.38)	(0.38)
Firm Perf	0.00	-0.27
	(0.99)	(0.75)
Peer return(Industry)	0.10	
	(0.95)	
Peer return (Industry/Size)		0.89
		(0.53)
Firm size (sales)	2.71^{***}	2.69^{***}
	(0.00)	(0.00)
Growth options	-19.66^{*}	-19.39^{*}
	(0.09)	(0.10)
Year dummies	yes	yes
Industry dummies	yes	yes
Country dummies	yes	yes
R^2	51.71%	51.79%
Number of observations	318	318

Note: Table documents logit regression results for the equation $y_{it} = \gamma_0 + \gamma_1 \cdot Comp_{it} + \gamma_2 \cdot FirmPerf_{it} + \gamma_3 \cdot PeerPerf_{it} + \gamma_4 \cdot C_{it} + \epsilon_{it}$. The dependent variable is *RPE* an indicator variable which is equal to 1 if the firm reported RPE use in the compensation contracts. We regress *RPE* on firm performance, peer returns, firm size, and growth options for 318 firm-year observations over the time span 2004-2013. We also include year, country, and industry dummies in the regression estimation and use industry and industry/size peers. We report the Cox and Snell's R^2. Significance levels are denoted as follows: 1% ($***$), 5% ($**$) and 10% ($*$).

A Appendix

A.1 Kernel-based peer group construction

This section points to some issues within the industry/size approach and introduces a novel Kernel-based approach. This novel method extends Albuquerque (2009) with a more rigorous peer group selection. We show that there is room for improvement in generalising Albuquerque's industry/size approach.

To highlight the main caveat of the industry/size quartile approach implemented in Albuquerque (2009) consider the following. All firms are partitioned and ranked into four size groups (per industry). The first group contains the 25% firms with the smallest firm size, and the fourth group contains those 25% of the firms with the biggest size. The boundaries between the four groups, the so-called breakpoints, lie on 25%, 50%, and 75% of the ranked values of firm size. Let us assume that we want to test the RPE hypothesis in a target company that is very close to the breakpoint between the first and the second quartile, but just happens to fall into the first one. In this particular case it is not readily obvious why the first peer group, and not the second one, should be assigned to the target firm, which lies so close to the breakpoint.

Our method of peer group aggregation addresses this issue. Every target firm is assigned a unique peer group that corresponds to the size of that target firm. We achieve this by implementing a Kernel-based weighting scheme. Put simply, firms that are closer to the target firm in terms of firm size receive a higher weight.

We differentiate between the size of a chosen target firm and other firms in the sample. A specific weighting function assigns a higher weight to a peer firm if it exhibits a smaller distance to the target firm in terms of firm size.

We measure the differences of the firm sizes in the following manner:

$$\mathrm{D}_i = \mathrm{Size}_T - \mathrm{Size}_i \quad \text{where} \quad i = 1, ..., N \tag{8}$$

Size_T denotes the size of the target company measured in terms of firm sales, and Size_i is a proxy for the size of all other firms. We standardize the "distances" by dividing them with the cross-sectional standard deviation, $\mathrm{s}(\mathrm{D}_i)$, in order to achieve a valid comparison:

$$\mathrm{D}_i^* = \frac{\mathrm{D}_i}{\mathrm{s}(\mathrm{D}_i)} \quad \text{where} \quad i = 1, ..., N \tag{9}$$

From these standardized distances, we construct weights using a kernel weighting function. The firm i in the sample of N firms will be assigned the weight

$$\mathrm{w}_i = \mathrm{K}(\mathrm{D}_i^*) \tag{10}$$

Additionally, we create weights by multiplying the standardized difference with the following scaling factor, SF:

$$\mathrm{SF}_i = \mathrm{Median}\left(\frac{\mathrm{s}(\mathrm{Size}_i)}{\mathrm{s}(\mathrm{Size}_T)}\right) \cdot 2 \tag{11}$$

$$\mathrm{D}_i^{**} = \mathrm{D}_i^* \cdot \mathrm{SF} \tag{12}$$

$$w_i = K(D_i^{**}) \tag{13}$$

For robustness we use three types of kernel functions: 1. The probability density function (pdf) of the Standard Normal Distribution, 2. the pdf of the Uniform Distribution, and 3. the pdf of the "Cosine Distribution".[34] In addition, we standardize each weight with the sum of all weights. This amounts to the following peer performance weight:

$$w_i{}^* = \frac{w_i}{\sum_{j=1}^{N} w_j} \tag{14}$$

So that,

$$\sum_{i=1}^{N} w_i{}^* = 1 \tag{15}$$

Finally, we use the performance weights and individual firm performance Perf_i in order to construct each target firm's peer group as follows:

$$\text{Peer Perf} = \sum_{i=1}^{N} w_i^* \cdot \text{Perf}_i \quad \text{where} \quad i = 1, ..., N \tag{16}$$

In contrast to Albuquerque's industry/size quartile approach that generates fixed-size peer groups, we thus allow for individual peer groups that correspond more closely to the target firm in terms of firm size. We argue that this approach is more in keeping with the theoretical models, which are built on the assumption of common uncertainties.

A.2 Regression results (kernel-based peers)

A.2.1 Full sample of banks

Table A.1 reports the results from regressing logarithm of total compensation on firm stock return, Kernel-based peers, growth options, and log of sales.

The parameter estimates are negative but insignificant, which is not consistent with the presence of RPE. The parameter estimates hardly differ across several Kernel specifications. They are -0.26 (p-value=0.38) for the normal Kernel function, -0.16 (p-value=0.54) for the cosine Kernel function, and -0.20 (p-value=0.48) for the uniform Kernel function. In Table A.1 we have slightly adjusted the Kernel-based approach by multiplying the difference of the firm size by the scaling factor introduced in the previous section. We test the presence of RPE by regressing log of total CEO compensation on firm stock return, peer performance, growth options, and log of sales. We also include year, country, and industry dummies. The coefficient on the log of firm stock return is again positive and statistically significant at the 1% level for every specification. The negative coefficients on the Kernel-based peer portfolio keep persisting. They are -0.22 (p-value=0.39) for the normal Kernel function, -0.20 (p-value=0.38) for the cosine Kernel function, and -0.27 (p-value=0.29) for the uniform Kernel function. The adjusted Kernel-based approach reports smaller p-values. Still, the coefficients remain insignificant, revealing no evidence of RPE in the full sample of banks.

[34] There is no Cosine Distribution to our knowledge, but if there was one this would be its probability density function.

[Insert Table A.1 about here]

A.2.2 Weak tests of RPE (disclosure subsample)

Table A.2 documents the same regression procedure on the subsample of banks that explicitly disclose the use of peers in determining their level of CEO compensation. Here we use Kernel-based peers.

Under the Kernel-based peer group specification, external shocks are removed from the compensation contract, which is consistent with RPE. The peer coefficients do not differ much across several Kernel specifications. They are -0.99 (p-value=0.03) for the normal Kernel function, -0.81 (p-value=0.05) for the "cosine" Kernel function and -0.88 (p-value=0.06) for the uniform Kernel function. The coefficient on firm stock performance is positive and statistically significant with a range from 0.70 to 0.77. The fourth, fifth, and sixth column of the table report the regression results with the adjusted Kernel-based peers. All the Kernel-based peer coefficients keep a negative and statistically significant sign soundly rejecting the null hypothesis of no RPE. The coefficient of the normal Kernel peer group is -0.82 (p-value=0.03), of the cosine Kernel peer group -0.83 (p-value=0.01), and -0.77 (p-value=0.04) of the uniform Kernel peer group.

[Insert Table A.2 about here]

A.2.3 Strong-form tests of RPE (disclosure subsample)

In this section we use strong-form RPE tests in order to test the RPE hypothesis on the RPE subsample. We use the Kernel-based method in order to construct a systematic performance variable and run the same regression model. Table A.3 reports the results.

We document insignificant parameter estimates on systematic firm performance. The coefficient of the normal Kernel peer group is 0.04 (p-value=0.85), of the cosine Kernel peer group 0.08 (p-value=0.70), and 0.09 (p-value=0.65) of the uniform Kernel peer group. Our results are robust to different specifications of the weights in the Kernel-based approach, which is reported in the fourth, fifth, and sixth columns of the Table A.3. The parameter estimates of the normal Kernel peer group is 0.07 (p-value=0.75), of the cosine Kernel peer group 0.01 (p-value=0.96), and 0.09 (p-value=0.66) of the uniform Kernel peer group. The unsystematic firm performance is significant at the 1% level for every Kernel-based specification.

[Insert Table A.3 about here]

A.2.4 The drivers of RPE

In this section we estimate equation (7). For this purpose, as in the previous section, we use the alternative peer group definitions based on the kernel methods described above. The main results are presented in Table A.4.

The parameter estimates on firm size remain statistically significant and have the same sign. The firm size coefficient of the normal Kernel peer group is 2.68 (p-value=0.00), of the cosine Kernel peer group 2.70 (p-value=0.00), and 2.69 (p-value=0.00) for the uniform Kernel peer group. The coefficient for growth options remains negative and in most cases statistically significant as well, lending further support to our results. The results are qualitatively similar when we use the adjusted Kernel-based approach. The coefficients are -19.64 (p-value=0.09) for the normal Kernel peer group, -19.28 (p-value=0.10) for the cosine Kernel peer group, and -19.74 (p-value=0.09) for the uniform Kernel peer group.

[Insert Table A.4 about here]

A.3 Clustered standard errors

In this section, we consider the same regression procedure (equation (3)) for the full sample of 42 banks but include cluster standard errors across industry codes.

Table A.5 reports the regression results when peers are based on industry and industry/size. The coefficient on industry peer is -0.06 (p-value=0.87), whereas the coefficient on industry/size peers is -0.31 (p-value=0.06). Hence, we find qualitatively similar results to those presented in Table 6. In addition, in unreported results we find that the results for the Kernel-based approaches are also robust to the inclusion of clustered standard errors.

[Insert Table A.5 about here]

A.4 Banks in our sample

Table A.6 reports the list of banks used for our analysis.

[Insert Table A.6 about here]

Table A.1: Regressions estimating the sensitivity of CEO compensation to RPE

Independent Variables	Knor	Kcos	Kuni	Knor (Scal)	Kcos (Scal)	Kuni(Scal)
Intercept	3.27*	3.28*	3.26*	3.36*	3.37*	3.43*
	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)
Firm stock return	0.52***	0.51***	0.51***	0.53***	0.53***	0.54***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Peer return (Knor)	-0.26					
	(0.38)					
Peer return (Kcos)		-0.16				
		(0.54)				
Peer return (Kuni)			-0.20			
			(0.48)			
Peer return (Knor (Scal))				-0.22		
				(0.39)		
Peer return (Kcos (Scal))					-0.20	
					(0.38)	
Peer return (Kuni (Scal))						-0.27
						(0.29)
Control variables	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes
Adjusted R^2	76.39%	76.35%	76.36%	76.39%	76.39%	76.44%
Number of observations	318	318	318	318	318	318

Note: The table shows OLS regression results for the equation $Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it}$. We report the results from regressing log of total CEO compensation on stock return and peer performance aggregated based on the Kernel approach and the adjusted Kernel approach. Significance levels are denoted as follows: 1% ($***$), 5% ($**$) and 10% ($*$).

Table A.2: Regressions estimating the sensitivity of CEO compensation to RPE (subsample of RPE-disclosures)

Independent Variables	Knor	Kcos	Kuni	Knor (Scal)	Kcos (Scal)	Kuni(Scal)
Intercept	-3.21	-3.21	-3.22	-2.82	-2.91	-2.63
	(0.34)	(0.34)	(0.35)	(0.40)	(0.38)	(0.44)
Firm stock return	0.73***	0.73***	0.70***	0.74***	0.77***	0.74***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Peer return (Knor)	-0.99**					
	(0.03)					
Peer return (Kcos)		-0.81*				
		(0.05)				
Peer return (Kuni)			-0.88*			
			(0.06)			
Peer return (Knor (Scal))				-0.82**		
				(0.03)		
Peer return (Kcos (Scal))					-0.83**	
					(0.01)	
Peer return (Kuni (Scal))						-0.77**
						(0.04)
Control Variables	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes
Adjusted R^2	65.20%	65.00%	64.81%	65.16%	65.63%	65.63%
Number of observations	156	156	156	156	156	156

Note: The table shows OLS regression results for the equation $Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it}$on the subsample of RPE-disclosing banks. We report the results from regressing log of total CEO compensation on stock return and peer performance aggregated based on the Kernel approach and the adjusted Kernel approach, respectively. We also include year, industry, and country dummies. Significance levels are denoted as follows: 1% (***), 5% (**) and 10% (*).

Table A.3: Strong-form test of RPE (Subsample of RPE-disclosures)

Independent Variables	Knor	Kcos	Kuni	Knor (Scal)	Kcos (Scal)	Kuni (Scal)
Intercept	-3.27	-3.26	-3.28	-2.86	-2.94	-2.67
	(0.33)	(0.34)	(0.34)	(0.40)	(0.38)	(0.43)
Unsystematic Firm Perf	0.73^{***}	0.73^{***}	0.70^{***}	0.74^{***}	0.77^{***}	0.74^{***}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Systematic Firm Perf	0.04	0.08	0.09	0.07	0.01	0.09
	(0.85)	(0.70)	(0.65)	(0.75)	(0.96)	(0.66)
Control Variables	yes	yes	yes	yes	yes	yes
Year,dummies	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes
Adjusted R^2	65.20%	65.00%	64.81%	65.16%	65.63%	65.11%
Number of observations	156	156	156	156	156	156

Note: The table documents OLS regression results for the equation $Comp_{it} = \delta_0 + \delta_1 \cdot UnsysFirmPerformance_{it} + \delta_2 \cdot SystFirmPerformance_{it} + \delta_3 \cdot C_{it} + \epsilon_{it}$ on the subsample of RPE-disclosing banks. We regress logarithm of CEO compensation on unsystematic firm performance, systematic firm performance, and control variables for 156 firm-year observations over the time span 2004-2013. We use both Kernel-based and adjusted Kernel-based methods with three specifications to construct the systematic variable. For more details on the systematic and unsystematic variable construction see Section 2.3. Significance levels are denoted as follows: 1% ($***$), 5% ($**$) and 10% ($*$).

Table A.4: Logit regression of RPE use in executive compensation contracts

Independent Variables	Knor	Kcos	Kuni	Knor (Scal)	Kcos (Scal)	Kuni (Scal)
Intercept	-25.30	-25.86	-25.18	-25.85	-26.14	-25.76
	(0.13)	(0.12)	(0.13)	(0.12)	(0.12)	(0.12)
Compensation	0.46	0.45	0.46	0.46	0.46	0.47
	(0.39)	(0.39)	(0.39)	(0.39)	(0.38)	(0.38)
Firm Perf	-0.28	-0.29	-0.20	-0.22	-0.24	-0.20
	(0.74)	(0.75)	(0.82)	(0.80)	(0.79)	(0.82)
Peer return (Knor)	1.18					
	(0.53)					
Peer return (Kcos)		0.95				
		(0.55)				
Peer return (Kuni)			0.86			
			(0.63)			
Peer return (Knor (Scal))				0.76		
				(0.62)		
Peer return (Kcos (Scal))					0.72	
					(0.61)	
Peer return (Kuni (Scal))						0.63
						(0.65)
Firm size (sales)	2.68***	2.70***	2.69***	2.69***	2.70***	2.71***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Growth options	-19.64*	-19.28	-19.74*	-10.26	-19.09*	-19.42
	(0.09)	(0.10)	(0.09)	(0.10)	(0.09)	(0.10)
Year dummies	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes
R^2	51.80%	51.80%	51.78%	51.79%	51.79%	51.79%
Number of observation	318	318	318	318	318	318

Note: The table documents logit regression results for the equation $y_{it} = \gamma_0 + \gamma_1 \cdot Comp_{it} + \gamma_2 \cdot FirmPerf_{it} + \gamma_3 \cdot PeerPerf_{it} + \gamma_4 \cdot C_{it} + \epsilon_{it}$. The dependent variable is *RPE*, an indicator variable which is equal to 1 if the firm reported RPE use in the compensation contracts. We regress *RPE* on firm performance, peer returns, firm size, and growth options for 318 firm-year observations over the time span 2004-2013. We include year, country and industry dummies. We use both Kernel-based and adjusted Kernel-based methods for the peer group aggregation. Significance levels are denoted as follows: 1% (***), 5% (**) and 10% (*).

Table A.5: Regressions estimating the sensitivity of CEO compensation to RPE

Independent Variables	Industry Peer Group	Industry/Size Peer Group
Intercept	3.18**	3.22***
	(0.05)	(0.05)
Firm stock return	0.47***	0.56***
	(0.00)	(0.00)
Peer return (Industry)	-0.06	
	(0.87)	
Peer return (Industry/Size)		-0.31*
		(0.06)
Firm size (sales)	0.37***	0.37***
	(0.00)	(0.00)
Growth options	-0.59	-0.61
	(0.60)	(0.60)
Year dummies	yes	yes
Industry dummies	yes	yes
Country dummies	yes	yes
Adjusted R^2	78.48%	78.67%
Number of observations	318	318
Number of clusters	(5)	(5)

Note: The table shows OLS regression results for the equation $Comp_{it} = \alpha_0 + \alpha_1 \cdot FirmPerf_{it} + \alpha_2 \cdot PeerPerf_{it} + \alpha_3 \cdot C_{it} + \epsilon_{it}$. The first column presents the results from regressing log of total CEO compensation on stock return, industry peer performance, and other variables. The second column documents regression results based on industry and size quartiles, that is Albuquerque (2009)'s approach. OLS estimation is based on clustered standard errors. Firm size and growth options for the period 2004 to 2013 are also reported. We include year, industry and country dummies. The corresponding p-values are reported in parentheses below each coefficient estimate. We report significance levels for 1% (***), 5% (**) and 10% (*).

Table A.6: List of international banks in the sample

Name of the Bank	Country
SWEDBANK	Sweden
CREDIT AGRICOLE	France
CHINA MINSHENG BANKING	China
BANCO DE SABADELL	Spain
HUAXIA BANK	China
DNB	Norway
BNP PARIBAS	France
COMMONWEALTH BANK OF AUSTRALIA	Australia
CHINA CONSTRUCTION BANK	China
BANK OF CHINA	China
CIMB GROUP HOLDINGS	Malaysia
HSBC HOLDINGS	UK
NORDEA BANK	Sweden
BANCO SANTANDER	Spain
SEB	Sweden
SOCIETE GENERALE	France
MALAYAN BANKING	Malaysia
PUBLIC BANK	Malaysia
FIRSTRAND	South Africa
LLOYDS BANKING GROUP	UK
BARCLAY	UK
ROYAL BANK OF SCOTLAND GROUP	UK
NATIONAL AUSTRALIA BANK	Australia
CANADIAN IMPERIAL BANK COMMERCE	Canada
COMMERZBANK	Germany
BANK OF MONTREAL	Canada
BANK OF NOVA SCOTIA	Canada
DEUTSCHE BANK	Germany
WESTPAC BANKING	Australia
TORONTO-DOMINION BANK	Canada
ROYAL BANK OF CANADA	Canada
OVERSEA-CHINESE BANKING	Singapore
BANCO POPULAR ESPANOL	Spain
UNITED OVERSEAS BANK	Singapore
DBS GROUP HOLDINGS	Singapore
UBS	Switzerland
CREDIT SUISSE GROUP N	Switzerland
AUSTRALIA AND NEW ZEALAND BANKING GROUP	Australia
STANDARD BANK GROUP	South Africa
BANK OF EAST ASIA	Hong Kong
NATIONAL BANK OF CANADA	Canada
SVENSKA HANDELSBANKEN	Sweden