THE UNIVERSITY OF
NEW SOUTH WALES

School of Accounting

Seminar – Session 2, 2010

Are US CEOs Paid More than UK CEOs? Inferences From Risk-Adjusted Pay

Professor Wayne Guay

The Wharton School
University of Pennsylvania

Date: Friday 10th September
Time: 3:00 to 4:30 pm
Venue: Room ASB115.

Are US CEOs Paid More Than UK CEOs? Inferences From Risk-Adjusted Pay

Martin J. Conyon[♣]
The Wharton School
The University of Pennsylvania
conyon@wharton.upenn.edu

John E. Core
The Wharton School
The University of Pennsylvania
jcore@wharton.upenn.edu

Wayne R. Guay
The Wharton School
The University of Pennsylvania
guay@wharton.upenn.edu

April 28, 2010

Abstract

We compute and compare risk-adjusted pay for US and UK CEOs, where the risk adjustment is based on estimated risk premiums stemming from the equity incentives borne by CEOs. Controlling for firm and industry characteristics, we find that US CEOs have higher pay, but also bear much higher stock and option incentives than UK CEOs. Using reasonable estimates of risk premiums, we find that risk-adjusted US CEO pay does not appear to be large compared to that of UK CEOs. We also examine differences in pay and equity incentives between a sample of non-UK European CEOs and a matched sample of US CEOs, and find that risk-adjusting pay may explain about half of the apparent higher pay for US CEOs.

(JEL G31, G34, M41)

Keywords: CEO compensation, incentives, risk aversion, corporate governance, international comparisons

---

[♣] Corresponding author: Martin J. Conyon, The Wharton School, University of Pennsylvania. E-mail conyon@wharton.upenn.edu. We would like to thank Mary Barth, Bill Beaver, Jim Brickley, Peter Cappelli, Alexander Dyck, George Foster, Alan Jagolinzer, Bjorn Jorgenson, Brian Main, Michael Orszag, Graham Sadler, Ross Watts, Joanna Wu, Jerry Zimmerman, an anonymous referee, and seminar participants at Baruch College, the 2005 Royal Economic Society meetings, Imperial College London, Manchester University, the 2005 NBER Summer Institute, New York University, Pennsylvania State University, Rutgers University, Singapore Management University, Stanford University, the University of Pittsburgh, the University of Rochester, and the University of Utah 2006 Winter Conference for comments and suggestions. We thank Sophia Hamm for excellent research assistance. We are especially grateful to Richa Gulati, Michael Orszag, to Watson Wyatt for their help with UK pay data, to Jie Cai and Anand Vijh for sharing their executive equity portfolio valuation software, and to Volkan Muslu for sharing his European CEO compensation and incentives data.

1. Introduction

Since at least as early as the 1950s, the press and academic researchers have remarked on the high levels of US CEO pay and questioned whether these levels are consistent with share value maximization [e.g., Murphy (1999)]. As these high levels have continued, there has been an increased willingness among academic researchers to suggest that US CEO pay practices reflect managerial rent-extraction.[1] The purpose of this paper is to shed light on this issue by comparing CEO pay and incentives in the US with CEO pay and incentives in the UK, the latter being a country with a similar economy, but where excessive pay is generally considered to be less problematic. Specifically, we examine whether, and to what extent, pay differences between US and UK CEOs can be explained by differences in incentives and in risk premiums paid to CEOs for bearing incentive risk. Our results suggest that the commonly-held view that US CEO pay is high relative to UK CEO pay may not hold once one considers the risk premiums attributable to greater holdings of risky equity incentives.

The suitability of corporate governance in general, and of executive compensation and incentives in particular, continues to be of much interest to both academics and practitioners. The spate of corporate scandals in the United States over the last decade, as well as accusations about corporate largesse in the face of the current financial crisis, have once again focused attention on the pay received by those at the very top of organizations. Moreover, a growing body of academic research proposes that problems with US governance and CEO pay are so profound that overpayment of CEOs is not limited to a few bad apples, but that all CEOs in the US economy are overpaid [e.g., Bebchuk and Fried (2004) and Jensen, Murphy, and Wruck (2004)]. If this conjecture is correct, within-country benchmarking can provide an indication of

[1] See Core, Holthausen, and Larcker (1999), Bebchuk and Fried (2004), Bebchuk, Fried, and Walker, (2002), Jensen, Murphy, and Wruck (2004).

how compensation practices vary with governance quality within the US, but tells us little about whether US executive compensation practices as a whole suffer from systemic poor governance and excessive pay. Instead it is necessary to compare US practices with those of other countries where compensation practices ex ante are expected to suffer from these problems to a lesser extent [e.g., Core, Guay, and Thomas (2005) and Holmstrom and Kaplan (2003)].

In this paper, we use the United Kingdom as a benchmark against which to examine whether CEO pay in the United States appears unusually high. These two economies share important governance features (such as active takeover markets, unitary board structures, etc.). However, the UK is generally considered to be less afflicted by problems of excessive executive compensation. As we discuss below, and as is detailed in Becht, Franks, Mayer, and Rossi (2009), certain features of the UK governance environment may constrain pay. For example, unlike the US, UK CEOs are rarely also the board chair, shareholders vote annually on executive compensation packages, and disclosures about compensation consultants have been required for many years. Further, empirical evidence indicates that after controlling for standard economic determinants of pay, CEO compensation in the UK is systematically lower than it is in the US.[2]

Using US and UK CEO pay and incentives data for 1997 and 2003, we show that US CEOs have greater pay, but also hold substantially greater equity incentives than their UK counterparts. For example, after controlling for firm characteristics, the US CEOs' 2003 pay was about 1.4 times the pay of UK CEOs. However, US CEOs' 2003 equity incentives were about 5.5 times greater than those of UK CEOs (the 1997 differences in pay and incentives were even greater).

[2] Several studies have drawn the inference that US CEOs earn more than British CEOs. Conyon and Muphy (2000) provide a detailed comparison illustrating that U.S. CEOs receive more pay than UK CEOs. Abowd and Kaplan (1999) also show that US CEO pay is high compared to non-US countries using survey data from Towers Perrin, and state: "U.S. CEOs receive compensation levels that appear out of line with the other OECD countries." In their data, US CEOs earned about $905,000 compared to $494,000 for UK CEOs. Recently, Fernandes, Ferreira, Matos and Murphy (2009) confirm that US CEOs receive more pay than UK CEOs.

A central tenet of agency theory and contracting predicts that executives will require greater pay to bear greater incentive risk (e.g., Pratt, 1964). The key research question in our paper is whether some or all of the difference in pay between US and UK CEOs can be explained by greater risk premiums paid to US CEOs as compensation for their holdings of greater equity incentives. To examine this hypothesis, we first note that total pay to a risk-averse CEO is the sum of a risk premium for bearing incentive risk plus "risk-adjusted pay," which consists of compensation for CEO ability, compensation for CEO effort, and any rents the CEO obtains. For convenience we term these two components of pay "risk premium" and "risk-adjusted pay." To partition pay into these components, we extend the method used in Cai and Vijh (2005), and estimate risk premiums for US and UK CEOs using data on equity incentives and various assumptions about CEO risk-aversion and outside wealth. We then subtract these risk premiums from total pay to estimate the CEOs' risk-adjusted pay.

For a reasonable range of parameters, we find that after controlling for the risk premium, median risk-adjusted pay for the US CEOs is not consistently higher than that for UK CEOs (specifically, we find risk-adjusted pay to be higher for US CEOs in 1997, but higher for UK CEOs in 2003). We conclude that critics of high US executive pay should give greater consideration to the incentives borne by US CEOs and the risk premiums that executives are likely to require for holding these incentives. We also note that while our risk premium estimates undoubtedly contain measurement errors, the main takeaway from our analysis seems unlikely to be altered: that risk premiums in CEO pay must be considered to draw accurate inferences about the appropriateness of CEO pay levels. Further, we recognize that although risk premiums offer a potential economic explanation for why US pay is higher than UK pay, it leaves open the question of why US incentives are so much larger than UK incentives. In our main analysis, we

assume that CEOs in both countries hold the same proportion of their wealth in firm incentives. The lower incentives held by UK CEOs imply that they have less wealth. We explore reasons why US CEOs may accumulate more wealth, and we examine the sensitivity of our results to different assumptions about the proportion of wealth held in stock by US and UK CEOs. Finally, we suggest that researchers should shift their efforts toward better understanding the reasons for differences in incentives between US CEOs and CEOs in other parts of the world.

As a supplemental and exploratory analysis, we also examine pay and incentive differences between a sample of 40 non-UK European CEOs and a matched sample of US CEOs. Similar to the UK-US analysis, we find that European CEOs receive less pay and hold less equity incentives than US CEOs. Using estimates of the risk premium to construct measures of risk-adjusted pay, we find that about half of the difference in US-Europe CEO pay may be explained by differences in equity incentives. Although these findings provide an interesting perspective on US-Europe CEO pay differences, we caveat these results by noting that there are likely to be greater differences in governance, institutional, and social structures between US and non-UK European firms than there are between US and UK firms (e.g., as compared to the UK, Europe has smaller, less liquid capital markets, a weaker market for corporate control, more concentrated ownership, greater monitoring from creditors, two-tiered boards, and required labor representation on boards).

In the next section, we motivate the paper, review related literature, and describe our sample and data. In Section 3, we present univariate and multivariate comparisons of pay and incentives for the US and UK over time. In Section 4, we estimate risk premiums related to incentive holdings and examine whether US pay is high compared to UK pay once we control for differences in incentives. Section 5 provides an exploratory analysis of differences in risk-

adjusted pay between non-UK European firms and US firms. In the final section, we offer concluding remarks and caveats to our conclusions.

2. Executive compensation in the US and UK: Motivation and data

2.1 Motivation and literature review

Recent research has suggested that US pay is "too high" and that CEOs are able to exploit existing governance arrangements to extract rents [Bebchuk and Fried (2004) and Bebchuk, Fried, and Walker (2002)]. The claim that US CEO pay is "too high" begs the question – "too high compared to what?" If the pay of *every* CEO within an economy is considered excessive, then there is no within-economy control group against which to evaluate the compensation package of any given CEO. In this paper, we compare US CEO pay to UK CEO pay. The US and UK have very similar economies, but as we describe below, the UK is generally considered to be less afflicted by problems of excessive executive compensation. As such, the UK can be usefully considered as a control group with which to compare US CEO compensation.

The extant research investigating international differences in CEO pay arrangements is sparse. Indeed, the majority of executive compensation papers are single country studies rather than research designed to probe cross-country differences in pay setting strategies. An exception is Conyon and Murphy (2000), who find that after controlling for size, sector and other firm and executive characteristics, US CEOs earned 45% higher cash compensation and 190% higher total compensation in 1997 than UK CEOs.[3]

What explains these pay differences? Conyon and Murphy (2000) argue that the differences could be largely attributed to greater stock option awards in the US arising from

[3] Other research examining international differences in pay and governance includes Crystal, Main, and O'Reilly (1994) and Abowd and Kaplan (1999) for the US relative to the UK, Kaplan (1994a, b) for the US relative to Japan and Germany, and Conyon and Schwalbach (1999) for differences in European pay.

institutional and cultural acceptance of equity pay in the US vis-à-vis the UK. Consistent with this explanation, Abowd and Kaplan (1999) examine survey pay estimates from Towers Perrin from 1984 to 1996 and find that stock options, expressed as a fraction of CEO pay, were increasing in the US but not elsewhere. Using data from 27 countries in 2006, Fernandes et. al. (2009) also find that equity-based CEO compensation is much more prevalent in the US than elsewhere. Consistent with options contributing to an excessive pay problem, several researchers, such as Hall and Murphy (2002) and Jensen, Murphy and Wruck (2004), argue that US compensation committees historically have under-appreciated the full cost of options, and as a result, overpaid executives with option grants. Further supporting this conjecture, until recently, stock option disclosures were more detailed in the UK than in the US.

A second, and related, explanation is that pay-related governance problems are more severe in the US. By this explanation, US firms overpay their executives using stock options because option pay is less visible to shareholders [e.g., Bebchuk and Fried (2004)]. Although the governance structures of the US and UK are similar in many respects (e.g., both economies have active takeover markets, single board internal control systems with remuneration committees, etc.), differences do exist. For example, the roles of the CEO and Chair positions are more often separated in the UK.[4] Further, since 2002, UK shareholders have voted annually on executive compensation packages, although there is no evidence that say-on-pay proposals change the level or growth of CEO pay (e.g., Ferri and Maber, 2008). The outcome of this voting mechanism is frequently negative, and although the vote is not binding, companies often adhere to them.[5] Also, until very recently UK firms, but not US firms, were required to disclose whether a

[4] See, for example, "No excessive pay, we're British," *The Wall Street Journal*, February 8, 2006, page C1.

[5] Recent examples where a majority of shareholders have voted against management remuneration plans include Royal Dutch Shell PLC, Royal Bank of Scotland Group, Bellway PLC, and Provident Financial PLC.

compensation consultant was hired by management to design their pay packages and the name of the consulting firm. As a final point, if the UK populace has lower tolerance of income inequality, this would constitute another cultural norm or governance mechanism that constrains executive pay.

A third possibility, which we explore in this paper, is that there is no difference in the efficiency of pay outcomes in the two countries. Instead, differences in pay between the US and UK may be explained by differences in risk premiums for bearing incentive risk. If the optimal contract requires a CEO to hold more incentives, the CEO will demand more pay. Prior research provides some descriptive support for this conjecture. Conyon and Murphy (2000) find that in 1997 US CEOs had greater pay and held greater equity incentives than did UK CEOs. Conyon and Murphy briefly consider, but dismiss, the equilibrium explanation that US executives have larger incentives and therefore larger pay.

2.2 Data description

While US executive compensation data are readily available in machine-readable form, UK data require hand collection.[6] Because of the costs of hand collection, we limit ourselves to examining the year of the latest available data at the time we began this study, 2003, and the year of the earliest available UK data, 1997 (the basic points of the paper, however, are not expected

[6] Unfortunately, it is both labor- and time-intensive to collect UK executive compensation data. Although compensation disclosure in the UK was significantly expanded following the Greenbury (1995) and Hampel (1998) reports, the disclosed data are usually not available electronically and must be hand-collected. Moreover, the information is not reported in the same tabular form across different companies, making data collection more difficult. Currently, UK companies disclose information comparable to those available for US executives including exercise prices, maturity terms, options granted and information on stock options outstanding.

to be sensitive to particular years chosen for analysis).[7] Our UK data are hand-collected from annual reports and accounts of UK firms (broadly equivalent to US DEF 14A proxy statements). These companies are drawn from the largest 250 UK publicly traded firms ranked by market capitalization in each of the years. We report results based on 177 UK CEOs in 1997 and 214 UK CEOs in 2003 for which we have complete data. As a supplemental analysis, in Section 5, we further explore the role of incentive risk by comparing US CEO pay with CEO pay of firms in other non-UK European countries.

Our US data come from the Compustat ExecuComp database, which includes firms in the S&P 500, the S&P MidCap 400, the S&P SmallCap 600, and the S&P supplemental indices. Our US sample consists of 1,372 CEOs in 1997 and 1,511 CEOs in 2003. However, as shown in Panels A and B of Table 1, because we examine the largest 250 UK firms, the median US firm in our sample tends to be smaller than the median UK firm. The median UK firm has sales of $1.6 billion ($1.8 billion) in 2003 (1997), as compared to median sales for the US firms of $1.1 billion ($1.0 billion) in 2003 (1997). Similar size differences are observed between the UK and US firms based on market capitalization. To mitigate the concern that our findings are influenced by size differences across the US-UK firms, in most of our tests, we focus on a subsample of US firms that are matched (within industry) to the UK firms using a propensity-score procedure (discussed in more detail below).[8]

2.3 Measurement of CEO pay and incentives

[7] 1997 is the first year that UK companies were required to disclose data on stock option grants to top executives. For a similar reason, prior studies of US pay often begin at 1992 because this is the first year that US companies were required to disclose data on stock option grants to top executives.

[8] All of our inference holds when we conduct our tests using the full US sample.

Executive pay in the UK and the US consists of the same basic elements. CEOs in both countries receive base salaries and are eligible to receive annual bonuses, usually based on accounting performance. CEOs in both countries frequently receive stock options, and can also receive restricted stock. In the US, restricted stock grants typically vest with the passage of time but not with performance criteria. In the UK, by contrast, the vesting of restricted stock is typically tied to the attainment of performance objectives. In our empirical work, we define *total pay* for the firm's CEO as the sum of salary, bonus, benefits, stock option grant value, restricted stock grants (valued at 100% of performance contingent awards) and other compensation.[9] We estimate the value of options granted during the year using a modified version of the Black-Scholes (1973) model. Consistent with the findings of Hemmer, Matsunaga and Shevlin (1996) and Huddart and Lang (1996) that employees exercise options prior to maturity, we assume the expected time-to-exercise is 70% of the option grant's stated maturity. Our inference, however, is unaffected if we value the option grant using the stated time-to-maturity.

Panel C of Table 1 provides descriptive statistics for CEO total pay for our full sample of US and UK firms. We provide figures for the average and median values, as well as the percentage change in these values from 1997 to 2003. The total pay data illustrate that the broad sample of US CEOs earn more than the sample of British CEOs. In 1997, the median US CEO's pay was $2.0 million, or 100% more than the median UK CEO's pay of $1.0 million. In 2003, the median US CEO's pay was $2.5 million, or 30% more than the median UK CEO's pay of $1.9 million. Note that the higher pay for US CEOs is observed in spite of the fact that the US firms in the full sample are somewhat smaller than the UK firms (we control for this size difference explicitly below). As a final point on Panel C, the pay differential between the US and

[9] In the case of the United States, we use variable item TDC1 from the ExecuComp database. For the UK we calculate total pay from information contained in the annual reports.

UK CEOs appears to have narrowed between 1997 and 2003.[10] There is a 92% increase in median UK CEO pay from 1997 to 2003, as compared to a 29% increase in median US CEO pay over this time period.[11]

We turn now to our measure of CEO equity incentives, which recognizes that incentives are greater when the CEO has more of his wealth invested in firm equity and less in other assets. The sensitivity of annual pay to stock returns captures only a small part of CEO equity incentives. Much greater incentives are provided by the sensitivity of the CEO's holding of stock and options to changes in shareholder value. Stock and options directly link CEO wealth to shareholder value, and are the major component of total CEO equity incentives [Hall and Liebman (1998) and Jensen and Murphy (1990)].

We measure equity incentives as the equivalent stock value. For example, we refer to $100 of stock as having $100 of incentives. However, because options are equivalent to a leveraged investment in stock, $100 of options has a greater sensitivity to stock returns, and greater incentives, than $100 of stock. To estimate the sensitivity of option value to stock price, i.e., the option portfolio delta, we use the method developed by Core and Guay (2002), with option maturities set to 70% of the Core and Guay assumed times-to-maturity to adjust for expected early exercise. We compute the total incentive measure as: (share price) × (the number

[10] Although the determinants of changes in pay and incentives for UK CEOs over time is an interesting research question, the objective of our study is to explore the implications of equity incentive risk premiums for cross-sectional differences in US vs. UK (and EU) CEO pay. That is, we seek to understand whether US and UK pay appears to be different once pay is adjusted for the risk premium stemming from equity incentives.

[11] As a caveat to interpreting the changes in pay over time, we note that changes in business conditions over the six-year window from 1997 to 2003 have not been identical in the US and UK. For example, in Panel B of Table 1, we show that the median US firm's market value fell by 2% from 1997 to 2003 compared to a decline of 27% for the UK sample firms. This relatively greater decline in market values for UK firms makes the relatively greater increase in UK pay more remarkable. Aggregate price inflation from 1997 to 2003 was 8.1% in the UK (1.3% per year) as compared to 15.2% in the US (2.4% per year), but these changes in general price levels seem unlikely to explain the observed pay changes. We also note that average exchange rates were very similar in 1997 and 2003: in both years, one UK pound sterling was worth about 1.64 US dollars.

of shares held) + (share price) × (option delta) × (the number of options held).[12] We note that our incentive measure is a scaled version (i.e., multiplied by 100) of a commonly-used incentive measure: dollar change in the CEO's wealth from a 1% stock price increase [Baker and Hall (2004) and Core and Guay (1999)]. We use the scaled equivalent stock value incentive measure to facilitate our later discussions of the risk premium required for holding incentives.

In Panel D of Table 1, we provide descriptive evidence that US CEO equity incentives are greater than those of UK CEOs. The median US CEO in 2003 had incentives equal to about $19.6 million in stock equivalent value. That is, for each 1% increase in the stock price, the median CEO would experience a $196,000 increase in his equity value (=1% x $19.6 million). This compares to the median UK CEO incentives of about $3.8 million in stock equivalent value, or a $38,000 increase in equity value for a 1% change in stock price. The incentive data are positively skewed with mean values substantially greater than median values. This skewness is largely due to a small percentage of CEOs who hold very large amounts of equity. Between 1997 and 2003, the median UK CEO incentives increased by about 58% compared to 24% for US CEOs' incentives. Overall, the evidence in the bottom two panels of Table 1 shows that American CEOs have greater wealth and incentives in their firms compared with their British counterparts, but that UK CEOs' incentives have exhibited a greater relative increase from 1997 to 2003.

3. Analysis of relative US and UK CEO pay and incentives

We begin our analysis by showing that the US-UK pay difference, which has previously been documented in the literature, holds within our data. Although the descriptive statistics in

[12] Shares held includes restricted stock and performance-vested restricted stock.

Table 1 suggest such a premium, a proper test should control for differences in firm characteristics known to vary with CEO pay.

Columns (1) and (2) of Table 2 report coefficient estimates of the US-UK pay difference, using OLS regression methods and controlling for company size, growth opportunities, firm performance, stock idiosyncratic risk, leverage, and industry factors. Extant research on executive compensation has consistently hypothesized and found that larger firms with greater growth opportunities require more talented and more highly paid managers [e.g., Smith and Watts (1992)]. In addition, researchers often include controls for company performance, tenure, and firm risk (as proxies for ability or demand for ability). The models therefore include as controls the market value of the firm dated at t-1, the book-to-market assets ratio dated at t-1, the performance of the firm (measured as the one-year total return to shareholders), the idiosyncratic risk of shareholder returns (as a proxy for risk), CEO tenure, and a set of industry dummy variables. We also include a proxy for leverage, measured as the ratio of book value of debt to the market value of assets. Regressions including both US and UK CEOs are performed separately for 1997 and 2003 in columns (1) and (2).

Consistent with prior research, Table 2 indicates that CEO pay increases with firm size, growth opportunities, risk, and performance. However, the main coefficient of interest in columns (1) and (2) is the variable "US indicator" which is equal to one if the firm is a US firm and zero if it is a UK firm. The coefficient estimate on the US indicator variable for 2003 in column (2) is a significantly positive 0.32, indicating that after controlling for various firm, CEO, and industry factors, CEOs in the US earn approximately 38% more total compensation than their British counterparts in that year. An interesting feature of Table 2 is that it shows a

narrowing of pay differences from 1997 to 2003. US CEO total pay was about 99% higher than UK CEO pay in 1997, but this difference narrowed to 38% in 2003.[13]

Columns (3) and (4) of Table 2 report coefficient estimates of the difference between US and UK incentives using a series of OLS regressions similar to those for total pay in columns (1) and (2), and controlling for company size, growth opportunities, idiosyncratic risk, CEO tenure, leverage, and industry factors. The dependent variable in all columns is log(equity incentives). As in the CEO pay regressions, the incentives regressions include both US and UK CEOs, and are performed separately for 1997 and 2003. The coefficients on the control variables in the incentives regressions are consistent with prior literature: Larger firms with greater growth opportunities use more incentives, and CEOs with longer tenure hold more equity incentives. Consistent with prior mixed results on the association between risk and incentives, idiosyncratic risk does not show a consistent relation with incentives. Leverage is not associated with incentives in 1997, but shows a significant negative association in 2003.

In the 2003 regression, the coefficient estimate on the US indicator is 1.87 and indicates that, after controlling for firm, CEO, and industry factors, CEOs in the US hold about 549% more equity incentives than their UK counterparts in that year. This suggests that CEOs in the US have much more wealth tied up in firm equity that is at risk to adverse price shocks.[14] As

[13] The cost of living in major metropolitan areas is roughly similar across the two countries. Mercer Human Resource Consulting (2009) conducts a Cost of Living Survey which covers 143 cities across six continents and measures the comparative cost of over 200 items in each location, including housing, transport, food, clothing, household goods and entertainment. London is an expensive city in Europe and is ranked third globally in 2008, while New York is the most expensive city in the US and is ranked twenty-second globally in 2008. Further, it seems plausible that a greater percentage of UK CEOs reside in London, as compared to US CEOs that reside in New York. Outside of major metropolitan areas, the cost of living in the UK is generally lower than that of comparable US cities.

[14] We note that differences in incentives borne through risk of CEO turnover are unlikely to alter this inference regarding differences in incentives between US and UK CEOs. As we discuss in the Appendix, average UK CEO turnover is similar to, if not somewhat less frequent than, that of the US. Prior studies find similar results [e.g., Conyon and Murphy (2000) and Dahya, McConnell, and Travlos (2002)].

with the pay difference, the US-UK incentive difference in 2003 has declined somewhat from 1997 (549% vs. 759%, respectively).

The regressions in columns (1)-(4) indicate, not surprisingly, that CEO pay and incentives are influenced by many firm characteristics, such as size and growth. Because the US and UK samples are likely to differ across some of these dimensions (for example, Table 1 shows that the samples differ on the firm size dimension), we facilitate clear comparisons by using a propensity-score-matching procedure to select a firm from the US sample (which contains a much larger number of observations) for each UK firm. The propensity scores are computed based on the by-year logit regressions presented in columns (5) and (6) of Table 2, which include all the control variables from columns (1)-(4). The dependent variable is a "UK indicator" which is equal to one if the firm is a UK firm and zero if it is a US firm. The significant negative coefficients on idiosyncratic risk and on shareholder returns in both years suggest that UK firms tend to be less risky and had weaker stock price performance in both 1997 and 2003. We match each UK firm to the US firm with the closest propensity score within two-digit SIC code (the propensity-score regressions only include US observations for which there is a UK observation in the same industry).

Table 3 presents mean and median descriptive statistics for the propensity-score-matched US and UK samples separately for both 1997 and 2003, and shows differences between the samples in the far right columns. As expected and by construction, there are no significant differences in firm size (sales and market value) between the two samples. Further, among the variables included in the propensity-score regressions, idiosyncratic risk in 1997 is the only characteristic that exhibits a significant difference between the matched samples. Most importantly for our purposes, however, the direction and magnitude of differences in total pay

and incentives between the US and UK CEOs are quite similar to the descriptive statistics presented in Table 1. For the remainder of the paper, we focus on the propensity-score-matched sample in our analyses.

Table 3 also presents descriptive statistics on some other governance and risk characteristics that may shed light on differences in pay or incentives between US and UK CEOs. Specifically, we examine the incidence of CEOs who also serve as Board chairs and the extent to which the firms are closely held. Brickley, Coles and Jarrell (1997) argue that the prospect of becoming the Board chair acts as an incentive mechanism for CEOs, suggesting that more successful and talented CEOs are likely to be awarded the chair. The combined roles may also carry greater responsibility. On the other hand, it is frequently argued that the dual CEO-chair position reflects CEO power and entrenchment (Core, Holthausen, and Larcker, 1999). The previous finding that CEOs who serve this dual role are higher paid is consistent with both hypotheses. The dual position is rarely used in the UK compared to the US (in 2003, the percentages of firms were 4.2% vs. 69.6%, respectively). This difference potentially provides a non-risk explanation for some of the differences in pay between the US and UK CEOs. We examine the relation between CEO pay and incentives, and the dual position of CEO and Chair in a regression setting in Table 8 below.

Finally, we report the proportion of shares held by insiders and large shareholders ("%Closely held shares"), where large shareholders are defined as those holding more than five percent of outstanding shares (we report this variable with, and without, the CEO's shareholdings included). Jensen (1993) argues that active investors have the financial interest and independence to help correct governance problems. Thus, if differences in pay between US and UK CEOs reflect differences in agency conflicts, this may be due to a greater prevalence of

active investors in the UK vis-à-vis the US. The data, however, do not show a significant difference in shares held by insiders and large shareholders. Excluding ownership by the CEO, in 1997, the UK firms have insignificantly higher median ownership by insiders and large shareholders than US firms (11.6% vs. 7.7%, respectively), and in 2003, the UK and US firms have nearly identical median ownership by insiders and large shareholders (11.2% vs. 11.3%, respectively).

4. Results - The relation between pay and incentives

To this point, we have illustrated that the level of CEO compensation is higher for US CEOs compared to UK CEOs. Further, we have shown that US CEOs have more wealth at risk in their companies' stock and stock options relative to UK CEOs. There are economic benefits and costs to imposing incentives. The benefits of incentives are that they align the CEO's interests with those of shareholders and encourage the CEO to make decisions that increase shareholder value. However, the cost of these incentives is that a CEO will not work unless he is adequately compensated, and a risk-averse CEO will demand more compensation as the amount of incentives imposed is increased. All agency models predict that the greater the amount of incentives imposed on an agent, the more he will be paid. Recent research emphasizes that risk-averse and undiversified CEOs discount the value of their firm-specific equity [e.g., Hall and Murphy (2002)]. This occurs because CEOs would prefer to invest their wealth in a more diversified portfolio, and therefore do not value $1 in firm stock as much as $1 invested in this more diversified portfolio. The more incentives the CEO holds, the less his wealth is diversified, and the greater the risk premium he requires.

Table 4 shows a descriptive calculation of the ratio of extra pay received by the median US CEO to the extra incentives held by this median US CEO. Columns (1) and (2) show median CEO total pay and beginning-of-year CEO portfolio incentives for 1997 and 2003, respectively. Recall that this incentive measure is defined as the change in the value of CEO equity holdings for a percentage change in the stock price, and equates $100 in stock to $100 in incentives. Column (3) shows that in 1997 (2003) the median US CEO received $1,260,000 ($853,000) more pay and held $14,496,000 ($17,601,000) more incentives. In the final row of each panel, we compute the ratio of incremental pay received by the median US CEO for incremental incentives held. This incremental pay is 8.69% per unit of incentives in 1997, and 4.85% per unit of incentives in 2003. In other words, our matched sample of US CEOs receive between $4.85 and $8.69 in extra annual pay for holding an undiversified position equivalent to $100 in firm stock. In the next section, we explore whether the magnitude of this premium appears reasonable given various assumptions about CEO risk aversion, wealth, and firm characteristics.

4.1 Estimating the risk premium for holding incentives

That CEOs who hold greater incentives should receive greater pay seems reasonable. The key question is what magnitude of extra pay would we expect the US CEOs to receive given the extra incentives they hold? In other words, is a range of $4.85 to $8.69 in extra pay per $100 of extra incentives reasonable? Some light can be shed by extending the work of Hall and Murphy (2002) and Cai and Vijh (2005) on the risk premium a CEO will require for accepting an equity grant in lieu of cash pay. Hall and Murphy and Cai and Vijh show that the magnitude of the risk premium associated with the equity grant increases with the proportion of the manager's wealth that is invested in firm equity (as opposed to diversified assets) and with the CEO's risk-

aversion. Both outside wealth (money not held in firm equity) and risk-aversion are unobservable to the researcher. However, prior literature typically assumes that outside wealth ranges between 50% and 100% of the CEO's inside wealth. For example, if the CEO owns $10 million in firm equity, the literature assumes that his outside diversified holdings range from $5 million to $10 million. In addition, the literature typically assumes that the CEO exhibits relative risk-aversion, and that his relative risk-aversion ranges from two to three [see for example, Hall and Murphy (2002) and Cai and Vijh (2005)].

Part of pay can be thought of as compensation for the CEO holding firm equity instead of selling the equity and diversifying (holding aside the component of pay related to the CEO's skill and cost of effort, and any rents that he may extract, which we refer to as "risk-adjusted pay"). In other words, one can think of a portion of annual pay as the risk premium paid to the CEO for holding an undiversified position in firm equity for the next year. Another way to think of this risk premium is: How much less pay would the CEO accept if he were released from the restriction that he hold a substantial fraction of his wealth in firm stock? We solve for the risk premium the CEO requires to be indifferent between (1) receiving the risk premium and holding the firm equity position *for one year*, and (2) not receiving the risk premium, selling his firm equity, and holding a diversified portfolio instead.

We derive the risk premium by numerically solving the following equation:

$$E[U(wealth\ unconstrained)] = E[U(wealth\ \ constrained\ to\ firm\ equity, outside\ \ wealth, risk\ \ premium)] \quad (1)$$

Wealth constrained to firm equity (inside wealth) is the CEO's beginning-of-year portfolio of stock and options. We assume: (1) the CEO's outside wealth is either 50% or 100% of the CEO's inside wealth, (2) the CEO has a power utility with relative risk-aversion of either 2 or 3, and (3) the CEO may invest his outside wealth in long positions in both the market portfolio and the

risk-free asset (but may not sell short).[15] The expression on the left side is the utility the CEO would receive if he could invest his total wealth in a utility-maximizing combination of the risk-free asset and the market portfolio. We assume that this unconstrained wealth is equal to the market value of the CEO's stock and options, plus his outside wealth.[16] The expression on the right side is the utility the CEO receives when he is constrained to hold the assumed fraction of his wealth in firm stock and options for one year, but may sell the securities at market value at the end of the year. We assume that the CEO invests the remainder of his wealth in a utility-maximizing combination of the risk-free asset and the market portfolio, and that he holds these positions for one year.[17] We assume a one-year holding period to match the period over which annual compensation is paid.[18] The risk premium is the dollar amount that sets the two sides equal, and is assumed to be paid by the firm to the CEO at the end of the year.

As an illustration of this method, in Table 5, we show the estimated risk premium for holding incentives for a hypothetical CEO. For convenience, we express this risk premium as a percentage of the CEO's incentives.[19] The table shows that the CEO requires a greater risk

[15] Our assumption that the CEO chooses between the market portfolio and the risk-free asset is consistent with the literature, but is an abstraction of people's real-world portfolio choices that may include large investments in other assets such as homes and other real estate. To the extent that portfolio choice varies by country, it may indicate differences in risk-aversion or in proportions of outside wealth across the countries. In Section 4.3 below we provide a sensitivity analysis, and discuss how our inference would vary if UK CEOs differed from US CEOs in risk-aversion or in proportions of outside wealth.

[16] To the extent that the CEO owns options or restricted stock, he will not be able to invest the market value of firm equity in a diversified portfolio. However, the objective of our method is to make comparisons of CEOs with different types of firm equity by asking the question: How much less pay would the CEO accept if he were released from the explicit or implicit restriction that he hold a portion of his wealth in firm stock?

[17] Because the CEO is able to choose a utility-maximizing combination of the market portfolio and the risk-free asset, this allows him to minimize the risk of his incentive holdings and minimize the risk premium (relative to a situation in which he held a fixed position in these assets (see Cai and Vijh, 2005).

[18] Clearly some forms of compensation are restricted for multiple years, and options (if the executive wishes to obtain their full value) are implicitly restricted beyond vesting. On the other hand, CEOs typically also own unrestricted stock and fully vested options. However, as noted above, the objective of our method is to make comparisons of CEOs with different types of firm equity by asking the question: How much less pay would the CEO accept if he were released from the explicit or implicit restriction that he hold a significant portion of his wealth in firm stock?

[19] Under our assumption that the CEO has constant relative risk-aversion, the risk premium is proportional to the magnitude of the incentives. For example, if the CEO's inside and outside wealth both increase by a factor of 10,

premium when he is more risk-averse and when more of his wealth is concentrated in firm stock. For our hypothetical CEO, when relative risk-aversion is two (three) and 50% of his wealth is in firm stock, he requires a risk premium of 5.8% (8.5%). If the CEO is less diversified and holds 67% of his wealth in firm stock, he requires a risk premium of 7.6% (11.0%) for a risk-aversion parameter of two (three). An estimated risk premium of 7.6% means that if the CEO has incentives of $1,000,000, he will require an annual risk premium of $76,000 to compensate him for his lack of diversification. Another way to consider the risk premium is to suppose that a completely diversified shareholder requires a return of 10.0% on the firm's stock. Then the CEO, because he is undiversified, requires a return of 17.6%, 7.6% in extra annual pay on top of the 10% expected return. The estimated risk premiums in Table 5 appear comparable to the incremental US pay per unit of incentives shown in Table 4. In 2003, the median US CEO received $853,000 more pay for holding about $17.6 million more incentives, or an incremental-pay-to-incremental-incentive ratio of 4.85% (in 1997, the incremental-pay-to-incremental incentive ratio was 8.69%). This 4.85% to 8.69% range of incremental-pay-to-incremental incentive ratios is slightly lower than, but roughly consistent with, the range of 5.8% to 11.0% shown in Table 5.

It is important to note that, although we use similar numerical methods to Cai and Vijh (2005), the risk premium we estimate is different than the risk premium Hall and Murphy (2002) and Cai and Vijh (2005) estimate. This prior work focuses on determining the executive's value of a *new* option grant by solving the following equation:

$$E[U(\textit{wealth constrained to firm equity}, \textit{outside wealth}, \textit{option})] = E[U(\textit{wealth constrained to firm equity}, \textit{outside wealth}, \textit{executive's value})] \quad (2)$$

the risk premium also increases by a factor of 10. This makes it convenient to scale the computed risk premium, and in the table, we express the risk premium as a percentage of incentives.

The difference between the market value of the option (left-hand-side) and the executive's value (right-hand-side) is the risk premium associated with the option grant. Because of its interest in determining the executive's value for a new option grant, this work holds constant the risk premium for holding the existing equity portfolio, and solves for the incremental risk premium for holding a new option grant until maturity. In contrast, our objective is to estimate the risk premium required by the executive to hold his *entire* existing equity portfolio for a single year. Thus, the key difference between our objective and that of Hall and Murphy (2002) and Cai and Vijh (2005) is that we solve for the risk premium stemming from the CEO's entire equity portfolio, whereas they solve for the risk premium stemming from a single equity grant.

4.2 Estimating risk-adjusted pay

As described above, we conceive of total pay as compensation for ability and effort, plus a risk premium. Therefore, given an executive's incentives, one can estimate the risk premium and subtract it from total pay to obtain an estimate of "risk-adjusted pay". We note that this calculation requires one to make an assumption about the CEO's wealth and risk aversion, and we assume that US and UK CEOs have relative risk-aversion of two, and have 50% of their wealth outside the firm. From Table 5, these assumptions about risk-aversion and wealth outside the firm imply a risk-premium of 5.8% of incentives.[20] In Table 6, we use the median data shown in Table 4 to obtain an estimate of the median risk-adjusted pay received by these CEOs. We compute the median risk-adjusted pay by subtracting 5.8 times the CEO's beginning-of-year incentives from his total pay. The analysis in Table 6 suggests that controlling for the risk premium substantially reduces the pay differences between US CEOs and UK CEOs. In 1997,

[20] We note that 5.8% is approximately the midpoint of the observed incremental pay per unit of incentives reported in Table 4 for 1997 and 2003, and is the smallest of the estimated risk premium percentages presented in Table 5.

the median matched US CEO received 128% more pay than the median UK CEO and held about 602% more equity incentives. After deducting the risk premium compensation for holding the median level of incentives, the median risk-adjusted pay in 1997 is 50% greater for US CEOs than for UK CEOs, still a substantial difference but much smaller than the 128% difference in unadjusted pay. In 2003, we observe an even more striking result. The median matched US CEO received 45% more pay in 2003 than the median UK CEO and held 462% more equity incentives. After deducting the US and UK CEOs' expected compensation for holding incentives, the median risk-adjusted pay in 2003 is 11% *greater in the UK* ($1,503,000 for the median US CEO vs. $1,670,000 for the median UK CEO).[21] The results in Table 6 suggest that risk premium compensation may account for a large proportion of the observed differences in pay between US and UK CEOs.

In Table 7, we examine whether these median results hold when the risk premium adjustment is applied on a CEO by CEO basis (as opposed to simply illustrating results using the median CEO). To compute a risk premium for each CEO, we use Equation (1) above with an assumption that CEOs have relative risk-aversion of 2 and 50% of their wealth outside the firm. Inputs into the calculation are each CEO's beginning-of-year stock and option portfolio, the firm's beta and volatility, an assumed market volatility of 20%, a risk-free rate of 5%, and a market risk premium of 6%. We then compute each CEO's risk-adjusted pay by subtracting the computed risk premium from his total pay. In Panel A, we present the computed risk premiums as a percentage of incentives, which average 3.9% in 1997 and 8.4% in 2003. The greater risk

[21] The UK, to a much greater extent than the US, makes the vesting of options (and restricted stock) contingent upon the achievement of performance targets (e.g., Main, 2005). To the extent that these targets are non-trivial, performance-based vesting will lower the value of an option or restricted share and decrease the incentives provided by the equity (e.g., Johnson and Tian, 2000). We do not have data to feasibly incorporate these effects into our analysis. As a result, our calculated numbers may somewhat overstate UK pay, and also overstate UK incentives and the risk premium associated with these incentives. However, because the overstatement of pay will tend to be offset by the overstatement of the risk premium, it is not clear whether our measure of risk-adjusted pay for UK CEOs is somewhat overstated or understated.

premiums in 2003 are the result of higher estimates of stock-return volatility for the US and UK firms in that year. Because our propensity-score-matching procedure matches on idiosyncratic risk, the beta and stock volatility of the matched firms tend to be similar, and as a consequence there is no difference in risk premiums between the US and UK firms.

Panel B of Table 7 shows that the *average* risk-adjusted pay is $893,000 for the matched US CEOs in 1997 and -$485,000 for 2003, as compared to $1,008,000 for the UK CEOs in 1997 and $936,000 in 2003. The negative average value for US CEOs in 2003 is due to a small number of US CEOs who hold very large amounts of equity.[22] Setting negative values of risk-adjusted pay to zero (see Column (2)), the adjusted averages show mean US risk-adjusted pay is larger than risk-adjusted pay in the UK ($2,360,000 vs. $1,087,000 in 1997 and $2,930,000 vs. $2,086,000 in 2003).

However, because the averages in both samples are influenced by some extreme observations, as noted above, we interpret the median values as being more representative of the samples. The median risk-adjusted pay for the US CEOs is about 69% greater than for the UK CEOs in 1997, $1,364,000 vs. $808,000, respectively. The median paired difference is significantly greater than 0. From 1997 to 2003, risk-adjusted pay for the UK CEOs increased, largely due to growth in UK CEO pay over that period. At the same time, US CEO risk-adjusted pay declined from 1997 to 2003, largely due to an increase in the estimated risk premium per

[22] The five percent of CEOs who have the most negative risk-adjusted pay in 2003 have average risk-adjusted pay of -45 million, average tenure of 17.5 years, and average stock ownership of 21.1% of shares outstanding, as compared to the remaining 95% of CEOs who have average risk-adjusted pay of $1.7 million, average tenure of 5.4 years, and average stock ownership of 1.7% of shares outstanding. We acknowledge that a straight-forward risk-adjusted pay framework is unlikely to capture important aspects of the compensatory relationship between the CEO and firm when the CEO holds extremely large amounts of equity. Such CEOs are likely to be founders or long-standing executives that have successfully led the firm over a substantial period of time. These CEOs may reach a point where it is difficult for them to sell much of their equity (e.g., because shareholders expect them to show confidence in their continued leadership of the firm) and where it is also not feasible to expect the firm to fully compensate them for the risk borne through their equity holdings. The retention of these CEOs may be more closely tied to their motivation in maintaining the value of their equity holdings rather than in receiving annual pay (e.g., consider the compensation arrangements for well-known founding CEOs, such as Bill Gates at Microsoft Corp.).

unit of incentives (see Panel A of Table 7). As a result, the 2003 ordering of risk-adjusted pay is reversed, with the median UK CEO receiving more risk-adjusted pay than the median US CEO, $1,564,000 vs. $938,000, respectively. Now, the median paired difference is not significantly different from 0. Abstracting away from the magnitude, in 1997, 60.5% of US CEOs had greater risk-adjusted pay, but this figure drops to 44.3% in 2003. Overall, the results in Table 7 (and in Table 6) suggest that the commonly-held view that US CEO pay is high relative to UK CEO pay may not hold once one considers the risk premium attributable to greater holdings of risky equity incentives.

Our results in Tables 3 and 7 indicate that US pay is higher than UK pay, that risk-adjustments narrow these differences, and that risk-adjusted US pay is higher in 1997, but (insignificantly) lower in 2003. These results are based on propensity-score-matched differences that control for industry, size, and other determinants of compensation and incentives. In Table 8, we examine whether our findings are robust to controlling for additional CEO and labor market characteristics that may affect differences in pay and/or incentives between the US and UK.

As motivation for our first two additional explanatory variables, we expect that when a UK firm has greater exposure to the US, it is likely to participate in a more global CEO labor market, have a more global shareholder base, and to be more likely to pay its CEO (and provide incentives) at levels comparable to those of US CEOs. Our first proxy for a UK firm's degree of exposure to US labor markets is an indicator variable for whether the UK firm employs an American CEO.[23] If the UK firm must pay US wages to move an American CEO, we expect higher pay for this CEO. Following Gerakos et al. (2009), who find higher pay for US-listed UK firms, we also construct an indicator variable for whether the UK firm is listed on a US

[23] We were not able to identify the nationality of 56 (14%) of our UK CEOs. If we drop these observations from the analysis in Table 8, our inference is qualitatively identical.

exchange. In untabulated descriptive analysis, we find a small, but increasing, number of American CEOs at UK firms (4.0% in 1997 and 6.5% in 2003), as well as a small, but increasing number of US listings by UK firms (10.7% in 1997 and 14.0% in 2003). Although these factors are unlikely to explain a substantial proportion of the cross-sectional differences in pay between US and UK CEOs, the change in these factors over time suggest a growing exposure of UK firms to US markets, and could help explain some of the time-series narrowing of pay differences.

We also explore whether US-UK differences in the prevalence of CEOs who also serve as board chair might explain some of the pay differences. As noted above, we expect CEO-board chairs to receive higher pay (the board chair indicates greater ability and/or greater entrenchment), and as shown in Table 3, a much greater proportion of US CEOs are board chairs. We construct an indicator variable for whether a CEO is board chair, and include the difference between the indicator variables for the US and UK matched CEOs as a variable in the regression. Finally, we consider that the degree of industry product market competition could potentially influence observed differences in pay between US-UK CEOs. If the higher observed compensation for US CEOs reflects excessive pay, we expect the ability of US firms to excessively pay their CEOs would be reduced in very competitive industries (likewise, CEO incentives in competitive industries should converge). Competitive pressure is expected to produce a similar result (i.e., the convergence of pay) if the lower pay in the UK is the result of social norms. As an inverse measure of the degree of market competition, we use the Hirschman-Herfindahl Index of industry product market concentration, calculated using Compustat Global as the sum of squared market shares. Market shares are based on firm sales as a fraction of worldwide industry sales, where industry is based on 2-digit SIC codes. This measure is often

used as a proxy of market power in the industrial organization literature since higher values are associated with oligopoly, and in the limit monopoly, power.

In Table 8, we present median regression models of the difference in US-UK CEO pay, incentives, and risk adjusted pay, where the dependent variable is the difference between each US-UK propensity-score-matched pair. The results indicate that the pay difference between the US and UK matched CEO is smaller when the UK CEO is an American, and when the UK firm is listed in the US, consistent with Gerakos et al.'s (2009) findings that UK firms with more US exposure have greater pay. The difference in US-UK incentive levels (Column 2), however, is not significantly related to whether a UK firm has an American CEO or a US exchange listing. The results also indicate that CEOs who are board chairs have both greater pay and greater incentives. Product market competition, as measured by the Hirschman-Herfindahl index, does not have explanatory power for either the difference in US-UK pay or incentives.[24]

Importantly, the positive and significant intercepts in the total pay and risk-adjusted pay regressions (Columns 1 and 3) are consistent with our earlier findings that pay and risk-adjusted pay are higher in the US in 1997. Further, the Year 2003 Indicator is significantly negative in the risk-adjusted pay regression, indicating that differences in risk-adjusted pay narrowed between 1997 and 2003. We also find that F-tests on the sum of the intercept and the Year 2003 Indicator are insignificant, suggesting that there is no difference in 2003 in either pay or risk-adjusted pay. This is consistent with our earlier findings on risk-adjusted pay, but contrasts with our earlier finding of a significant difference in unadjusted pay. Overall, however, we find that the inclusion of the additional control variables in Table 8 do not change our earlier finding that US CEOs'

[24] If we add a control for the presence of large shareholders in Table 8, this variable is insignificant in all specifications and does not affect our inference. This is consistent with the descriptive statistics in Table 3 showing an insignificant difference in shares held by non-CEO insiders between our matched US and UK samples.

risk-adjusted pay is higher than that of UK CEOs in 1997 but about the same as that of UK CEOs in 2003.

4.3 Sensitivity Analysis and Interpretation

We interpret our findings as being consistent with US and UK CEOs receiving similar risk-adjusted pay, or at least that neither country's CEOs appear to receive consistently higher risk-adjusted pay. However, given perceptions by many that US CEOs are overpaid relative to UK CEOs, we now consider a set of necessary conditions for our results instead to be interpreted as US CEOs receiving greater risk-adjusted pay relative to UK CEOs. Not surprisingly, such a conclusion requires that either our analysis excludes an important determinant of differences in US-UK pay levels, or that our risk premium estimates or the assumptions we use to develop them are incorrect.

Differences in unreported compensation

In the above analysis, we focus on pay reported in US and UK proxy statements. Although the types of pay reported are similar in both countries, some forms of compensation are not disclosed in numeric form in the proxy statement and are not included in our measures of total annual pay. These forms of compensation include: value that may be received from backdated stock options, the expected value of pension and termination payments, and expected decreases in CEO pay due to early turnover.

As discussed in detail in the Appendix, our estimate of the difference between US and UK CEO pay is not greatly affected by these unreported forms of compensation. This inference is due, in part, because unreported pay is expected to be a relatively small fraction of pay (at least on average), as well as because some forms of unreported pay are expected to be greater in the

US whereas other forms are expected to be greater in the UK. For example, unreported pay due to option backdating in the US slightly increases our estimate of the difference between US CEO risk-adjusted pay and UK CEO risk-adjusted pay (option backdating was not, to our knowledge, prevalent in the UK). Pensions, on the other hand, appear to accrue at a higher rate in the UK than in the US (15% vs. 10%, respectively), thereby slightly reducing our estimate of the difference between US CEO pay and UK CEO pay. With respect to executive turnover, US CEOs have at least as much turnover probability as UK CEOs and have about the same severance protection. As a result, since US CEOs have higher total pay, they tend to lose more income conditional on turnover, and incorporating a risk premium related to turnover would slightly reduce our estimate of the difference between US CEO pay and UK CEO pay.

Different assumptions about risk aversion and wealth

Our analysis to this point has assumed that, US and UK CEOs have the same relative risk-aversion (2), and hold the same proportion of their wealth in equity incentives (50%). Combined with our empirical finding that US CEOs hold more equity incentives than UK CEOs, this latter assumption implies that, ceteris paribus, US CEOs are wealthier than UK CEOs (i.e., if CEOs are assumed to hold 50% of their wealth in incentives, more incentives implies more wealth). In this section, we consider how different assumptions about US-UK CEO risk aversion and/or wealth would change our inferences about US-UK CEO pay differences.[25]

We begin by supposing that CEOs in both the US and UK have much lower risk-aversion than is assumed in the literature. In this case, the risk premium shown in Panel A of Table 7

[25] We also make the implicit assumption that the cost of CEO effort, and the compensation for CEO effort is the same for each pair of CEOs. Edmans, Gabaix, and Landier (2009) use an alternative assumption that is common in macroeconomic models: the cost of effort is proportional to wealth. Intuitively, wealthier persons have greater opportunity costs. If this assumption is correct, and if US CEOs in fact tend to be wealthier, the differences in risk-adjusted pay shown in Table 7 would *overstate* the true pay premium received by US CEOs: the positive pay premium for US CEOs in 1997 would be less positive, and the slightly negative pay premium for US CEOs in 2003 would become more negative.

would drop substantially for both countries, and US pay would again appear high compared to UK pay. In the extreme, if all CEOs were risk neutral and required no risk premiums for holding incentives, the comparison of risk-adjusted pay across the two countries would become identical to the comparison shown in Table 6 in which US CEOs receive 128% (45%) more pay than their UK counterparts in 1997 (2003).

On the other hand, assuming that the literature's assumptions of relative risk-aversion between two and three are correct, one might consider the possibility that US and UK CEOs have somewhat different risk aversion, on average.[26] Specifically, a claim that US CEOs are overpaid relative to UK CEOs would require that UK CEOs are *more* risk averse than US CEOs and therefore require a greater risk premium per unit of incentives (if UK CEOs were instead less risk averse than US CEOs, this would imply a greater risk premium per unit of incentives for US CEOs and would further lower the US CEOs' risk-adjusted pay). In addition, due to country-specific differences in monitoring, perhaps it is optimal for US CEOs to hold a different proportion of their wealth in equity incentives than UK CEOs. Specifically, a claim that US CEOs are overpaid relative to UK CEOs would require that UK CEOs hold a greater proportion of their wealth in equity incentives (if UK CEOs were instead required to hold a lesser proportion of wealth in equity incentives than US CEOs, this would imply a greater risk premium for US CEOs and would further lower the US CEOs' risk-adjusted pay).

To explore how our results would change under the assumptions that UK CEOs are more risk-averse and hold more of their wealth in firm incentives, Table 9 revises the analysis in Table 6 to show the effect of assuming that the median UK CEO has relative risk aversion of three and

[26] Graham, Harvey, and Puri (2009) provide survey evidence that US CEOs tend to be more risk tolerant than non-US CEOs. Although the survey compares US CEOs (and CFOs) to European and Asian CEOs (and CFOs) as a group, and so does not speak specifically to the relative characteristics of UK CEOs, the results are at least suggestive that US CEOs might be somewhat less risk averse.

has 67% of his wealth in incentives, while maintaining the assumptions in Table 6 for the median US CEO (i.e., relative risk aversion of two and 50% of wealth in incentives). From Table 5, these assumptions imply that the UK CEO would require a risk premium of 11.0% of incentives held, and the US CEO would require a risk premium of 5.8% of incentives held. Under these alternative assumptions, the analysis in Table 9 shows that the median US CEO received 76% more risk-adjusted pay than his median UK counterpart in 1997. However, by 2003 there is essentially no difference: the median US CEO received only 2% more risk-adjusted pay than his median UK counterpart.

In reality, it seems unlikely that UK CEOs hold a greater fraction of their wealth in the firm than US CEOs. If this were true, it suggests implausibly large wealth differences between the two countries' CEOs. As shown in Table 9, because the median US CEO in 1997 held 7.0 times the incentives of the median UK CEO, an assumption that the US CEO held 50% of his wealth in the firm compared to 67% for the UK CEO, would imply that the US CEO had 9.4 times the wealth of the median UK CEO (assuming for simplicity that all of the incentives were held in stock, for which \$100 in stock = \$100 in incentives).

A more plausible assumption might be more similar wealth levels between the two countries' CEOs, with the observed incentive differences caused by US CEOs holding a greater portion of their wealth in the firm. For example, suppose that in 1997 US CEOs had twice the wealth of their UK counterparts. Then, if the median US CEO holds 50% of his wealth in the firm, the observed incentive differences imply that the median UK CEO holds only 14% of his wealth in the firm.[27] But this then raises the question of how UK firms are able to resolve agency conflicts with CEOs with this small amount of their wealth in firm equity. On one hand,

[27] Note that if UK CEOs hold less than 50% of their wealth in the firm, our risk premium estimates for UK CEOs will be upwardly biased, suggesting greater risk-adjusted pay for UK CEOs than our estimates in Tables 6, 7, and 9.

institutional, regulatory, and societal differences between the US and UK may allow UK firms to resolve governance problems without resorting to costly incentive structures tied to stock price performance. On the other hand, lower tolerance for high pay in the UK may result in inefficiently low incentives because of constraints on paying risk premiums. To shed light on these alternative explanations, future research is needed to quantify the risk-aversion and wealth levels of top executives.

A final objection to our analysis might be as follows: Does not the apparently greater wealth of US CEOs constitute prima facie evidence that they are overpaid? If US CEOs are not overpaid relative to UK CEOs, how do they have so much more wealth? Although an investigation of this issue is beyond the scope of this paper, we note a few potential explanations for why US CEOs might be wealthier than UK CEOs. First, CEOs accumulate wealth through both risk-adjusted pay and through pay for risk. To the extent that US CEOs bear more incentive risk throughout their careers, they will be paid more and accumulate greater wealth (albeit with greater variance), all else being equal. Second, compared to UK executives, US executive income is likely taxed at lower average rates over the individual's career. Although the top marginal tax rate is similar across the US and UK, this rate is applicable at lower income levels in the UK than in the US. For example, in 2003, the top UK income tax rate of 40% affected incomes above approximately $50,000, whereas the top US income tax rate of 35% affected incomes above approximately $310,000. Thus, future executives in the UK pay greater taxes earlier in their careers and are expected to accumulate less wealth. Further, capital gains of US executives are likely taxed at lower average rates. The capital gains tax rate on gains from equity sales is the same as the income tax rate in the UK. In the US, the top capital gains tax rate has generally been lower than the top marginal tax rate. In comparison to low US capital gains tax

rates of 20% or below throughout our sample period, the UK capital gains rate has been 40%. Finally, we note that retirement ages are not mandatory in the UK. The normal retirement age in the UK is 65, which is similar to the US. Overall, it seems conceivable that US executives are wealthier because they receive higher risk premiums throughout their careers and are taxed at lower income and capital gains rates.

An alternative argument for why US CEOs appear to accumulate more wealth is that US CEOs are systematically overpaid relative to UK CEOs due to systemic corporate governance weaknesses at US firms relative to UK firms. However, while it is obvious how excess pay leads to greater wealth, it is more difficult to see why this leads to greater incentives. In particular, why would a CEO who has considerable influence over the magnitude of his excess pay choose to bear excessive risk in the form of firm equity? The majority of stock and options held by US CEOs is vested and saleable, and it is difficult to see why CEOs with sufficient clout to ensure excessive pay would not also have the flexibility to liquidate their vested stock and option holdings for the purposes of holding a better-diversified portfolio of assets.

5. Analysis of US vs. other European CEO pay and incentives

In this section, we analyze CEO pay and incentives at other non-UK European firms. Although we believe this analysis provides some interesting additional insights on the potential importance of the risk premium in US vs. European CEO pay, we recognize that this comparison gives rise to a substantially longer list of caveats and concerns. Specifically, unlike the US-UK comparisons, there are significant differences in corporate governance systems and practices between continental European firms and the US (e.g., Becht, et al., 2002). For example, as compared to the US and UK, European capital markets tend to be smaller and less liquid, and

there is a significantly weaker market for corporate control (e.g., takeovers are relatively infrequent). Ownership of European firms tends to be more concentrated, and dominant family shareholdings are more prevalent, as in the case of France. Further, bank finance and monitoring is especially important in some countries, such as Germany. Two-tier boards, where the management and supervisory boards are separate entities, are common (e.g., in Germany, Holland, and France). Moreover, the governance of continental European firms often reflects a wider implicit social contract (e.g., in Germany, co-determination rules require half of the supervisory board members to represent labor). At the same time, because executive compensation disclosures tend to be of less uniform quality in many European countries, our European sample (which consists of companies providing sufficiently transparent disclosure to compute our pay and incentives variables) may be more heavily populated by firms with good corporate governance. Because of these differences, we are limited in our ability to draw inferences about potential reasons for any observed differences in risk-adjusted pay levels between Europe and the US.

We hand-collect CEO compensation and equity incentives data from annual reports and firm accounts for a sample of 40 European firms for 2003. We select companies from the main European exchanges where complete CEO compensation and option information is available. The small number of firms in the European sample stems largely from limited disclosure of executive compensation in continental European compared to the US, especially stock-options and other forms of equity compensation. Because of this, our sample over-represents firms with good disclosures about executive compensation. If firms with better disclosure have superior governance attributes, pay may be relatively lower, and incentives may be relatively higher, compared to non-disclosure firms. Also, because larger firms tend to have more detailed

disclosures, our European sample is comprised of very large firms, considerably larger than the typical firm in our US sample. Our results should be interpreted with the aforementioned caveats in mind. To allow for better comparisons to the US, we use the size and industry propensity-score-matching procedure (described above in Tables 2 and 3) to select a sample of 40 US firms that we use to conduct our US vs. Europe comparisons.[28]

Descriptive statistics are provided in Table 10. The median European firm is somewhat larger than the median matched US firm, but the differences are not statistically significant. The samples are quite similar across the other reported characteristics, except for CEO tenure and the incidence of the CEO serving the dual role of board chair. The median US CEO has been in that position somewhat longer than that for the CEOs in the European sample, and is also more likely to serve as board chair. Most importantly for our analysis (and in spite of the somewhat larger size of the European firms), the US CEOs have substantially higher median total pay than the European CEOs ($5,921,000 vs. $3,284,000, respectively). At the same time, the US CEOs also hold much greater equity incentives than the European CEOs. The median US CEOs held stock equivalent value of $30.7 million as compared to $3.2 million in stock equivalent value for the European CEOs.

In Tables 11 and 12, we provide US-Europe risk-adjusted pay analyses analogous to those in Tables 6 and 7. As in Table 6, controlling for the risk premium substantially reduces the pay differences between US CEOs and European CEOs. In 2003, the median US CEO received 80% more pay than the median European CEO and held about 854% more equity incentives. Table 11 shows that after deducting our estimate of the expected compensation for holding the median level of incentives, the median risk-adjusted pay is 34% greater for US CEOs than

[28] Our propensity-score logit regression model indicates that, in addition to being larger, our EU firms have greater book-to-market ratios, lower recent stock returns, and shorter CEO tenure.

European CEOS ($4,142,000 vs. $3,098,000). Or, alternatively stated, the $1,044,000 difference in median risk-adjusted pay is much less than the $2,637,000 difference in observed median total pay.

In Table 12, we examine risk-adjusted pay differences when the risk premium adjustment is applied on a CEO–by-CEO basis. In Panel A, we present the computed risk premium as a percentage of incentives. The lower risk premium for the median US CEO as compared to the median European CEO (5.39% to 7.17%) stems from the fact that our European sample firms generally have higher stock-return volatility than the matched US sample firms. Panel B of Table 12 shows that the median risk-adjusted pay in 2003 is $4,323,000 for the US propensity-score-matched CEOs as compared to $2,682,000 for the European CEOs. The median paired difference is not significantly different from 0. Abstracting away from the magnitude, 23 of 40 (57.5%) of US CEOs had greater risk-adjusted pay. Thus, as with the US-UK analysis, the results in Tables 11 and 12 suggest that the observed pay difference between the US and European CEOs may be largely explained by the differences in risky equity incentives borne by these individuals.

6. Concluding remarks

A growing body of academic research argues that problems with US CEO pay are systemic and that overpayment of CEOs is not limited to a few bad apples, but that all CEOs in the US economy are overpaid. If this conjecture is correct, benchmarking within the US tells us little about whether US executive compensation practices, as a whole, suffer from systemic poor governance and excessive pay. Instead it is necessary to compare US practices with those of other countries where compensation practices ex ante are expected to suffer from these problems to a lesser extent. In this paper, we use the United Kingdom as a benchmark against which to

examine whether CEO pay in the United States appears unusually high. These two economies share important governance features, but the UK is generally considered to be less afflicted by problems of excessive executive compensation.

Using US and UK data for 1997 and 2003, we compare US and UK CEO annual pay and incentives. Pay is total annual pay (from cash, stock and option grants, and other pay) and incentives are measured in equivalent stock value (from holdings of stock and stock options). Controlling for firm characteristics, we find that US CEOs have higher compensation and much higher incentives than UK CEOs. In 2003, median pay for a matched sample of US CEOs was 45% higher than UK CEO pay and about 128% higher in 1997. At the same time, US CEO incentives in 2003 were about 5.6 times higher than UK CEO incentives and 7.0 times higher in 1997.

When firms impose greater equity incentives on executives, one expects to observe greater risk premiums paid to those executives. Consequently, we expect that a portion of US CEOs' relatively greater pay is due to their relatively greater equity incentives. The key research question in our paper is whether greater risk premiums can explain some or all of the difference in pay between US and UK CEOs. To estimate risk premiums for US and UK CEOs, we extend the methods in Cai and Vijh (2005) under various assumptions about CEO risk-aversion and outside wealth. We estimate risk-adjusted pay as total pay less the estimated risk premium CEOs receive for holding equity incentives.

For a reasonable range of parameters typical in prior literature, we find that the difference in risk premiums plausibly accounts for differences in pay between US and UK CEOs. Specifically, we find that risk-adjusted pay for US CEOs is not consistently higher than that for UK CEOs (US CEOs have higher risk-adjusted pay in 1997, but UK CEOs have higher risk-

adjusted pay in 2003). Our analysis of European CEOs in 2003 offers a similar conclusion that US CEOs, while they have significantly higher pay, do not have significantly higher risk-adjusted pay than their European counterparts.

We note, however, that while risk premiums offer a potential economic explanation for why US pay is higher than UK and European pay, it leaves open the question of why US incentives are so much larger than UK and European incentives. We discuss differences in wealth accumulation and constraints on pay as potential reasons for these differences, and suggest that researchers should shift their efforts toward better understanding the reasons for differences in incentives between US and CEOs in the UK and in other parts of the world.

We conclude that critics of high US executive pay should give greater consideration to the incentives borne by US CEOs and the risk premiums that executives are likely to require to bear these incentives. Or stated another way, if critics believe that the level of US CEO pay is too high, they also might consider whether they would accept lower UK-style incentives as a trade-off for reductions in pay. However, particularly in recent years, many critics call for greater "pay-for-performance" and incentives for US CEOs. Our findings suggest that calls for lower pay and greater pay-for-performance may be at odds and may be economically infeasible.

An important caveat is that our conclusions rely on the reasonableness of our risk premium estimates, and if our assumptions about risk-aversion and CEO lack of diversification are invalid, so too are our risk premium estimates. For example, if CEOs in both countries had much lower risk-aversion than is assumed in the literature, the estimated risk premium would decrease, and US pay would again appear high compared to UK pay. However, for a fairly broad range of assumptions, risk premiums are likely to remain an important consideration in understanding differences in pay across groups of CEOs with differing levels incentives. At the

same time, quantifying the risk-aversion and wealth levels of top executives remains a crucial topic for future research in incentives and governance. A second important caveat is that our conclusions rely on the appropriateness of the choices of the UK and Europe as a benchmark. If UK and European CEOs are also overpaid, a finding that US CEOs are not more overpaid may be of little comfort.

Appendix: Details on unreported compensation

Option backdating

Option backdating refers to a firm reporting in the proxy statement that an executive received an at-the-money option grant, but where, in fact, the executive received a more valuable in-the-money option grant. This is achieved by using hindsight to identify an earlier date when the stock price was lower than the actual date on which the options are awarded, and then disclosing that an at-the-money option was granted on this earlier date. For example, on the grant date the stock price might be $10, but the firm looks back to a time when the price was $9 and reports that an at-the-money option was granted on that earlier date; but, in effect the executive is given an option with a $9 strike price on a day when the stock price is $10. Because firms do not report backdated options in the proxy statement, reported executive option pay is too low for firms that engage in this practice. Heron and Lie (2009) estimate that 23.0% (10.0%) of US option grants were backdated before (after) the SEC tightened reporting regulations on August 29, 2002. Heron and Lie (2007) find that for an average option grant before (after) August 29, 2002 there was a 3.7% (1.0%) discount to exercise price due to backdating. Combining, these results suggest that *conditional* on backdating, US option grants had a 16.1% discount (=3.7%/23%) before August 29, 2002, and a 10.0% discount (=1.0%/10%) after. To our knowledge, there is no evidence that UK firms engaged in backdating.

When we apply these discounts using the Black-Scholes parameters of our sample firms that granted options, we find that a backdated option grant is worth on average 40% more than is calculated using reported grant dates in 1997, and 20% more in 2003. While these figures appear large, they do not translate into large differences in estimated mean or median total pay. In 1997, median estimated US CEO pay increases 3.8% to 2,330,000 (as compared to $2,245,000 in Table

3), and the median risk-adjusted pay for US CEOs increases 4.3% to $1,424,000.[29] The median paired difference in Table 7 increases to $520,000 from $463,000 in 1997. Changes are smaller in 2003, with median estimated pay increasing 0.8% to 2,767,000 (as compared to $2,744,000 in Table 3), and median risk-adjusted pay for the US CEOs increasing 2.6% to $992,000. The median paired difference in Table 7 increases to -$378,000 from -$393,000.[30]

Note that we do not adjust our estimates of equity portfolio incentives for backdating. Although the computation of equity portfolio incentives at a point in time does depend on the exercise prices of the options in the portfolio, the computation does not depend on whether the options were, or were not, originally granted at-the-money. In other words, although a backdated option will convey greater annual compensation to the executive than is disclosed in the proxy statement, as long as the exercise prices of the executive's option portfolio are accurately reported at year end, our portfolio incentives computations should not be affected by the backdating.

Pension plans

Another source of pay in both countries at this time is the annual increase in the present value of an executive's company-sponsored pension plan. In the US, for a sample of 237 Fortune 500 companies in the 1996-2002 period, Sundaram and Yermack (2007) find that the mean annual pension accrual is 10% of total pay. In the UK, for a sample of 181 firms from the FTSE350 in the period 2003 to 2006, Minhat (2009) finds that the mean annual pension

[29] To see the reason for this small conditional difference, consider that in 1997, while the conditional effect on a option grant is large (40%), only 23% of companies backdate, 72% of sample firms grant options, and options are about 39% of pay for firms that grant options. Thus, the product of the figures (the unconditional effect on pay), is only 2.6%.

[30] The above estimates are based on each firm engaging in an average amount of backdating. We also examine results if we instead assume that a subset of firms do all of the backdating. In other words, as the prior research suggests, we assume that 23% (10%) of our sample firms engaged in backdating in 1997 (2003). Further, we assume that the firms that backdate are the firms with the largest incentives. This alternative assumption generates qualitatively very similar median paired differences of $504,000 in 1997 and -$363,000 in 2003.

increment for defined benefit plans is about 15% of total pay, or about 5% greater than the annual increment in the US.

Severance payments

Although not a regular component of annual pay, a further source of compensation for CEOs in both countries is the separation payment that may be given to a CEO upon termination or retirement. Although severance agreements are the source of negative publicity in the US, Kaplan (2008 p. 16) gives the following perspective:

> The average or median case is quite different from the extremes. Yermack (2006) looked at severance agreements in 179 instances of CEO turnover in Fortune 500 companies. The mean separation payment was $5.4 million (compared to average pay of $8.1 million), while the median was $0.7 million (compared to median pay of $4.8 million). Most observers would be surprised that these numbers are not larger. The disparity between the mean and the median indicates that the mean is driven by a few large (and well-publicized) separation payments.

Rusticus (2006) also examines severance pay, but in contrast to the ex post payments examined by Yermack (2006), Rusticus examines expected severance payments based on ex ante agreements. For a sample of 305 newly hired CEOs from S&P 1500 firms between 1994 and 1999, he finds that half of the CEOs have some form of severance agreement. For these CEOs, the total expected severance pay (including estimated value vesting of unvested stock and options) is 1.1 times total pay at the mean, 0.8 times total pay at the median. Thus, the ex post analysis in Yermack suggests average severance of 0.67 times pay (i.e., $5.4 million / $8.1 million), and the ex ante analysis in Rusticus suggests average severance of 0.55 times pay (1.1 times pay x 50% of CEOs with a severance agreement).

In the UK, to our knowledge, there is no academic research on severance agreements, and data is more difficult to obtain. Starting in 2002, Directors Remuneration Report regulations require the firm to disclose its policy on: (a) the duration of contracts with directors, and (b)

termination payments under such contracts. Survey results by Deloitte (2004) suggest that at the FTSE 250 firms, the typical expected severance payment is about one times pay. This figure is confirmed by private survey data given to us by Manifest Information Services Ltd. (a European proxy governance and electronic voting agency). Further, severance payments have gotten less generous since the change in disclosure: The percentage of directors in FTSE 250 firms who would receive 24 months of severance fell from 25% in 2001 to 5% in 2004 (Deloitte, 2004). We obtained some data on actual termination payments from Manifest for a sample of 60 executives in 2006 and 2007. For these, the median ratio of "loss of office payments" to total pay is approximately 1.1. Unfortunately, full disclosure on the percentage of UK CEOs with termination agreements and expected termination payments is incomplete (Deloitte, 2004). However, it appears that at least as many UK CEOs receive severance agreements, and the ex post severance appears to be on average at least as generous as in the US.

CEO turnover

Potential turnover imposes risk on CEOs, but also can generate severance pay. For our sample, we gather the incidence of CEO replacement in the year following the sample period (i.e., the years 1998 and 2004, for the 1997 and 2003 sample years, respectively). The propensity score matching procedure controls for several likely firm-related determinants of turnover, such as performance, size, volatility, and industry. Therefore, the turnover differences we report can be interpreted as country differences. We report this turnover incidence excluding CEOs that are younger than 63 years of age, since older CEOs are more likely to have voluntarily retired. In 1998, the incidence of turnover for US and UK CEOs is approximately the same (mean pre-63 years old turnover of 11.3% vs. 14.1% for the US vs. UK CEOs, respectively), but in 2004, the incidence of US turnover is significantly greater than that of the UK CEOs (mean pre-63 years

old turnover of 14.0% vs. 9.3% for the US vs. UK CEOs, respectively). Although we are reluctant to use these two years of data to draw strong inferences about the relative turnover risk in the US versus UK samples, it appears that turnover risk for US CEOs is at least as great as that for UK CEOs.

References

Abowd, J., and D. Kaplan, 1999, "Executive Compensation: Six Questions That Need Answering," *Journal of Economic Perspectives*, 13, 145-168.

Baker, G., and B. Hall, 2004, "CEO incentives and firm size," *Journal of Labor Economics* 22: 767-798.

Bebchuk, L.A., and J. Fried, 2004, *Pay without Performance: The Unfulfilled Promise of Executive Compensation*, Harvard University Press, Cambridge.

Bebchuk, L.A., J. Fried, and D. Walker, 2002, "Managerial Power and Rent Extraction in the Design of Executive Compensation," *University of Chicago Law Review*, 69, 751-846.

Becht, M., Franks, J. R., Mayer, C. and Rossi, S., 2009, "Returns to Shareholder Activism: Evidence from a Clinical Study of the Hermes UK Focus Fund," *Review of Financial Studies*, 22, 3093 - 3129.

Becht, M., Bolton, P. and Röell, A.A., 2002, "Corporate Governance and Control" ECGI - Finance Working Paper No. 02/2002. Available at SSRN: http://ssrn.com/abstract=343461 or DOI: 10.2139/ssrn.343461 (revised 2006)

Black, F., and M. Scholes, 1973, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, 81, 637-59.

Brickley, J., Coles, J. Jarrell, G., 1997, "Leadership structure: Separating the CEO and chairman of the board," *Journal of Corporate Finance*, 3, 189-220.

Cai, J., and A.M. Vijh, 2005, "Executive Stock and Option Valuation in a Two State-Variable Framework," *Journal of Derivatives*, 12, 9-27.

Conyon, M.J., and K.J. Murphy, 2000, "The prince and the pauper: CEO pay in the US and UK," *Economic Journal*, 110, 640-671.

Conyon, M.J., and J. Schwalbach, 1999, "Corporate governance, executive pay and performance in Europe," in J. Carpenter and D. Yermack (eds.), *Executive Compensation and Shareholder Value: Theory and Evidence*, Kluwer Academic Press, Dordrecht,13-33.

Core, J., and W. Guay, 1999, "The use of equity grants to manage optimal equity incentives," *Journal of Accounting and Economics*, 28, 151-184.

Core, J., W. Guay, 2002, "Estimating the value of employee stock option portfolios and their sensitivities to price and volatility," *Journal of Accounting Research* 40, 613-630.

Core, J., W. Guay, and R. Thomas, 2005, "Is U.S. CEO Compensation Inefficient Pay without Performance? A review of Pay without Performance: The Unfulfilled Promise of Executive Compensation," *Michigan Law Review* 103 (2005): 1142-1185.

Core, J., R. Holthausen, and D. Larcker, 1999, "Corporate Governance, Chief Executive Officer Compensation, and Firm Performance," *Journal of Financial Economics*, 51, 371-406.

Crystal, G., B.G. Main, and C. O'Reilly, 1994, "Over here and over there: A comparison of top executive pay in the UK and the USA," *International Contributions to Labour Studies*, 4, 115-127.

Dahya, J., J.J. McConnell, and N.G. Travlos, 2002, "The Cadbury Committee, corporate performance, and top management turnover," *The Journal of Finance*, 57, 461-483.

Deloitte 2004, "Report on the Impact of the Directors' Remuneration Report Regulations: A Report for the Department of Trade and Industry." Deloitte, Research Report, 2004.

Directors' Remuneration Report Regulations, 2002 [cited March 2009]. Available from http://www.opsi.gov.uk/si/si2002/20021986.htm.

Edmans, A., Gabaix, X. and Landier, A., 2009, "A multiplicative model of optimal CEO incentives in market equilibrium," *Review of Financial Studies*, 22 (12), 4881-4917.

Fernandes, N.G., Ferreira, M.A., Matos, P.P. and Murphy, K.J., 2009, "The Pay Divide: (Why) are U.S. Top Executives Paid More?" Available at SSRN: http://ssrn.com/abstract=1341639

Ferri, F. and Maber, D. A., 2008, "Say on Pay Vote and CEO Compensation: Evidence from the UK," Harvard University Working Paper.

Graham, J., C. Harvey, and M. Puri, 2009, "Managerial Attitudes and Corporate Actions," Duke University Working Paper.

Greenbury, R., 1995, *Directors' remuneration: Report of a study group chaired by Sir Richard Greenbury*, Gee Publishing, London.

Hall, B., and J. Liebman, 1998, "Are CEOs really paid like bureaucrats?" *The Quarterly Journal of Economics*, 113, 653-691.

Hall, B., and K.J. Murphy, 2002, "Stock options for undiversified executives," *Journal of Accounting and Economics*, 33, 3-42.

Hampel, R., 1998, *Committee on Corporate Governance: Final Report*, Gee Publishing, London.

Hemmer, T., S. Matsunaga, and T. Shevlin, 1996, "The influence of risk diversification on the early exercise of stock options by executive officers," *Journal of Accounting and Economics* 21, 45-68.

Heron, R. A., and E. Lie, 2007, "Does Backdating Explain the Stock Price Pattern Around Executive Stock Option Grants?" *Journal of Financial Economics*, 83, 271-295.

Heron, R. A., and E. Lie, 2009, "What Fraction of Stock Option Grants to Top Executives Have Been Backdated or Manipulated?" *Management Science*, 55, 513-525.

Holmstrom, B., and S.N. Kaplan, 2003, "The State of U.S. Corporate Governance: What's Right and What's Wrong?" ECGI - Finance Working Paper No. 23/2003.

Huddart, S., and M. Lang, 1996, "Employee stock option exercises: An empirical analysis," *Journal of Accounting and Economics* 21, 5-43.

Jensen, M., 1993, "The modern industrial revolution, exit, and the failure of internal control systems," *The Journal of Finance* 48, 831-880.

Jensen, M.C., and K.J. Murphy, 1990, "Performance pay and top-management incentives," *Journal of Political Economy*, 98, 225-64.

Jensen, M.C., K.J. Murphy, and E.G. Wruck, 2004, "Remuneration: Where We've Been, How We Got to Here, What are the Problems, and How to Fix Them," Harvard NOM Working Paper No. 04-28; ECGI - Finance Working Paper No. 44/2004. http://ssrn.com/abstract=561305.

Johnson, S. A. and Y. S. Tian, 2000, "The value and incentive effects of nontraditional executive stock option plans," *Journal of Financial Economics*, 57: 3-34.

Kaplan, Steven N. 2008, "Are U.S. CEOs Overpaid?" *Academy of Management Perspectives*, 22 (2): 5-20.

Kaplan, S., 1994a, "Top executive rewards and firm performance: A comparison of Japan and the United States," *Journal of Political Economy*, 102, 510-546.

Kaplan, S., 1994b, "Top executives, turnover, and firm performance in Germany," *Journal of Law, Economics and Organization*, 10, 142-159.

Main, B. G., 2005, "The ABI Guidelines for Share-Based Incentive Schemes: Setting the hurdle too high?" University of Edinburgh Working Paper.

Mercer Human Resource Consulting, 2009, "2009 worldwide cost of living survey results," http://www.mercer.com/costofliving Accessed: 11 March, 2010

Minhat, M., 2009, “The Role of CEO Pay in Corporate Governance”, Accounting and Finance Department, University of Stirling. (Unpublished PhD)

Murphy, K.J., 1999, “Executive compensation,” in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics* Vol. 3b, Elsevier Science North Holland (1999), Chapter 38: 2485-2563.

Pratt, J., 1964, “Risk aversion in the small and in the large”. *Econometrica* (January), 32(1/2), 122-136.

Rusticus, T., 2006, Executive Severance Agreements, The Wharton School, University of Pennsylvania, working paper.

Smith, C.W., and R.L. Watts, 1992, “The Investment Opportunity Set and Corporate Financing, Dividend and Compensation Policies,” *Journal of Financial Economics*, 32, 263-292.

Sundaram, R. K. and D. L. Yermack, 2007, “Pay me later: Inside debt and its role in managerial compensation,” *The Journal of Finance*, 62, 1551-1588.

Yermack, D., 2006, “Golden handshakes: Separation pay for retired and dismissed CEOs,” *Journal of Accounting and Economics*, 41(3): 237-256.

Table 1
Descriptive statistics on full US and UK samples: CEO total pay, incentives, sales and market value in 1997 and 2003

		Year	Average	Median	Change in the average	Change in the median
Panel A:						
$Sales_{t-1}$	US	1997	$3,522	$975[b]		
($million)	US	2003	$4,651	$1,121[b]	32.1%	15.0%
	UK	1997	$4,295	$1,779		
	UK	2003	$5,155	$1,555	20.0%	-12.6%
Ratio US / UK		1997	0.82	0.55		
		2003	0.90	0.72		
Panel B:						
Market Value of	US	1997	$4,273	$1,072[b]		
$Equity_{t-1}$ ($million)	US	2003	$5,791	$1,168[b]	35.5%	9.0%
	UK	1997	$4,985	$2,108		
	UK	2003	$4,996	$1,453	0.2%	-31.1%
Ratio US / UK		1997	0.86	0.51		
		2003	1.16	0.80		
Panel C:						
$Total\ pay_t$	US	1997	$3,739[a]	$1,959[a]		
($thousands)	US	2003	$4,439[a]	$2,521[a]	18.7%	28.7%
	UK	1997	$1,295	$985		
	UK	2003	$2,583	$1,891	99.4%	92.0%
Ratio US / UK		1997	2.89	1.99		
		2003	1.72	1.33		
Panel D:						
CEO equity	US	1997	$88,800	$15,807[a]		
$incentives_{t-1}$	US	2003	$120,444	$19,555[a]	35.6%	23.7%
($thousands)						
	UK	1997	$7,238	$2,409		
	UK	2003	$22,051	$3,806	204.7%	58.0%
Ratio US / UK		1997	12.27	6.56		
		2003	5.46	5.14		

[a] US value is significantly greater than UK value at a 5% level.
[b] US value is significantly less than UK value at a 5% level.

Note:
The US (UK) sample is 1372 (177) firms in 1997 and 1511 (214) firms in 2003. Sales and Market Value of Equity are measured at the beginning of the respective year. Total Pay for the firm's CEO is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards), and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355).

Table 2
Determinants of US and UK CEO pay and incentives, and Propensity-Score Matching regression

	Dependent Variable: OLS Regressions				Logit Regression (UK = 1) for Propensity-Score Matching	
	Log CEO Pay_t		Log CEO $Incentives_{t-1}$			
Column	(1)	(2)	(3)	(4)	(5)	(6)
	Year: 1997	Year: 2003	Year: 1997	Year 2003	Year: 1997	Year 2003
US indicator	0.69**	0.32**	2.15**	1.87**		
	(11.45)	(5.82)	(15.12)	(14.82)		
$Log(sales_{t-1})$	0.40**	0.41**	0.36**	0.43**	-0.20**	-0.01
	(18.41)	(21.65)	(10.90)	(15.71)	(-2.67)	(-0.18)
$Book\ to\ market_{t-1}$	-0.99**	-0.61**	-2.84**	-1.63**	0.02	1.48**
	(-7.58)	(-4.70)	(-12.91)	(-11.45)	(0.03)	(3.99)
$Log(Idio.\ Risk)_{t-1}$	0.20**	-0.09	0.15	-0.43**	-4.35**	-1.30**
	(3.03)	(-1.24)	(1.14)	(-4.73)	(-11.90)	(-5.35)
$Log(Tenure)_{t-1}$	0.02	0.05*	0.54**	0.65**	-0.07	0.11
	(1.10)	(2.33)	(13.37)	(17.15)	(-0.79)	(1.39)
$Leverage_{t-1}$	0.31**	0.18**	0.25	-0.81**	-1.77	0.72
	(5.29)	(3.39)	(0.63)	(-2.89)	(-1.68)	(1.16)
$Shareholder\ return_t$	0.69**	0.32**			-1.32**	-0.65**
	(11.45)	(5.82)			(-3.87)	(-2.91)
Industry Indicators	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,549	1,725	1,549	1,725	1,449	1,629
Adjusted R-squared	0.45	0.40	0.53	0.56		
US-UK difference	99.4%	37.7%	758.5%	548.8%		

Note:

A * is significant at 5%, and ** is significant at 1%. T-statistics are given in parentheses for Columns (1)-(4), and are based on Huber-White robust standard errors. Chi-Square statistics are given in parentheses in Columns (5)-(6). Total Pay for the firm's CEO is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). Book-to-market is the ratio of book value of assets to the sum of book value of liabilities plus market value of equity. Idiosyncratic Risk is the standard deviation of the residuals from a market model estimated daily over year t-1. Tenure is the number of years the CEO has held that position. Leverage is the ratio of book value of liabilities to market value of assets. Shareholder Return is the one-year total return to shareholders. Industry indicator variables are computed at the two-digit SIC code level. UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355). The US-UK CEO difference is calculated from the US indicator variable as $100\times(e^{\text{coefficient estimate}} - 1)$. The 1997 to 2003 change is calculated from the Year=2003 variable as $100\times(e^{\text{coefficient estimate}} - 1)$. The logit regressions in Columns (5)-(6) model the probability that a firm is a UK firm as a function of sales, book-to-market, tenure, CEO-Chair indicator, leverage and shareholder return. In the logit regressions, we include only US observations for which we have a UK observation in same industry (because our propensity-score matching procedure matches within industry).

Table 3
Descriptive statistics on propensity-score-matched US and UK samples

	US		UK		US-UK Difference	
Variable	Mean	Median	Mean	Median	Mean	Median
1997 (N= 177)						
$Sales_{t-1}$ ($millions)	$4,041	$1,896	$4,295	$1,779	-$254	$325
Market value of $equity_{t-1}$ ($millions)	$5,965	$2,082	$4,985	$2,108	$980	-$75
Book to $market_{t-1}$	0.64	0.65	0.62	0.61	0.02	-0.01
Idiosyncratic $risk_{t-1}$	22.2%	20.3%	19.6%	18.2%	2.6%**	1.5%**
Tenure $_{t-1}$	7.91	5.67	6.86	5.64	1.05	0.60
$Leverage_{t-1}$	16.4%	12.8%	14.7%	10.8%	1.7%	1.7%
Shareholder $return_t$	28.1%	24.6%	22.3%	20.6%	5.8%	3.6%
Total pay_t ($thousands)	$3,411	$2,245	$1,295	$985	$2,116**	$1,101**
CEO equity $incentives_{t-1}$ ($thousands)	$70,643	$16,905	$7,238	$2,409	$63,405**	$13,632**
CEO-Chair $indicator_t$	74.6%	100.0%	16.4%	0.0%	58.2%**	100.0%**
%Closely held $shares_{t-1}$	15.9%	10.7%	17.3%	11.6%	-1.4%	0.4%
%Closely held $shares_{t-1}$ excluding CEO	13.7%	7.7%	17.0%	11.6%	-3.3%	0.3%
2003 (N=214)						
$Sales_{t-1}$ ($millions)	$6,097	$1,727	$5,155	$1,555	$942	$52
Market $value_{t-1}$ ($millions)	$6,630	$1,627	$4,996	$1,453	$1,634	-$82
Book to $market_{t-1}$	0.80	0.83	0.82	0.83	-0.02	-0.02
Idio. $Risk_{t-1}$	37.2%	33.8%	35.5%	31.0%	1.7%	0.9%
Tenure $_{t-1}$	7.56	5.63	7.34	6.42	0.22	-0.43
$Leverage_{t-1}$	21.5%	19.7%	22.5%	20.4%	-1.1%	0.4%
Shareholder $return_t$	33.9%	27.8%	32.0%	27.5%	1.9%	0.2%
Total pay_t ($thousands)	$4,964	$2,744	$2,583	$1,891	$2,381**	$514**
CEO equity $incentives_{t-1}$ ($thousands)	$93,186	$21,407	$22,051	$3,806	$71,135**	$13,119**
CEO-Chair $indicator_t$	69.6%	100.0%	4.2%	0.0%	65.4%**	100.0%**
%Closely held $shares_{t-1}$	17.3%	12.6%	16.6%	11.4%	0.7%	1.6%
%Closely held $shares_{t-1}$ excluding CEO	14.7%	11.3%	15.7%	11.2%	-1.0%	1.2%

A * is significant at 5%, and ** is significant at 1%.
Sales and Market value of equity are measured at the beginning of the respective year. Book-to-market is the ratio of book value of assets to the sum of book value of liabilities plus market value of equity. Idiosyncratic risk is the standard deviation of the residuals from a market model estimated daily over year t-1. Tenure is the number of years the CEO has held that position. Leverage is the ratio of book value of debt to market value of assets. Shareholder return is the one-year total return to shareholders. Total Pay for the firm's CEO is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355). CEO-Chair indicator takes the value of 1 if the CEO is also board chair, and zero otherwise. Turnover takes the value of 1 if the CEO turns over in year t+1, and zero otherwise. $Turnover_{t+1}$ (pre-63 years old) takes the value of 1 if the CEO turns over in year t+1 *and* the CEO is less than 63 years old, and zero

otherwise. %Closely held shares$_{t-1}$ is the percentage of shares held by outside 5% holders and shares held by officers and directors (source: Worldscope). %Closely held shares$_{t-1}$ excluding CEO is Closely held shares less shares held by the CEO.

Table 4
Illustration of incremental pay for incremental incentives for the median CEO

	Median Pay and Incentives ($thousands)		
	US (1)	UK (2)	Difference: US – UK (3)
1997			
CEO Pay in 1997	$2,245	$985	$1,260
CEO Equity Incentives at beginning of 1997	$16,905	$2,409	$14,496
Incremental pay per unit of incremental incentive (%)			8.69%
2003			
CEO Pay in 2003	$2,744	$1,891	$853
CEO Equity Incentives at beginning of 2003	$21,407	$3,806	$17,601
Incremental pay per unit of incremental incentive (%)			4.85%

Note:
Incremental pay per unit of incremental incentive in the last column is computed as the difference in pay divided by the difference in incentives, and is expressed as a percentage.

The UK sample consists of 177 firms in 1997 and 214 firms in 2003. The US sample consists of 177 firms in 1997 and 214 firms in 2003, selected using the propensity-score-matching procedure described in Tables 2 and 3. CEO pay is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during each of the years 1997 (=1.6386) and 2003 (=1.6355).

Table 5
Risk premium for holding firm equity

	% of wealth in firm equity	
Relative risk-aversion	50%	67%
2	5.8%	7.6%
3	8.5%	11.0%

Note:
This table shows the risk premium as a % of incentives for various levels of risk-aversion and % of wealth in firm stock. The risk premium is derived by solving:

$$E[U(wealth\ unconstrai ned)] = E[U(wealth\ \ constraine d\ to\ firm\ eq uity, outside\ \ \ wealth, risk\ \ premium)] \quad (1)$$

The expression on the left side is the utility the executive receives from investing his wealth in a utility-maximizing combination of the risk-free asset and the market portfolio. The expression on the right side is the utility the executive receives when he is constrained to invest some proportion of his starting wealth in firm equity, and the remainder in a utility-maximizing combination of the risk-free asset and the market portfolio. The executive holds the positions for one year. The risk premium is assumed to be paid at the end of the year, and is the amount that sets the two sides equal. A percentage risk premium of 5.8%, for example, means that, if the CEO had $1 million in firm equity, he would need to receive $58,000 in extra pay to compensate for the additional risk.

The executive is assumed to hold all stock (no options). Returns on the stock and on the market portfolio are assumed to be jointly lognormal, and to follow the capital asset pricing model. The market is assumed to have an 11% expected return and 20% volatility, and the risk-free rate is assumed to be 5%. The stock is assumed to have a beta of 1, an 11% expected return, and 40% volatility.

Table 6
Implied risk-adjusted pay for the median CEO

	Median Pay and Incentives ($thousands)		
	US	UK	US/UK
Relative risk-aversion	2	2	1.00
Wealth in firm (%)	50%	50%	1.00
1997			
CEO Pay in 1997	$2,245	$985	2.28
CEO Equity Incentives at beginning of 1997	$16,905	$2,409	7.02
Implied CEO Total Wealth	$33,809	$4,818	7.02
Risk premium (5.8% of incentives)	$980	$140	7.02
Implied risk-adjusted pay	$1,264	$845	1.50
2003			
CEO Pay in 2003	$2,744	$1,891	1.45
CEO Equity Incentives at beginning of 2003	$21,407	$3,806	5.62
Implied CEO Total Wealth	$42,814	$7,612	5.62
Risk premium (5.8% of incentives)	$1,242	$221	5.62
Implied risk-adjusted pay	$1,503	$1,670	0.90

Note:
Implied risk-adjusted pay is computed as pay minus the risk premium. The risk premium is assumed to be 5.8% of incentives (assuming relative risk-aversion of 2.0 and 50% of wealth in firm equity, and using the calculations shown in Table 5). Implied CEO total wealth, under the assumption of 50% of wealth in firm equity, and the simplifying assumption that all incentives come from stock, is (equity incentives)/.50.

The UK sample consists of 177 firms in 1997 and 214 firms in 2003. The UK sample consists of 177 firms in 1997 and 214 firms in 2003. The US sample consists of 177 firms in 1997 and 214 firms in 2003, selected using the propensity-score-matching procedure described in Tables 2 and 3. CEO pay is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held), measured at the beginning of the year. UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355).

Table 7
Implied CEO-specific risk-adjusted pay

Panel A: Risk premium as a % of incentives

	Country	N	Average	25th percentile	Median	75th percentile
1997	UK	177	4.01%	2.69%	3.86%	5.05%
	US	177	3.88%	2.53%	3.30%	4.75%
2003	UK	214	8.37%	5.05%	7.21%	8.98%
	US	214	8.38%	4.78%	6.86%	9.85%

Panel B: Implied risk-adjusted pay ($thousands)

	Country	N	Average (All values) (1)	Average (Negative Values set to 0) (2)	25th percentile (3)	Median (4)	75th percentile (5)
1997	UK	177	$1,008	$1,087	$481	$808	$1,334
	US	177	$893	$2,360	$317	$1,364	$2,728
	US-UK	177	-$115	--	-$805	$463[a]	$2,047
	%(US>UK)		60.5%				
2003	UK	214	$936	$2,086	$905	$1,564	$2,728
	US	214	-$485	$2,930	-$246	$938	$3,339
	US-UK	214	-$1,421	--	-$3,157	-$393	$2,251
	%(US>UK)		44.3%				

[a] US value is significantly greater than UK value at a 5% level.
[b] US value is significantly lower than UK value at a 5% level.

Note:
The UK sample consists of 177 firms in 1997 and 214 firms in 2003. The US sample consists of 177 firms in 1997 and 214 firms in 2003, selected using the propensity-score-matching procedure described in Tables 2 and 3. Implied risk-adjusted pay (expressed in thousands of dollars) is computed as total pay minus the risk premium. The risk premium as a % of incentives is estimated using Equation (1) above assuming that the CEO has relative risk-aversion of 2 and 50% of his wealth outside the firm. Inputs into the calculation are the CEO's beginning-of-year stock and option portfolio, the firm's beta and volatility, an assumed market volatility of 20%, a risk-free rate of 5%, and a market risk premium of 6%. UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355).

Table 8
Differences in US-UK CEO pay and incentives: Relations to Competition and Globalization

	Median Regressions: Dependent Variable (000's)		
	US-UK Difference in CEO Pay_t	US-UK Difference in CEO $Incentives_{t-1}$	US-UK Difference in CEO Risk-Adjusted Pay_t
Column	(1)	(2)	(3)
UK CEO is from US	-1,476*	7,457	-1,325
	(-2.33)	(0.50)	(-1.30)
UK firm is listed in US	-1,189*	-4,595	-770
	(-2.21)	(0.74)	(-1.52)
US-UK Difference in CEO is chair indicator	559*	13,234**	-322
	(1.86)	(4.45)	(-0.94)
Hirschman-Herfindahl Index	3,294	70,623	-2,653
	(-0.61)	(0.71)	(-0.33)
Year 2003 Indicator	-436	48	-954**
	(-1.46)	(0.02)	(-3.02)
Intercept	808**	4,562	923*
	(2.74)	(1.38)	(2.48)
Pseudo R-squared	0.02	0.01	0.01

Note:
A * is significant at 5%, and ** is significant at 1%. T-statistics are given in parentheses, and are based on bootstrap standard errors. The UK sample consists of 391 firm-years (177 firm-years in 1997 and 214 firm-years in 2003). The US sample also consists of 391 firm-years, selected using propensity scores developed from the logit regressions reported in Columns (5)-(6) of Table 2. Each UK firm is matched within industry to the US firm with the closest propensity score.
"US-UK Difference in" is the difference between the relevant variable for its US firm match and its UK firm. CEO pay is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held), measured at the beginning of the year. Implied risk-adjusted pay (expressed in thousands of dollars) is computed as total pay minus the risk premium. UK CEO is from US is an indicator variable for whether the UK CEO is originally from the US. UK firm is listed in US is an indicator variable for whether the UK firm is listed on any US exchange. The Hirschman-Herfindahl Index is the sum of squared market shares within a 2-digit SIC industry. The market share is firm sales as a fraction of total industry sales. CEO is chair indicator takes the value of 1 if the CEO is also board chair, and zero otherwise.

Table 9
Implied risk-adjusted pay for the median CEO – Sensitivity analysis
UK CEOs assumed more risk-averse and less diversified than US CEOs

	Median Pay and Incentives ($thousands)		
	US	UK	US/UK
Relative risk-aversion	2	3	0.67
Wealth in firm (%)	50%	67%	0.67
1997			
CEO Pay in 1997	$2,245	$985	2.28
CEO Equity Incentives at beginning of 1997	$16,905	$2,409	7.02
Implied CEO Total Wealth	$33,809	$3,596	9.40
Risk premium (5.8% for US and 11.0% for UK)	$980	$265	3.70
Implied risk-adjusted pay	$1,264	$720	1.76
2003			
CEO Pay in 2003	$2,744	$1,891	1.45
CEO Equity Incentives at beginning of 2003	$21,407	$3,806	5.62
Implied CEO Total Wealth	$42,814	$5,681	7.54
Risk premium (5.8% for US and 11.0% for UK)	$1,242	$419	2.96
Implied risk-adjusted pay	$1,503	$1,472	1.02

Note:
The UK sample consists of 177 firms in 1997 and 214 firms in 2003. The US sample consists of 177 firms in 1997 and 214 firms in 2003, selected using the propensity-score-matching procedure described in Tables 2 and 3. Implied risk-adjusted pay is computed as pay minus the risk premium. The risk premium is assumed to be 5.8% of incentives for US CEOs (assuming relative risk-aversion of 2.0 and 50% of wealth in firm equity and using the calculations shown in Table 5), and is assumed to be 11.0% of incentives for the UK CEOs (assuming relative risk-aversion of 3.0 and 67% of wealth in firm equity and using the calculations shown in Table 5). Implied CEO total wealth for US CEOs, under the assumption of 50% of wealth in firm equity, and the simplifying assumption that all incentives come from stock, is (equity incentives)/.50, and for UK CEOs, under the assumption of 67% of wealth in firm equity, and the simplifying assumption that all incentives come from stock, is (equity incentives)/.67.

CEO pay is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held), measured at the beginning of the year. UK pounds sterling denominated data are converted to US dollars using the average $/£ exchange rate during 1997 (=1.6386) and 2003 (=1.6355).

Table 10
Descriptive statistics on propensity-score-matched US and European samples

	US		Europe		US-Europe Difference	
Variable	Mean	Median	Mean	Median	Mean	Median
2003 (N=40)						
$Sales_{t-1}$ ($millions)	$19,674	$14,623	$24,979	$18,589	-$5,305	-$6,209
Market value of $equity_{t-1}$ ($millions)	$19,000	$9,029	$18,512	$12,163	$488	-$1,547
Book to $market_{t-1}$	0.86	0.88	0.90	0.96	-0.04	-0.02
Idiosyncratic $risk_{t-1}$	36.0%	29.8%	35.2%	30.5%	0.7%	-1.6%
$Tenure_{t-1}$	4.33	3.63	3.05	2.00	1.28	1.00
$Leverage_{t-1}$	21.3%	20.6%	22.3%	22.2%	-1.1%	1.0%
Shareholder $return_t$	15.4%	20.5%	21.1%	19.2%	-5.7%	-7.7%
Total pay_t ($thousands)	$8,745	$5,921	$4,982	$3,284	$3,762**	$3,295**
CEO equity $incentives_{t-1}$ ($thousands)	$62,266	$30,662	$5,858	$3,213	$56,408**	$24,287**
CEO-Chair $indicator_{t-1}$	67.5%	100.0%	40.0%	0.0%	27.5%**	0.0%**
%Closely held $shares_{t-1}$	14.9%	8.6%	16.1%	9.7%	-1.2%	0.8%
%Closely held $shares_{t-1}$ excluding CEO	14.5%	8.5%	16.0%	9.7%	-1.5%	0.0%

A * is significant at 5%, and ** is significant at 1%.
The European sample consists of 40 firms in 2003. The US sample also consists of 40 firms in 2003, selected using propensity scores developed from a logit regression similar to those reported in Columns (5)-(6) of Table 2. Each European firm is matched within industry to the US firm with the closest propensity score. Sales and Market value of equity are measured at the beginning of the respective year. Book-to-market is the ratio of book value of assets to the sum of book value of liabilities plus market value of equity. Idiosyncratic risk is the standard deviation of the residuals from a market model estimated daily over year t-1. Tenure is the number of years the CEO has held that position. Leverage is the ratio of book value of debt to market value of assets. Shareholder Return is the one-year total return to shareholders. Total Pay for the firm's CEO is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards) and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). European currency denominated data are converted to US dollars using the average exchange rate during 2003. CEO-Chair indicator takes the value of 1 if the CEO is also board chair, and zero otherwise. %Closely held $shares_{t-1}$ is the percentage of shares held by outside 5% holders and shares held by officers and directors (source: Worldscope). %Closely held $shares_{t-1}$ excluding CEO is Closely held shares less shares held by the CEO.

Table 11
European and US Propensity Score Matched Sample

Panel A: Incremental pay for incremental incentive for the median CEO

	Median Pay and Incentives ($thousands)		
	US	Europe	Difference: US – Europe
CEO Pay in 2003	$5,921	$3,284	$2,637
CEO Equity Incentives at beginning of 2003	$30,662	$3,213	$27,449
Incremental pay per unit of incremental incentive			9.61%

Panel B: Implied risk-adjusted pay for the median CEO

	Median Pay and Incentives ($thousands)		
	US	Europe	US/Europe
CEO Pay in 2003	$5,921	$3,284	1.80
CEO Equity Incentives at beginning of 2003	$30,662	$3,213	9.54
Implied CEO Total Wealth	$61,324	$6,425	9.54
Risk premium (5.8% of incentives)	$1,778	$186	9.54
Implied risk-adjusted pay	$4,142	$3,098	1.34

Note:
Implied risk-adjusted pay is computed as pay minus the risk premium. The risk premium is assumed to be 5.8% of incentives (assuming relative risk-aversion of 2.0 and 50% of wealth in firm equity, and using the calculations shown in Table 5). Implied CEO total wealth, under the assumption of 50% of wealth in firm equity, and the simplifying assumption that all incentives come from stock, is (equity incentives)/.50.

Total Pay for the firm's CEO is defined as the sum of salaries, bonuses, benefits, stock options (valued on the date of the grant using the Black-Scholes formula), restricted stock grants (valued at 100% of performance contingent awards), and other compensation. CEO equity incentives are in equivalent stock value, and are defined as: (share price) × (the number of shares held) + (share price) × (option delta) × (the number of options held). European currency denominated data are converted to US dollars using the average exchange rate during 2003.

Table 12
Implied CEO-specific risk-adjusted pay
European and US Propensity Score-Matched Sample

Panel A: Risk premium as a % of incentives

	Region	N	Average	25th percentile	Median	75th percentile
2003	US	40	8.11%	3.73%	5.39%	8.74%
	Europe	40	7.87%	4.44%	7.17%	9.48%

Panel B: Implied risk-adjusted pay ($thousands)

	Region	N	Average (All values)	Average (Negative Values set to 0)	25th percentile	Median	75th percentile
2003	US	40	$4,239	$6,024	$1,428	$4,323	$10,479
	Europe	40	$4,521	4,532	2,037	2,682	4,717
	US-Europe	40	-$282		-$2,090	$1,108	$5,857
	%(US>Europe)		57.50%				

Note:
The European sample consists of 40 firms in 2003. The US sample consists of 40 firms in 2003, selected using propensity scores developed from logit regressions similar to those reported in Columns (5)-(6) of Table 2. Each European firm is matched within industry to the US firm with the closest propensity score. Implied risk-adjusted pay (expressed in thousands of dollars) is computed as total pay minus the risk premium. The risk premium as a % of incentives is estimated using Equation (1) above assuming that the CEO has relative risk-aversion of 2 and 50% of his wealth outside the firm. Inputs into the calculation are the CEO's beginning-of-year stock and option portfolio, the firm's beta and volatility, an assumed market volatility of 20%, a risk-free rate of 5%, and a market risk premium of 6%. European currency denominated data are converted to US dollars using the average exchange rate during 2003.

Professor Wayne Guay

Professor Wayne Guay *is the Yageo Professor of Accounting at the Wharton School, University of Pennsylvania. He received an undergraduate degree in Engineering and Management from Clarkson University, an MBA from Northeastern University, and a Ph.D. in Accounting from the Simon School of Business at the University of Rochester. He has published many articles in leading accounting, finance, law and economics journals on topics such as design of executive compensation contracts, stock-based incentives, corporate governance, employee stock option accounting and valuation, financial accounting quality, risk management, firm valuation, and earnings management. He has lectured and presented his research at more than one hundred universities and conferences around the world. His research on stock option accounting and valuation was selected by the Financial Executive Research Foundation as the 2002 Article of the Year in The Accounting Review. He currently serves on editorial boards of the Journal of Accounting & Economics and Journal of Accounting Research.*