The managerial labor market and the governance role of shareholder control structures in the UK

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Abstract

We simultaneously analyze two mechanisms of the managerial labor market: CEO turnover and monetary remuneration schemes. Sample selection models and hazard analyses applied to a random sample of 250 firms listed on the London Stock Exchange show that managerial remuneration and the termination of labor contracts play an important role in mitigating agency problems between managers and shareholders. We find that both the CEOs' industry-adjusted monetary compensation and their replacement are strongly performance-sensitive. We also investigate whether specific corporate governance mechanisms have an impact on managerial disciplining or on the pay-for-performance contracts. There is little evidence of outside shareholder monitoring whereas entrenched CEOs with strong voting power successfully resist replacement irrespective of corporate performance. CEO remuneration is more sensitive to stock price performance in firms with strong outside shareholders whereas remuneration in insider-dominated firms is more sensitive to measures of accounting returns. When stock prices decrease, CEOs seem to compensate disappointing stock performance by augmenting the cash-based compensation package. Finally, the presence of a remuneration committee has no significant impact on remuneration.

Keywords: corporate governance, agency costs, CEO remuneration, disciplinary CEO turnover, ownership and control entrenchment, sample selection model

JEL Classifications: G30, G32, G34, J33

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I. Introduction

In spite of Jensen's (1989) prediction that the (widely-held) public corporation would eclipse due to large agency costs resulting from the lack of emphasis on value creation by insufficiently monitored managers, this type of corporation survived. In Continental European listed firms, the level of trading liquidity even increased at the expense of the high control levels of majority shareholders (Becht and Mayer (2001)). Several reasons for the preservation of the public corporation are propounded. First, the deficiencies of widely-held public corporations – 'strong managers, weak owners', in the words of Roe (1994, 2002) – may not be that prominent in a corporate governance regime which provides strong protection of shareholder rights. La Porta et al. (1999, 2000) show that shareholder rights are best upheld in the Anglo-American legal tradition. Second, the importance of the widely-held public corporation in the US and the UK is the consequence of a path-dependent process wherein existing corporate ownership structures influence legislation and vice versa (Bebchuk and Roe (1999)). Third, the agency costs mentioned by Jensen are restrained by mechanisms aligning the interests of managers and shareholders. It is the efficiency of these alignment mechanisms, namely performance-related managerial remuneration and removal, that this paper is addresses.

The delegation of tasks by the principal (owner) to the agent (executive team), resulting from the separation of ownership and control, necessitates governance mechanisms aligning the interests of principal and agent (Jensen and Meckling (1976)). In this process, the managerial labor market plays a prominent role (Shleifer and Vishny (1997)). Shareholders' interests can be protected because managerial incentives can be (re)structured such that managers try to avoid poor performance due to the threat of dismissal and attempt to reach strong corporate performance as a result of the rewarding and incentive effects of compensation contracts. Jensen and Murphy (1990) argue that the probability of CEO dismissal is too low to align effectively the interests of managers and owners. Likewise, performance-sensitive managerial compensation schemes in isolation only address agency problems at average or high levels of performance. Management may not be induced to generate further effort when it realizes that the minimal performance thresholds triggering bonuses are out of reach.

This paper contributes to the agency literature in the following ways. First, although a large body of literature exists (especially for the US) on both managerial disciplining and managerial compensation, these two aspects of the managerial labor market are usually - with the notable exception of Coughlan and Schmidt (1985) - treated separately. This paper analyses both incentive mechanisms simultaneously for a sample of UK firms. Second, this simultaneous treatment is econometrically translated into a sample selection technique estimated by type-2 Tobit models. This technique mitigates the sample selection biases induced by endogeneity and affecting many of the studies analyzing managerial compensation. Endogeneity problems are

frequently ignored in corporate finance research (see e.g. Himmelberg et al. (1999), Coles et al. (2002)). We document that our estimation technique yields unbiased results as opposed to fixed-effects panel data regressions. Third, the paper contributes to the research on the (relative) efficiency of various governance mechanisms. Our models examine the impact of a set of governance mechanisms on turnover and the use of compensation: e.g. control concentration by type of shareholder, the market for share blocks, the structure of the internal control mechanism (board of directors) and leverage (as a bonding mechanism).

We analyze a randomly drawn sample of listed UK firms. Our period of analysis, 1988-1993, was chosen since it is prior to the publication of the Cadbury report's recommendations for good corporate governance. All companies listed on the London Stock Exchange were obliged to implement these recommendations since 1993.

We obtain the following results for our analysis of CEO dismissal: (a) CEO replacement is strongly performance-sensitive. Top executive turnover is shown to serve as a disciplinary mechanism for corporate underperformance. (b) Neither total ownership concentration nor the presence of large blockholdings held by outsider shareholders (institutions, families or individuals, other corporations) is related to higher CEO turnover even in the wake of poor performance. This implies that there is little evidence of shareholder monitoring. (c) CEOs with strong voting power successfully impede replacement irrespective of corporate performance. This case of strong managerial entrenchment is even exacerbated when the CEO also holds the position of chairman of the board. (d) Boards with a high proportion of non-executive directors and with separate persons fulfilling the tasks of CEO and chairman, replace the CEO more frequently, although these boards are not more apt to replace underperforming management. (e) There is also little consistent evidence that the market in large ownership stakes influences CEO turnover.

Our sample selection models generate the following results on CEO compensation: (a) The CEOs' industry-adjusted monetary compensation is strongly performance-sensitive: monetary compensation rewards both past good industry-adjusted accounting and stock price performance. (b) We find that CEOs' monetary compensation is not only positively related to corporate performance but also increases with size and risk. (c) CEO remuneration is more sensitive to stock price performance in firms with strong outside shareholders whereas remuneration in insider-dominated firms is more sensitive to measures of accounting returns. (d) When stock prices decrease, CEOs seem to compensate disappointing stock performance by augmenting the cash-based compensation package. (e) The presence of a remuneration committee has no impact on the performance sensitivity of cash remuneration.

The remainder of the paper is organized as follows. In the next section, the research hypotheses are motivated. Section III discusses the sample selection procedure, describes the variables and reveals the data sources. In the same section, the different estimation techniques are

explained. Section IV presents the results while Section V discusses detailed robustness tests. The conclusions are presented in Section VI.

II. Determinants of CEO compensation and of managerial turnover

A. Background agency literature

Coughlan and Schmidt (1985) were the first to document that the likelihood of forced turnover is a decreasing function of corporate performance; a finding further corroborated by a.o. Warner et al. (1988), Weisbach (1988), Denis and Denis (1995), and Franks et al. (2001). The disciplinary character of managerial turnover is influenced by board size (Yermack (1996)), board composition (Weisbach (1988)), ownership structure (Kang and Shivdasani (1995); Denis et al. (1997)), and is industry-dependent (Parrino (1997)). Forced executive resignations in the US are accompanied by positive and statistically significant abnormal stock performance (Denis and Denis (1995)) provided that an outsider is appointed as CEO (Borokhovich et al. (1996), and Rosenstein and Wyatt (1997)). Finally, CEO turnover is the ultimate element of an 'error-correcting process', for it affects firm's investment decisions, giving a stimuli to divest poorly performing acquisitions (Weisbach (1995)).

The theoretical blueprint of pay-for-performance remuneration were laid by the principal-agent models of Jensen and Meckling (1976), Holmström (1979), and Grossman and Hart (1983). A multi-period setting has enabled the analysis of career concerns that also affect executive compensation contracts (Gibbons and Murphy (1992))[1]. Following Holmström (1982a), it is relative rather than absolute performance that is shown to be a valid determinant of CEO remuneration (Gibbons and Murphy (1990))[2]. Performance-sensitivity of managerial compensation is empirically well documented (e.g. Coughlan and Schmidt (1985); Jensen and Murphy (1990)). Executive pay depends on both past stock returns and past accounting measures (Sloan (1993)) as well as on relative measures of performance (Gibbons and Murphy (1990)). Still, the level of executive compensation depends not only on past performance: also important are company size (Murphy (1985)) and CEO age and tenure (Conyon and Murphy (2000); Murphy (1986)). Furthermore, the following characteristics also explain part of the changes in remuneration: ownership structure (Core et al. (1999)), board composition (Hallock (1997)), threat of takeover (Agrawal and Knoeber (1998)), merger and acquisition policy (Girma et al. (2002)), company risk, growth opportunities, dividend policy (Lewellen et al. (1987)), and the country where the company is operating (Conyon and Murphy (2000)). The optimal balance of stock- and cash-based compensation solves a trade-off between short- and long-term incentives

[1] Brickley et al. (1999) document that career concerns provide incentives even for CEOs on the verge retirement as the well performing CEOs are more likely to be awarded non-executive directorships after their retirement.

[2] Similar arguments are made in the so-called tournament models (Lazear and Rosen (1981)).

(Narayanan (1996)). While cash compensation creates short-term incentives (and therefore mitigates long-run overinvestment), stock-based compensation may provide appropriate incentives and reduce long-term underinvestment problems (Dechow and Sloan (1991)). Finally, Kole (1997) argues that optimality of a given compensation structure crucially depends on the characteristics of the assets managed by a given CEO.

B. Motivation of hypotheses

The importance of the disciplining role of managerial dismissals is widely accepted. Still, setting a correct performance yardstick is problematic as both accounting and stock price performance have deficiencies. Accounting information records only past corporate performance and can be manipulated over a period of several years by top management. Stock price performance captures the firm's ability to generate value in the future and may hence already include the effects of an expected change in CEO. Therefore, we argue that both stock- and accounting-based measures of performance provide incremental information about executives' productivity.

Hypothesis 1 (Disciplinary role of managerial turnover): *Poor accounting and past stock market-based performance positively affect the likelihood of CEO turnover.*

The essence of the agency literature is that in order to induce agents to exert (costly) effort, the principal has to provide them with appropriate incentives. Jensen and Meckling (1976) suggest (partial) equity ownership by managers as a way of mitigating this problem, but Murphy (1986) finds only little empirical support for this mechanism. Fama (1980) discounts the idea of pay-for-performance contracts for managers with short track records because, if managers believe that subsequent wage offers will depend on current levels of performance, they will work hard today to build up reputational value independent of incentive compensation[3]. Holmström (1982b) challenges this idea and shows that although the effects of labor-market discipline can be substantial, it is not a perfect substitute for contracts[4]. Gibbons and Murphy (1992) extend the Holmström model by introducing Fama's reputation concept and show that the optimal compensation contract optimizes total incentives: the combination of the implicit incentives from career concerns and the explicit incentives from the compensation contract.

Managerial compensation schemes may be an appropriate device complementing performance-related turnover for the following reasons. First, many managers can be subjected to this incentive mechanism, while performance-induced disciplinary turnover only affects a few top managers. Second, Chang (1995) argues that for industries where industry-specific skills are

[3] There is some evidence that the managerial labor market and hence managerial reputation plays an important role. Top managers leading poorly performing firms will be offered fewer non-executive directorships (Kaplan and Reishus (1990)).

[4] In the absence of contracts, managers are expected to work too hard in their early years (when market is still assessing the manager's ability) and not hard enough in later years.

required, performance-based compensation is likely to be a more effective solution to agency problems than the threat of dismissal. Third, as disciplinary turnover penalizes underperformance, the mere fact of being able to avoid poor performance (and, hence dismissal) does not constitute the right incentive for well-performing managers to pursue a value-maximizing strategy. If higher managerial effort induces better corporate performance, there is an important rewarding role for performance-dependent bonus and option schemes[5]. Imperfect observability of top management's actions creates opportunities for moral hazard that adversely affect the contracting with a manager (Holmström (1979)). The efficiency of contracting can be improved by using informative signals about executive's effort. Following this argument, Bushman and Indjejikan (1993), and Kim and Sloan (1993) develop models in which the CEO's compensation depends on both accounting- and stock-based performance measures. Both indicators are considered noisy signals of managerial effort, but as long as they are incrementally informative about managerial actions, they enter a performance-dependent wage formula with non-zero weight[6]. They argue that constructing employment contracts dependent on both stock returns and accounting measures of performance shields the CEO from market-wide changes and thus improves contracting efficiency.

Hypothesis 2 (Rewarding effect of compensation): *Past performance (both in terms of accounting-based and stock market-based measures) positively influences the level of the CEOs monetary compensation.*

Decisions about hiring and firing top management as well as about the remuneration are ultimately taken by the board of directors. The higher the degree of independence of the board from top management, the higher is the level of performance-induced turnover. Still, the empirical US literature comes up with conflicting results. Weisbach (1988) shows that board structure affects the likelihood of disciplinary turnover: poorly performing CEOs are more frequently fired provided that the board is outsider-dominated. This conclusion is challenged by Mikkelson and Partch (1997), and Agrawal and Knoeber (1996) who show that managerial turnover is unrelated to board composition. Instead, turnover seems to result mainly from the pressure of the takeover market (Martin and McConnell (1991)). For the UK, Franks et al. (2001) do not find that a high proportion of independent directors leads to stronger managerial disciplining in the poorly performing firms. What does seem to matter is separating the functions of CEO and chairman of the board.

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[5] Pay-for-performance compensation schemes may also have a punishing role provided that the bonus is forgone in case of poor performance and the base salary is scaled down. Although such a contract could achieve both the goals of disciplining and rewarding simultaneously, it is not observed empirically. Gregg et al. (1993) document that managerial compensation tends to increase over time, even in periods of bad performance.

[6] This argument of using both types of performance measures (stock- and accounting-based) as determinants of CEO compensation is also included in some of the empirical literature for US firms (Core et al. (1999); John and Senbet (1998); Mehran (1995)).

For the US, there is ample evidence that forced turnover follows from monitoring by large (activist) block holders and by the external control market (e.g. Denis and Denis (1995); Bethel et al. (1998)). For UK firms, Franks et al. (2001) confirm that these mechanisms also play a leading role in managerial replacement.

Hypothesis 3a (Governance effects on turnover): *Ownership concentration as well as independent boards of directors positively affect the likelihood of managerial turnover in poorly-performing firms.*

There is little empirical research on the relation between governance mechanisms and CEO employment/remuneration contracts. Still, the degree of independence of the board of directors may have a direct impact on managerial compensation as it is the non-executive directors (or their representatives in a remuneration committee) who set the remuneration contracts. In addition, shareholders will monitor the firm when their share stakes are sufficiently large such that the benefits from monitoring exceed the costs (Admati et al. (1994); Maug (1998); Kahn and Winton (1998)) and may set the terms of CEO employment contracts. Core et al. (1999) and Crespi et al. (2002) illustrate that the ownership structure influences the level of managerial compensation.

Hypothesis 3b (Governance effects on compensation): *Ownership concentration as well as independent boards of directors positively affect the level of performance sensitivity of the CEO cash compensation.*

The intensity of monitoring may not only depend on mere ownership concentration but also on the type of blockholders. In particular, substantial insider ownership may lead to managerial entrenchment, which decreases the performance-sensitivity of managerial turnover and reduces the likelihood of CEO dismissal (Chung and Pruitt (1996); Denis et al. (1997)). Outsider blockholders may hold management responsible for poor performance and attempt to remove them. Even across different types of outsider shareholders (institutions, families or industrial firms), the incentives to monitor may differ. Institutions may be passive shareholders in order not to reduce the liquidity of their investment portfolios as a result of insider trading legislation. Other outside shareholders may not be hindered by such constraints. It is also likely that the decision criteria to remove underperforming management may depend on the type of owner. For example, a reduction in share value or negative abnormal returns may trigger intensified monitoring by outside shareholders and increase top management dismissal. In firms with diffuse ownership, in contrast, substitution of top management may only take place (too) late due to lack of large shareholder monitoring and may happen after a substantial decrease in corporate performance, like negative accounting earnings.

Hypothesis 4a (Blockholder identity effect on turnover): *The type of controlling shareholders affects the likelihood of managerial turnover: monitoring by outsider blockholders (institutions, families and individuals, industrial firms or the government) leads to increased performance-related CEO removal whereas insider blockholders impede executive board changes. Furthermore, the decision criterion of CEO dismissal is related to the type of controlling blockholder: in companies with monitoring outside shareholders, the CEO is replaced after poor stock price performance, whereas in widely-held firms or firms with strong insider ownership the decision criterion is based on negative accounting results.*

A similar argument applies to the pay-for-performance schemes of top management. Managers with a high level of decision discretion (resulting from diffuse ownership and weak boards) may set their own pay and performance criteria. In these cases, we expect pay-for-earnings performance contracts to be more prominent as top management can to some extent influence accounting policies. In firms with high outsider control concentration, the value maximization criterion may be translated into pay-for-share price performance remuneration schemes. Core et al. (1999) find that both size of the CEO equity stake and presence of outside block holdings are significant determinants of executive pay in the US. Clay (2000) argues that monitoring activities are delegated to some classes of owners (namely financial institutions) and that the presence of activist shareholders leads to higher levels of CEO compensation, simultaneously increasing performance-sensitivity.

Hypothesis 4b (Blockholder identity effect on compensation): *In firms with a diffuse ownership structure or strong concentration of insider control, pay-for-accounting performance remuneration contracts prevail whereas in outsider shareholder-controlled firms pay-for-share price performance compensation contracts are imposed.*

Denis and Sarin (1999), and Denis and Kruse (2000) show that changes in ownership structure imply adjustments in board composition, and consequently result in changes in the management team. This tends to indicate that monitoring activities are a function of ownership dynamics rather than of a *status quo* of ownership concentration. Not only full takeovers, but also the acquisition of substantial blocks result in substantial policy changes in target firms (Jenkinson and Ljungqvist (2001)).

Hypothesis 5a (Ownership dynamics effect on turnover): *Changes in ownership structure influence the likelihood of managerial turnover: new block holders with strong monitoring abilities are more likely to remove the CEO in the wake of poor performance.*

Hypothesis 5b (Ownership dynamics effect on compensation): *Changes in ownership structure influence the level of the CEO's cash compensation. The presence of new block holders with strong monitoring abilities leads to a stronger pay-for-performance relation.*

III. Sample description and methodological approach

A. Sample description

The sample consisting of 250 UK firms is randomly drawn from the population of all companies quoted on the London Stock Exchange, excluding financial institutions, real estate companies and insurance companies. As we intend to investigate the impact of changes in the corporate governance structure, a company is retained if it has at least three consecutive years of data in the period 1988-1993. A data panel was constructed for this six-year period. Our sample period terminates in 1993 when the London Stock Exchange imposed the recommendations for good corporate governance of the Cadbury report on all listed firms.[7] Thus, our period is characterized by lower corporate governance standards than more recent years, and is therefore particularly interesting from an agency-theory point of view.

For a company to be included in the sample we required that data for at least three consecutive years within the six years time window are available. Hence, the sample also includes those firms that were taken over or went bankrupt. Seven of the 250 companies were dropped because accounting data were not available from Datastream.

B. Variable definitions, and data description

All data on managerial compensation, turnover and board composition were retrieved from the Directors' Report and the Notes in the annual reports. In our sample, approximately 11% of CEOs lost their position in a given year (Table 1). The mean and median logarithm of cash compensation (salary and bonus) was 11.88 and 11.91, respectively (which corresponds to approximately £ 144,000 and £ 149,000). The median age of a CEO is 52 years (with a mean of 52.6). The median tenure equals 4 years (with a mean of 5.2). Every third CEO also holds the position of chairman of the board of directors. The median board consists of 9 directors, 61.5% of whom are non-executive directors. Finally, in approximately 26% of the sample firm-years, CEO compensation is determined by a remuneration committee[8]. The fraction of companies having such a committee increases substantially towards the end of the sample period (as documented also by Conyon et al. (1995)). Turnover data are corrected for natural turnover. We distinguish between natural and forced turnover, classifying a resignation as 'natural' if the director was described as having left the board for reasons of retirement, death or illness. Otherwise the resignation was classified as being forced. The normal retirement age is between 62 and 65 but some voluntary retirement does occur before that; we took 62 as the minimum retirement age and viewed any earlier retirement as forced.

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[7] For the effect of the Cadbury recommendations on performance and turnover, see Dahya et al. (2002).

[8] The presence of such committees (postulated by Cadbury report) can alter compensation policies and eliminate the situation when the remuneration decision is largely influenced by CEOs themselves (Conyon (1994)).

Ownership data both for existing and new shareholders for each year of the period 1988-1993 were also collected from the Directors' Report and the Notes in the annual reports. All the directors' holdings greater than 0.1% are recorded as well as other shareholders' stakes of 5% and more and of 3% and above (from 1990 when the statutory disclosure threshold was reduced). The status of the directors (executive/non-executive) and the dates of joining and leaving the board were also obtained from the annual reports and from contacting the firms directly by phone or fax. Non-beneficial share stakes held by the directors on behalf of their families or charitable trusts were added to the directors' beneficial holdings. Although directors do not obtain cash flow benefits from these non-beneficial stakes, they usually exercise the voting rights. For equity stakes in Nominees accounts, the identity of the shareholders was found by contacting the listed firms directly. In 97% of these cases, the shareholders of Nominees accounts were institutional investors.

[Insert Table 1 about here]

As is typical for Anglo-American firms, the ownership concentration shown in Table 1 is relatively low. The median Herfidahl-5 index equals only 0.028 (with a mean of 0.057). Most of CEOs do not hold substantial share stakes: the average CEO owns less than 3% of the equity (with a median of zero). The median of the combined shareholdings of all executive directors (excluding CEO) amounts to less than 1%, with an average of slightly below 8%. Stakes of non-executives are lower and do not exceed 4%, on average. The most important class of blockholders consists of financial institutions: they hold a (cumulative) median stake of 13% (a mean of 16.6%). Finally, other outsiders – individuals, families and industrial firms – control on average 8.2% of equity. There is also evidence of a market in (small) blockholdings. Gross increases in holdings by institutions and by other outsiders amount to 6.4% and 1.8%, respectively, which accounts for half and one fourth of the average equity stakes held by those shareholder classes.

As proxies for stock performance, we employ annual abnormal stock returns (in percentage terms), which are collected from the London Share Price Database (LSPD). Abnormal returns are calculated using the market model and corrected for thin trading[9]. The stocks in our sample companies underperformed the benchmark by approximately 2.5% in year t (see Table 1). We also use alternative performance measures like the percentage dividend changes (between years t - 2 and t - 1, and between t - 1 and t, respectively), which are collected from Datastream, and employ return on assets (earnings before interest and taxes over book value of total assets) as accounting-based performance indicators. All accounting data are collected from Datastream and are cross-checked with the information from annual reports.

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[9] Both a Dimson (1979)-correction for non-synchronous trading and a Wasicek (1973)-Bayesian updating are applied.

In order to control for (potential) size effects, we introduce the logarithm of total assets (in £ thousands) at the end of a given year. For the median (mean) company in our sample, this value equals to 11.35 (11.26), which corresponds to approximately £ 85 million (£ 78 million). The median and mean ratios of capital gearing (defined as long term-debt on total assets) equal 29.72% and 32.65%, respectively. Finally, we measure risk by the annual volatility of stock returns, which is gathered from the LSPD. The median and mean values amount to 34.39% and 37.43%, respectively.

Some important data are not available for this study. First, non-cash elements of CEO remuneration (in particular stock- and option-grants) are not disclosed for our sample period. At best, the annual reports only mention that some managerial options were outstanding without consistently revealing the number of options outstanding, the exercise price, and the number of options exercised in the preceding year. Only in the years subsequent to 1995 (when the Greenbury report was issued), only some of this information became available. Second, the presence of director interlocks might affect the level of managerial compensation as well (Hallock (1997)). Finally, our sample period is relatively short but extending the data set beyond 1993 would be problematic due to structural differences between pre- and post-Cadbury period.

C. Methodology

We employ the following econometric techniques. Firstly, sample selection models are applied to analyze jointly executive compensation and turnover. Second, in order to assure robustness of conclusions, survival analysis is applied to investigate factors leading to managerial turnover. We also analyze corporate remuneration using a fixed-effects panel regression framework in order to compare these estimates with the results from the sample selection models. This allows us to draw some conclusions about whether or not the fixed-effects methodology or simple OLS regressions, frequently used in previous research, biases the results of earlier studies.

We simultaneously explain managerial turnover and compensation within a sample selection model framework. The model, often referred to as a type-2 Tobit model, is specified as follows:

(1a) $$\begin{cases} y^{*}_{1\,it} = X'_{1\,it}\,\beta_1 + \varepsilon_{1\,it} \\ y^{*}_{2\,it} = X'_{2\,it}\,\beta_2 + \varepsilon_{2\,it} \end{cases}$$

(1b)

(2) $$y_{1it} = \begin{cases} 1 & \text{if } y^{*}_{1it} > 0 \\ 0 & \text{if } y^{*}_{1it} \le 0 \end{cases}$$

(3) $$y_{2it} = \begin{cases} y^{*}_{2it} & \text{if } y^{*}_{2it} > 0 \\ 0 & \text{if } y^{*}_{2it} \le 0 \end{cases}$$

where $\{\varepsilon_{1it}, \varepsilon_{2it}\}$ are drawn from a bivariate normal distribution with mean 0, variances σ_1^2 and σ_2^2, and covariance σ_{12} (Amemiya (1984)). *y*-variables are quantities of interest while *X*-variables correspond to the explanatory variables. Finally, β_1 and β_2 are vectors of the model

coefficients. It is assumed that only the sign of y_{1it}^* is observed and that y_{2it}^* is observed only when $y_{1i}^* > 0$. Moreover, it is assumed that X_{1i} are observed for all *i*, but X_{2i} need not be observed for *i* such that $y_{1it}^* \leq 0$. Finally the two sets of explanatory variables, i.e., X_{1it} and X_{2it}, are not disjoint (they can differ, however).

In a standard setting, error terms are assumed to be i.i.d. drawings from a bivariate normal distribution. In our models, *i* corresponds to a firm and *t* to a year. We relax the assumption of independence of ε's across *i* and allow clustering of observations corresponding to a given firm, i.e. we assume error terms to be i.i.d. across firms, but not necessarily for different observations within the same firm. All the reported standard errors of estimates are adjusted for clustering (StataCorp (2001)). This procedure enhances robustness of our findings and allows us to take the panel data structure of our sample explicitly into account. To estimate the type-2 Tobit models, we employ a two-step procedure suggested by Heckman (1979), which yields consistent parameter estimates.

Throughout the paper we call equation (1a) a selection equation, while equation (1b) is referred to as a regression equation. The selection equation explains CEO turnover, i.e., $y_{1it} = 1$ corresponds to those firm-years when the CEO kept his position. The regression equation explains the compensation of such CEOs in the subsequent year. As the notion of compensation sensitivity to previous year performance is not meaningful for new CEOs, we restrict the remuneration analysis to CEOs with a tenure of more than one year. Estimating the parameters of the regression equation (1b) on the basis of the non-turnover sample only, would not be a valid alternative to the proposed method because the OLS estimator of β_2 is biased when the selection of the regression sample is endogenous (i.e., $\sigma_{12} \neq 0$). Instead, our sample selection model deals with the endogeneity of selection, and therefore renders reliable parameter estimates for the regression equation (Greene (2000)).

The hypotheses pertaining to ownership variables are tested within tobit-2 models with interaction terms. This can be illustrated by the following general example. Consider a given model of the form:

$$\begin{aligned} y_i = {} & \beta_0 + \beta_1 \cdot Perf_i + \beta_2 \cdot InsOwn_i + \beta_3 \cdot OutOwn_i + \\ & + \beta_4 \cdot Perf_i \cdot InsOwn_i + \beta_5 \cdot Perf_i \cdot OutOwn_i + \mathrm{B} \cdot \mathrm{X}_i + \varepsilon_i, \end{aligned} \tag{4}$$

where *y* is a dependent variable; $\beta_0, \beta_1, \mathrm{K}, \beta_5$ and a vector B are model parameters; $Perf_i$ is the analyzed performance indicator; $InsOwn_i$ and $OutOwn_i$ are (median-centered[10]) stakes controlled by insiders and outsiders, respectively; X_i is a vector containing other regressors; and ε_i is an error term. The conditional estimate (*CE*) of the effect of the performance variable on *y* (given $InsOwn_i$ and $OutOwn_i$) in such a model can be expressed as:

[10] In models with interaction terms, variable-centering is applied for two reasons: (i) it mitigates collinearity problems; (ii) it results in straightforward interpretation of the main-effect coefficient - such a coefficient shows the strength of the relationship for a median (or mean) level of the moderating variable (Aiken and West (1991)).

$$\hat{CE}_{Perf}(InsOwn_i, OutOwn_i) = \hat{\beta}_1 + \hat{\beta}_4 \cdot InsOwn_i + \hat{\beta}_5 \cdot OutOwn_i, \tag{5}$$

where ^ denote estimates of the parameters. Such conditional estimates for one of our models will be illustrated by Figures 1, 3, 5, and 7 (of which the discussion will follow in section IV).

The variance of this conditional estimate is given by:

$$\begin{aligned} &\operatorname{var}\left\{\hat{CE}_{Perf}(InsOwn_i, OutOwn_i)\right\} = \\ &\operatorname{var}\left\{\hat{\beta}_1\right\} + InsOwn_i \cdot \operatorname{var}\left\{\hat{\beta}_4\right\} + \\ &+ OutOwn_i \cdot \operatorname{var}\left\{\hat{\beta}_5\right\} + 2 \cdot InsOwn_i \cdot \operatorname{cov}\left\{\hat{\beta}_1, \hat{\beta}_4\right\} + \\ &+ 2 \cdot OutOwn_i \cdot \operatorname{cov}\left\{\hat{\beta}_1, \hat{\beta}_5\right\} + 2 \cdot InsOwn_i \cdot OutOwn_i \cdot \operatorname{cov}\left\{\hat{\beta}_4, \hat{\beta}_5\right\}. \end{aligned} \tag{6}$$

Finally, the conditional z-statistic (illustrated for one of the models by Figures 2, 4, 6, and 8) is defined as:

$$z = \frac{\hat{CE}_{Perf}(InsOwn_i, OutOwn_i)}{\sqrt{\operatorname{var}\left\{\hat{CE}_{Perf}(InsOwn_i, OutOwn_i)\right\}}}. \tag{7}$$

Under the null hypothesis (H_0: Conditional performance sensitivity = 0), it has an asymptotic standard normal distribution (Aiken and West (1991)).

In order to investigate robustness of the type-2 Tobit models, the determinants of CEO turnover are also analyzed with Cox proportional hazard regressions (Cox (1972); Cox and Oakes (1984)). The hazard function is defined as

$$h_i(t) = \lim_{\Delta \to 0^+} \frac{\Pr(t \le T_i < t + \Delta \mid t \le T_i)}{\Delta}, \tag{8}$$

where T_i is the date of dismissal of CEO i. Hence, the hazard function for a given manager can be interpreted as the marginal conditional probability of being replaced in the time instant Δ given that he or she was not replaced up to time t. Consequently, a positive parameter estimate for a given variable reflects that larger values of this variable increase the probability of CEO dismissal.

The basic proportional hazard model looks as follows:

$$h_i(t) = \psi(X_i, \beta) \cdot h_0(t), \tag{9}$$

where $h_i(\cdot)$ is the hazard function for individual i, $\psi(\cdot)$ is some function of model covariates X_i and of parameters β, and $h_0(\cdot)$ is the underlying (unspecified) baseline hazard function. Following the literature, we use a log-linear specification, i.e. we impose the following form of the function ψ:

$$\psi(X_i, \beta) = \exp(X_i' \beta). \tag{10}$$

The advantage of this approach is that we do not have to parameterize the baseline hazard function. Instead, since we are mainly interested in the values of model parameters β, we need to maximize only the partial likelihood, which for a given observation is given by:

$$L_i = \frac{\exp(X_i'\beta)}{\sum_{j \neq i} \exp(X_j'\beta)} \tag{11}$$

and does not depend on h_0 (Geddes and Vinod (1997)).

We allow the explanatory variables to be time-varying, which results in multiple observations for each of the analyzed firms. In order to assure robustness of the results, we account for possible dependence between different observations corresponding to the same firm. We allow for clustering and implement the procedure, which assumes the observations to be independent across firms, but does not require different observations on the same firm to be independent (StataCorp (2001)). Finally, a robust estimate of the coefficient covariance matrix is computed as in Lin and Wei (1989).

IV. Results

In Section A, we discuss the results from the sample selection models which simultaneously explain CEO turnover and compensation. Subsequently, the hazard rate analyses of managerial survival are outlined in Section B.

A. Sample selection models explaining managerial compensation

The results of Panel A of Table 2 support the disciplinary role of managerial turnover (Hypothesis 1) as performance is positively correlated to future turnover in the selection equations. This effect is highly significant for the industry-adjusted accounting-based performance measure, but less so for stock performance. Managers generating high corporate performance (above the industry return on assets) are more likely to keep their position during the subsequent year. Strong support for Hypothesis 2 (the rewarding effect of compensation) can be found in Panel B of Table 2. In all models, cash compensation, consisting of salary and bonus, is sensitive to both past accounting and stock price performance within the 5% (and frequently 1%) level of statistical significance.

[Insert Table 2 about here]

We also obtain strong results for the relationship between turnover and board characteristics (Panel A). Contrary to the US evidence of e.g. Yermack (1996), the presence of larger boards facilitates the replacement of the CEO in the UK. It may be that larger boards are a proxy for a larger internal pool of managerial talent. Our findings also confirm the intuition of the

1993 Cadbury report, the 'Recommendations for Good Corporate Governance': boards with a larger percentage of outside, independent directors replace CEOs more frequently. Still, the interaction terms of the proportion of non-executive directors and both performance measures (not shown)[11] are not statistically significant. This suggests that boards with a high proportion of non-executive directors do not appear significantly more apt to replace underperforming management. Therefore, we cannot support that part of Hypothesis 3a referring to the board of directors. Our results do not confirm Weisbach's (1988) findings that outsider-dominated boards, supposedly more independent from management, are more able to enforce disciplinary turnover. Finally, when a person fulfills the tasks of CEO and chairman of the board simultaneously, the likelihood of his or her replacement is significantly decreased. This danger of conflicts of interest provides further support for the need to separate the positions of CEO and chairman.

There is no significant relation between board characteristics (including those interacted with performance) and the CEO's cash remuneration with the exception of board size (Panel B of Table 2). CEOs of firms with large boards receive a large compensation. Finally, the presence of a remuneration committee (consisting of non-executive directors) has a negative impact on CEO compensation, which hints that these committees mitigate managerial remuneration although this effect is statistically insignificant. We therefore reject that part of Hypothesis 3b referring to the characteristics of the board of directors.

There is no relation between total ownership concentration, measured by the Herfindahl-5 index, and CEO turnover (Model 2 of Panel A). Also, the interactive terms of total ownership concentration with performance are not statistically significant. Hence, these results fail to support Hypothesis 3a. Still, when we dissect ownership concentration into insider ownership concentration (shareholdings controlled by the CEO, other executive directors and non-executive directors), we find that strong insider control induces a higher probability that the CEO will not be removed (Model 3).[12] The insignificant interaction terms with accounting returns indicate that insiders with large ownership stakes are able to successfully ward off any attempts to replace the CEO regardless of accounting performance.[13] The negative interaction term with abnormal returns (counter-intuitively) suggests that the CEO with strong voting power is even in a stronger position when the stock price performance of his firm is weaker. Neither an analysis with outsider ownership concentration (Model 3), nor a more detailed analysis with ownership concentration held by institutions, families and individuals, other corporations and the government (not shown)

[11] Models with interactive terms of board characteristics and performance are available upon request.

[12] It should be noted that the stakes (both in simple terms and in interactions) are median-centered: zero corresponds to the sample median (i.e. 2.14% of equity is controlled by insiders and 22.8% by outsiders).

[13] When we estimate the models with ownership concentration held by the CEO, executive and non-executive directors separately, we find that it is only the CEO's ownership stake which matters in terms of impeding the CEO's removal. The variables capturing the voting power of the other director classes (and their interaction terms) are not significant but have the same sign as the CEO's ownership concentration. This confirms that little monitoring is performed by non-executive directors. This is in line with the findings of Franks et al. (2001) who state that non-executive directors frequently support incumbent management even in the wake of poor performance. Poor performance is not only the result of poor management but maybe also of poor corporate governance.

yield any evidence of outside shareholder monitoring. Thus, we conclude that there is only partial support for Hypothesis 4a: CEOs with strong voting power seem immune for substitution (be it performance-related or not) and outside shareholders do not seem to play a role in replacing underperforming management. Lai and Sudarsanam (1998), and Franks et al. (2001) also present evidence of managerial entrenchment.

A more detailed analysis of the parameter estimates of Model 3 highlights the economic significance of our findings. Our results imply that the CEO of the median company has 14.3% probability of losing his or her job. The median firm is characterized by median values of firm specific characteristics (performance, board composition, ownership structure, control variables). In well-performing companies (both performance indicators are at the top quartile of performance) with median ownership structure and control variables, the probability of CEO turnover significantly drops to 10.7%, while in poorly performing firms (both performance indicators are at the bottom quartile performance), a substantially higher percentage of CEOs (18.6%) departs. Still, the strength of this disciplining effect depends strongly on the control structure of the firm. In an insider-dominated underperforming firm, the corresponding probability is merely 11.4% whereas it is as high as 21.3% for an outsider-dominated company[14].

The economic effects of insider versus outsider control on CEO turnover (as discussed above) are visualized in Figures 1-4. Figure 1 depicts that the accounting-based performance sensitivity of CEO turnover weakens significantly for larger insider stakes (regardless of outsider control concentration). The test-statistic of the conditional estimates of CEO turnover significantly exceeds zero for low insider ownership and strong outsider ownership of ownership structures (of about 20% and more), as exhibited in Figure 2. The picture of stock price performance sensitivity of turnover (Figure 3) shows that this sensitivity also weakens for strong insider ownership, almost irrespective of the size of outside block holdings. The conditional coefficient is significantly different from zero only up to a relatively moderate level of insider block holdings (Figure 4). For example, in firms where the board controls 18.6% of equity (3rd quartile) and outside blockholders hold 22.8% of equity (median value), CEO is almost immune to the disciplinary turnover following bad stock performance. The conditional z-statistic for the estimate of the stock price performance sensitivity of turnover equals 0.65 only (p-value = 0.515).

[Insert Figures 1-4 about here]

In the remuneration regression equation (Panel B of table 2), we find that when insiders hold large share stakes, the CEO's monetary remuneration is lower. It may be that CEOs deriving substantial wealth from their equity investment in their corporation, care less about their cash

[14] Hereafter, an insider-dominated firm denotes a firm with 18.57% of voting equity controlled by the directors (3rd quartile of the insiders' blockholdings variable) and only 9.40% of shares held by outside blockholders (1st quartile of the outsiders' blockholdings variable). Analogously, an outsider-dominated company is defined as a firm of which 37.05% of equity is controlled by outside blockholders (3rd quartile of the outsiders' blockholdings variable) and for which there are no insider block holdings (1st quartile of the insiders' blockholdings variable equals zero).

income. Still, when the firm's stock performance is low and the wealth of a CEO with a large ownership stake therefore decreases[15], the CEO is paid a relatively higher level of cash compensation. Thus, model 3 implies that CEOs receive a higher monetary compensation in the wake of poor stock performance provided that they strong voting power. It seems that managerial entrenchment not only eliminates the disciplining of poorly performing management but also introduces a pernicious remuneration incentive scheme.

When outside shareholders hold large stakes, the monetary compensation of the CEO is lower, but as the interactive terms are not statistically significant, there is no evidence that CEO remuneration is more performance-related in outsider-dominated firms.[16] We only find partial evidence supporting Hypothesis 4b: Strong insider or outsider control concentration leads to lower CEO remuneration. In the latter case, strong monitoring outsider shareholders may curb excessive managerial compensation, but they do not seem to impose a pay-for-performance remuneration scheme. It may very well be that pay-for-performance schemes and shareholder control are supplementary monitoring mechanisms. In the former case of strong insider ownership, the remuneration package may not be relevant as CEOs may derive substantial wealth and income from their share blocks. Still, when stock prices decrease, it seems that CEOs compensate disappointing stock returns by augmenting the cash-based compensation package.

Our calculation of the conditional estimates (see Section III.C) clarifies the economic significance of the above results. In a median firm, the estimates of accounting- and stock-based performance sensitivity of remuneration equal 0.00318 and 0.00184, respectively (see Model 3). Hence, top managers can expect their cash compensation to exceed the salaries enjoyed by industry peers by 3.18% provided that the ROA of their firms exceeds the industry median by 10 percentage points in the preceding year. Similarly, top managers can expect an increase in their industry-adjusted remuneration by 0.184% for every percentage point of increasing abnormal stock return the firm generated in the year before. In outsider-dominated firms, the conditional stock performance sensitivity of CEO remuneration rises to 0.00192 (from 0.00184 for the median firms) and is statistically significant with a z-statistic of 3.60 (p-value of 0.0003). In contrast, the conditional performance sensitivity of remuneration is not statistically different from zero for our accounting-based performance measure in firms with controlling outside shareholders (the z-statistic is 1.33 with a p-value of 0.183). Interestingly, we find the opposite results for insider-dominated firms. Comparing the stock performance sensitivity of remuneration of the median and of the insider-dominated companies, we find a drop in sensitivity from 0.00184 to a mere 0.00111. The conditional z-statistic indicates that the latter number is not significantly different from zero (z-statistic is 1.55 with a p-value of 0.122). The accounting performance sensitivity of firms with insider control is statistically significant, but only weakly so. These

[15] See the interactive term of abnormal return with insider ownership in Model 3 (Panel B of Table 2).

[16] An analysis of the different types of outside blockholders does not give any significant results apart from the fact that CEOs' compensation is lower in firms with high ownership concentration held by institutions. This effect is not performance-related.

findings are in line with Hypothesis 4b which states that CEO remuneration is more sensitive to stock price performance in firms with strong outside shareholders whereas remuneration in insider dominated firms is more sensitive to measures of accounting returns.

[Insert Figures 5-8 about here]

Figure 5 shows that accounting-based performance sensitivity of CEO monetary compensation is almost flat as a function of ownership variables. Still, it significantly exceeds zero in the case of strong insider control combined with low outsider control (Figure 6). Figure 7 confirms that the presence of large insider-controlled blocks obliterates the pay-for-stock-performance relationship for virtually all levels of outside block holdings. In firms where insiders hold more than approximately 20% of the outstanding equity, the relationship between past stock performance and monetary compensation is insignificantly different from zero, irrespectively of the outside equity concentration (Figure 8). One can argue that in such firms managerial incentives stem mainly from the equity holdings and the compensation would, anyway, play only a marginal role in strengthening the pay-for-stock-performance relationship.

Finally, Table 2 shows that the ownership dynamics are not a relevant determinant of CEO turnover (Hypothesis 5a) in Model 4 of Panel A. Contrary to what was postulated in Hypothesis 5b, ownership changes do not influence CEO pay (Model 4 of Panel B) [17].

Table 2 also provides some interesting insights concerning the impact of firm-specific control variables (size, gearing and risk) on CEO remuneration (Panel B). In line with the UK remuneration literature, CEOs of larger firms enjoy significantly higher industry-adjusted cash compensation. Top management usually tries to justify – rightly so or not – size-related compensation by the fact that to manage larger firms, more managerial skills are needed which are in short supply. We also document that firm leverage has no impact on compensation.

Our results show that CEO remuneration increases with corporate risk. Aggarwal and Samwick (1999), and Jin (2002) argue, however, that in an agency framework, managerial risk aversion implies that firm risk moderates performance sensitivity of executive compensation. We verified this claim and expanded our models with interaction terms of company risk and performance (tables available upon request). None of these interaction terms are statistically significant which fails to corroborate the risk hypotheses of the above studies.

As reported in Panel C, the estimate of the correlation coefficient of the error terms in the selection and the regression equations is statistically significant (Models 1-3). This result confirms that if an analysis of compensation performance-sensitivity were to be performed using

[17] It should be noted that all results discussed above remain valid for a model which includes interactive terms of ownership (Model 3), changes in ownership (Model 4) and board characteristics simultaneously. The results are available upon request.

a simple regression framework (OLS or fixed-effects estimations on a censored sample), such a study is likely to suffer from a severe selection bias (see Section III.C above). In particular, ignoring the selectivity resulting from disciplinary CEO turnover can substantially bias the estimated strength of the remuneration rewarding effect (and of the impact of other covariates). Table A of the appendix illustrates this point. It reports the estimates of panel data fixed-effect models explaining industry-adjusted CEO cash compensation for the sample of executives who are at least one year in place[18]. Models 9-12 correspond to the regression equations of Models 1-4 reported in Table 2.

Table A of the appendix indicates that, as a consequence of ignoring the problem of sample selection, the statistical inference may lead to spurious conclusions. Based on the evidence of Table A, we would reject the hypothesis predicting a significant relationship between past accounting performance and CEO compensation in all of the Models 9-12. The significance of stock performance sensitivity of remuneration survives, but the coefficient estimates are only approximately half of the ones reported in Table 2 (e.g. 0.00079 in Model 9 as opposed to 0.00140 in Model 1). An analysis of the economic significance of these fixed-effects results would be underestimate the results. The discrepancies between the parameter estimates obtained by two methods are even higher for some other regressors (e.g. for the firm size variable, the estimates reported in Table A are almost six times smaller than those in Table 2). These findings may explain the differences in conclusions between our analysis and earlier UK compensation studies[19] (e.g. Conyon et al. (1995) and caution us interpreting the evidence on remuneration in past studies.

B. Hazard rate analysis on CEO survival.

Survival analysis allows us to investigate the determinants of managerial replacement and the robustness of our conclusions from the simultaneous estimation of previous section. Using a series of Cox regression models, we confirm the strong support for Hypothesis 1 in Table 3. Previous year's poor accounting performance (measured by industry-adjusted ROA) significantly increases the likelihood of CEO removal. Although, in some of the models, past stock market

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[18] To estimate $y_{it} = \alpha_i + X_{it}'\beta + \varepsilon_{it}$, fixed-effects and random-effects techniques are frequently used. y_{it} stands for *i*-th firm CEO compensation in year *t*. X_{it} is a vector of covariates (again for firm *i* at time *t*). α_i is a firm-specific effect characterizing *i*-th company, β is the vector of model parameters, and ε_{it} is an error term. In the fixed-effects approach, α_i's are treated as model parameters and are hence estimated. The random-effect model treats α_i's as the result of a random draw from some distribution (e.g., the normal one). For a data panel like ours (relatively large number of firms drawn randomly from an even larger population of companies), the use of a random-effects model is recommended (Verbeek, 2000), as the number of parameters to be estimated is substantially lower with this technique. Furthermore, more efficient estimates are obtained than with fixed-effects models. Still, the consistency criterion of such a random-effects approach requires α_i's to be uncorrelated with explanatory variables of the model, i.e. the *X*'s (Baltagi, 2001). Since the Hausman specification tests points out that in almost all our specifications this assumption is violated, we report the results from the fixed-effects approach.

[19] Most past remuneration research on the UK does not find a positive pay-for-performance relation. It is likely that the reason for this lack of results follows from the fact that inappropriate econometric techniques were used.

performance is marginally significant, it is accounting- rather than market-based performance measures that are the dominating criterion for replacing a CEO (Models 5-8).[20]

[Insert Table 3 about here]

Significant results, in line with those reported in Section IV.A, are obtained for the relationship between turnover and board characteristics. Large boards and boards with a high proportion of outside directors facilitate the removal of CEOs. Still the interactive term of the proportion of non-executive directors with performance is not significant which implies that non-executive directors who are more independent from management are not more able to discipline underperforming management.[21] When the CEO dominates the board by also holding the chairmanship, he is more likely to 'survive' longer.

Whereas total ownership concentration does not seem to influence the likelihood of CEO dismissal (Model 6), Model 7 shows that the presence of specific types of blockholders determines the (non-natural) CEO dismissal. In companies where insiders hold larger a fraction of the voting rights, entrenchment is more likely, especially when these firms generate losses. The estimates imply that in an underperforming outsider-dominated firm (with both performance indicators at their 1st quartile values), the marginal probability of CEO removal is approximately 42% higher than in an underperforming firm with median ownership structure and approximately 58% larger than in an underperforming firm that is insider-dominated (cf. Model 7). A more detailed analysis of insider ownership concentration – more specifically of that of the CEO, executive and non-executive directors – reveals that the CEO's stake and its interaction terms are statistically significant. CEOs holding a large proportion of voting rights can make themselves to some extent immune to dismissal.[22]

Model 8 analyses the impact of ownership structure on managerial turnover from another angle, namely that of ownership dynamics rather than that of block holdings. As before, the ownership dynamics are not related to CEO turnover. The annual volatility of stock returns, our proxy for firm risk, is always significant with a positive sign, implying that top executives of high-risk firms are more vulnerable to dismissal. Finally, the other control variables (leverage and firm size) are insignificant in all the Cox models explaining CEO turnover.

[20] All turnover figures in these models are corrected for natural turnover (cf. Section III.B).
[21] The results from the models with board interactive terms are available upon request.
[22] The results from this model are available upon request.

V. Robustness tests

A. Alternative variable specifications in the simultaneous equations estimation.

1. Remuneration

We re-estimated the Models of Section IV.A using the logarithm of CEO compensation rather than the logarithm of industry-adjusted CEO pay as a dependent variable in the regression equation. Such specifications failed to explain managerial remuneration, even after the inclusion of industry dummies to control for industry-specific effects. Therefore, we argue that Hypothesis 2 only holds for the appropriate measure of compensation. The lack of performance sensitivity of compensation found in the UK compensation literature (compare Conyon et al. (1995)) may be attributable to the different variable specifications.

2. Corporate performance

We substituted unadjusted ROA and (yearly) changes in EBIT for our accounting performance measure and obtained similar results both in the regression and the selection equation. For two other proxies tried (adjusted and unadjusted ROE), the relation with CEO turnover and industry-adjusted compensation was not significant. An alternative measure of stock performance (dividend changes as a signal of future value) gave results similar to those obtained with stock returns. Tobin's Q correlates positively with remuneration in the regression equations, but is not a used as a benchmark to remove the CEO (selection equation).

Finally, we extended the models by also including two-year lags of the performance indicators. In most of the specifications, both accounting- and market-based proxies lagged two years appeared insignificant. Thus, it seems that the decisions to CEO removal as well as remuneration are taken swiftly, once poor or good performance thresholds are reached.

3. Ownership and control

In the selection equations, the variables measuring total ownership concentration mostly turn out to be insignificant, irrespectively of the proxy tried. Only when we employ a Shapley value of the largest block holder, which captures the relative voting power of this blockholder, we obtain a positive correlation (at the 10% level) with the likelihood of CEO dismissal (Hypothesis 3a). In relation to the tests of Hypothesis 4a and b, we tried alternative proxies to measure stakes and voting power of different types of owners (e.g. the largest stake in each of the classes, Herfindahl-3 concentration indices within each shareholder class, the largest Shapley value for the largest blockholder by shareholder classes, the Shapley values by class of owner). The results are in line with those reported in Section IV.A: we only find consistent support for managerial entrenchment as larger stakes controlled by insider (mainly the CEO) mitigate the likelihood of CEO dismissal.

With respect to the regression equations (on remuneration), our results appear robust to different proxies of ownership structure: total ownership concentration has no impact on the level of CEO compensation. Thus, Hypothesis 3b can be rejected. Replacing cumulative stakes of various classes of owners by the largest block in each of the groups, by Shapley values of the largest investor in each of the owner-type classes, by Herfidahl-3 indices for different groups, or by class Shapley values produces results that are comparable to those reported earlier in Section IV.A.

4. Leverage

The results are also robust to the choice of leverage proxy (using book or market value) as none of the conclusions concerning the research hypotheses is challenged in alternative specifications. Extending the model specifications by adding additional firm-specific control variables capturing changes in capital structure (such as dummy variable for firms issuing new equity) does not materially affect the results.

5. Model extensions by CEO age

Several studies argue that CEO age is one of the crucial determinants of compensation and of turnover. We expand the models in Table 2 by including CEO age and find that this variable has no impact on CEO replacement but that it is positively related to CEO cash compensation. None of the other results presented in Table 2 are rejected. The reason why we do not present these additional results in the table is that the CEO age variable is only available for 60% of our the sample.

B. Robustness tests for hazard models

In spite of the advantages of the methodology applied in Section IV.B - more specifically the fact that we do not need a full parameterization of the hazard function - we estimate panel-data fixed-effect logit models to verify robustness further. Due to the requirements of estimation procedure (i.e., conditional maximum likelihood) sample size shrinks substantially (by approximately 60%), which brings about lower levels of statistical significance. Nevertheless, the major qualitative conjectures concerning CEO turnover are upheld irrespectively of the choice of methodology.

Next, we re-estimate Cox models of Section IV.B using alternative proxies for stock price performance (yearly dividend changes, Tobin's Q proxy), for accounting-based performance (unadjusted ROA and changes in EBIT), for ownership concentration (Herfindahl-10 index, the largest block holding, Herfidahl-3 indices for each shareholder class and Shapley values of the largest shareholder of each class), for leverage (book- or market-based) and generate results that hardly differ from those presented in Table 3. Two-year lags of the performance variables are insignificant. Franks et al. (2001) state that new equity issues present the ideal opportunity to

replace poorly performing CEOs, but we find no evidence that the dummy variable capturing the fact that a new equity issue took place, is correlated with CEO replacement.

VI. Conclusion and discussion

In this paper we simultaneously analyze two mechanisms of the managerial labor market: CEO turnover and monetary remuneration schemes. Sample selection models and hazard analyses applied to a random sample of 250 firms listed on the London Stock Exchange over a six-year period show that managerial remuneration and the termination of labor contracts play an important role in mitigating agency problems between managers and shareholders. We find that both the CEOs' industry-adjusted monetary compensation and CEO replacement are strongly performance-sensitive. Top executive turnover is shown to serve as a disciplinary mechanism in case of corporate underperformance, whereas the level of monetary compensation rewards good past performance. We find that CEO turnover has the strongest performance-sensitivity for industry-corrected accounting measures and less strong a relation with stock performance measures. This suggests that CEOs are only dismissed at a rather late stage, namely when poor performance is reflected in the accounting returns. CEOs' monetary remuneration, relative to that of their industry peers, reflects both past good accounting performance and stock price performance (abnormal returns, Tobin's Q and dividend increases). Thus, our results provide strong evidence of both the disciplinary effect of turnover and the rewarding effect of monetary compensation. In contrast, past UK literature has uncovered little evidence of performance-sensitivity which may be the result of biases introduced by inappropriate estimation techniques as well as the incorrect choice of remuneration measures and performance benchmarks. We detail that the use of Tobit-2 sample selections models generates unbiased results compared to fixed-effects panel data regressions.

We also investigate whether specific corporate governance mechanisms (different types of blockholders, of boards of directors or of leverage) have an impact on managerial disciplining or on pay-for-performance contracts. We find that neither total ownership concentration (measured by fraction of voting rights, Herfindahl index and Shapley indices) nor the presence of large blockholdings held by outsider shareholders (institutions, families or individuals, other corporations) are related to higher CEO turnover even in the wake of poor performance. This implies that there is little evidence disciplinary monitoring by outsider shareholders. Still, there is one type of blockholder that is able to impede CEO dismissal: insiders with strong voting power successfully resist CEO dismissal, irrespective of corporate performance. In an insider-dominated underperforming firm, the probability of CEO replacement is merely 11.4% whereas it is as high as 21.3% for an outsider-dominated company. This case of strong managerial entrenchment is even exacerbated when the CEO also holds the position of chairman of the board. Boards with a high proportion of non-executive directors and with separate persons fulfilling the tasks of CEO and chairman, replace the CEO more frequently, but these boards are not more apt to replace

underperforming management. There is also little consistent evidence that the market in large ownership stakes and leverage influence CEO turnover.

We find that CEO monetary compensation is not only positively related to corporate size and risk, but also to both industry-adjusted accounting and abnormal stock price performance. Strong insider or outsider control concentration leads to lower CEO remuneration. In the latter case, strong monitoring outsider shareholders may curb excessive managerial compensation, but they do not seem to impose a strict pay-for-performance remuneration scheme. It seems that pay-for-performance schemes and shareholder control are supplementary monitoring mechanisms. In the former case of strong insider ownership, the remuneration package may not be relevant as CEOs may derive substantial wealth and income from their share blocks. Still, when stock prices decrease, it seems that CEOs compensate disappointing stock performance by augmenting the cash-based compensation package. We also examine the economic interpretation of our results by comparing the significance of the performance-sensitivity of remuneration in the median firm to that of insider- versus outsider-controlled firms, respectively. We conclude that CEO remuneration is sensitive to stock price performance in firms with strong outside shareholders whereas remuneration in insider-dominated firms is sensitive to measures of accounting returns only. Finally, the presence of a remuneration committee has no impact on remuneration.

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Tables and figures

Table 1. Sample characteristics.

	Median	Mean	Std. deviation
CEO turnover			
CEO dismissal	0.000	0.110	0.313
CEO compensation			
Industry-adjusted logarithm of salary	0.000	0.002	0.623
Logarithm of salary	11.878	11.909	0.687
CEO characteristics			
CEO age	52.000	52.581	6.343
CEO tenure	4.000	5.151	5.482
CEO is the board chairman	0.000	0.335	0.472
Board composition			
Fraction of outside directors	61.540	61.411	15.035
Board size	2.197	2.173	0.372
Remuneration committee presence	0.000	0.259	0.438
Ownership variables			
Herfindahl-5 concentration index	0.028	0.057	0.084
CEO stake	0.000	2.983	8.095
Executives' stake	0.120	4.572	10.746
Non-executives' stake	0.000	3.914	9.625
Institutions' stake	13.000	16.596	16.116
Families/indiv.'s and corporations' stake	0.000	8.218	14.083
Increase in executives' stake	0.000	0.729	3.376
Increase in non-executives' stake	0.000	0.513	2.935
Increase in institutions' stake	3.100	6.402	8.802
Increase in fam./indiv./corporations' stake	0.000	1.842	5.911
Performance indicators (all but the last variable in percentage terms)			
Abnormal stock return in year *t*	-5.195	-2.506	47.150
Abnormal stock return in year *t*-1	-3.710	-2.418	38.173
Abnormal stock return in year *t*-2	-1.370	2.063	41.054
Return on assets in year *t*	16.315	15.234	26.572
Return on assets in year *t*-1	18.100	17.704	20.420
Return on assets in year *t*-2	19.590	19.000	20.194
Firm-specific control variables			
Firm size	11.259	11.349	1.794
Capital gearing	29.715	32.651	24.784
Risk	34.390	37.429	13.070

Note to Table 1: CEO dismissal is a dummy variable that equals one for firm-years in which CEO change took place. Logarithm of salary is a natural logarithm of CEO total cash compensation (including bonuses) expressed in pounds. Industry-adjusted logarithm of salary is an industry-year median-adjusted logarithm of CEO salary (as defined above). CEO age and tenure are measured in years. The last of the CEO characteristics is a dummy variable that equals one for those CEOs who also hold the function of chairman of the board. The fraction of outside directors is expressed as a percentage of the total number of directors. The board size is defined as a natural logarithm of the total number of directors. The presence of a remuneration committee is a dummy variable equaling one for those firm-

years for which a remuneration committee is in place. The Herfindahl-5 concentration-index is calculated using the equity stakes of the five largest shareholders. The following ownership variables represent cumulative total percentage stakes for the CEO, executive directors, non-executive directors, financial institutions, families and individuals, and corporations, respectively (as revealed in company reports). The remaining four ownership variables correspond to increases (in percentage points) of cumulative stakes held by executives, non-executives, financial institutions, families and individual shareholders, and corporations. The first three performance indicators are abnormal stock returns (in percentage terms) and their values lagged one and two years, respectively. Return on assets (contemporaneous, lagged one and two years) is defined as the ratio of EBIT over total assets in a given year. Firm size is proxied by a natural logarithm of the total book value of assets. Capital gearing is defined as the ratio of debt to total assets and expressed in percentage terms. Risk is measured as an annual volatility of stock returns.

Table 2. Sample selection models explaining CEO turnover and industry-adjusted cash compensation.

	Model 1		Model 2		Model 3		Model 4	
Panel A: Selection equations	**Dependent variable equals 0 if the CEO is replaced and 1 otherwise**.							
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	4.23534	0.000	4.38876	0.000	3.83454	0.000	4.89602	0.000
Performance indicators								
Industry-adjusted ROA in year *t*-1	0.01030	0.001	0.00973	0.011	0.01094	0.058	0.01275	0.001
Abnormal stock returns in year *t*-1	0.00321	0.158	0.00333	0.163	0.00526	0.032	0.00292	0.291
Board composition								
Board size	-0.98560	0.000	-0.90042	0.000	-0.94299	0.000	-0.89115	0.003
Fraction of outside directors	-0.00757	0.058	-0.00823	0.050	-0.00812	0.046	-0.00785	0.545
CEO is also the chairman	0.40096	0.006	0.41711	0.006	0.40528	0.006	0.48601	0.299
Firm size, leverage, and risk								
Firm size	0.05780	0.179	0.03164	0.497	0.08513	0.128	0.04349	0.702
Capital gearing	0.00029	0.909	-0.00020	0.941	-0.00028	0.919	0.00038	0.949
Risk	-0.00776	0.209	-0.00745	0.253	-0.00518	0.374	-0.00564	0.444
Ownership concentration								
Herfindahl-5 concentration index			-0.44790	0.541				
Accounting perform. * Herfindahl-5 index			-0.01529	0.784				
Stock Price perform. * Herfindahl-5 index			-0.02514	0.309				
Insiders' blockholdings					0.01206	0.042		
Accounting perform. * insider stakes					-0.00012	0.638		
Stock Price perform. * insider stake					-0.00024	0.023		
Outside block holdings					-0.00428	0.250		
Accounting perform. * outsider stakes					-0.00002	0.922		
Stock Price perform. * outsider stakes					0.00001	0.944		
Ownership dynamics								
Increase in insiders' blockholdings							0.00913	0.789
Accounting perform. * increase insider stakes							-0.00060	0.389
Stock Price perform. * increase insider stakes							-0.00029	0.844
Increase in outsiders' blockholdings							0.01292	0.229
Accounting perform. * increase outsider stakes							-0.00030	0.432
Stock Price perform. * increase outsider stakes							0.00021	0.429
Year and industry control variables								
Year dummies	Yes		Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes		Yes	
Wald χ^2	$\chi^2(23) = 86.05$		$\chi^2(26) = 63.69$		$\chi^2(29) = 104.78$		$\chi^2(29) = 161.24$	
P-value for χ^2	< 0.001		< 0.001		< 0.001		< 0.001	

Table continues on next page.

Table 2 - continued.

	Model 1		Model 2		Model 3		Model 4	
Panel B: Regression equations	**Dependent variable is the industry-adjusted CEO cash remuneration**							
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	-3.51081	0.000	-3.48873	0.000	-3.13868	0.000	-3.74666	0.000
Performance indicators								
Industry-adjusted ROA in year *t*-1	0.00356	0.013	0.00389	0.008	0.00318	0.059	0.00636	0.001
Abnormal stock returns in year *t*-1	0.00140	0.002	0.00166	0.001	0.00184	0.001	0.00146	0.025
Board composition								
Board size	0.19077	0.023	0.19291	0.022	0.18921	0.015	0.19297	0.154
Fraction of outside directors	0.00176	0.306	0.00167	0.327	0.00188	0.271	0.00122	0.620
CEO is the board chairman	0.01938	0.675	0.02478	0.595	0.03023	0.525	0.02887	0.655
Remuneration committee presence	-0.00915	0.840	-0.01341	0.768	-0.01916	0.659	-0.04293	0.440
Firm size, leverage, and risk								
Firm size	0.23641	0.000	0.23476	0.000	0.20847	0.000	0.25329	0.000
Capital gearing	0.00097	0.314	0.00086	0.383	0.00073	0.434	0.00041	0.771
Risk	0.00839	0.003	0.00849	0.003	0.00769	0.009	0.01071	0.003
Ownership concentration								
Herfindahl-5 concentration index			-0.32539	0.522				
Accounting perform. * Herfindahl-5 index			-0.00961	0.580				
Stock Price perform. * Herfindahl-5 index			-0.00723	0.089				
Insiders' blockholdings					-0.00454	0.007		
Accounting perform. * insider stakes					0.00007	0.329		
Stock Price perform. * insider stakes					-0.00005	0.024		
Outside block holdings					-0.00310	0.046		
Accounting perform. * outsider stakes					-0.00004	0.506		
Stock Price perform. * outsider stakes					0.00000	0.942		
Ownership dynamics								
Increase in insiders' blockholdings							-0.00041	0.979
Accounting perform. * increase insider stake							-0.00078	0.050
Stock Price perform. * increase insider stake							-0.00029	0.251
Increase in outsiders' blockholdings							-0.00047	0.863
Accounting perform.* increase outsider stakes							-0.00010	0.253
Stock Price perform.* increase outsider stakes							-0.00001	0.877
Year control variables								
Year dummies	Yes		Yes		Yes		Yes	
Wald χ^2	$\chi^2(13) = 352.92$		$\chi^2(16) = 363.20$		$\chi^2(19) = 500.90$		$\chi^2(19) = 382.29$	
P-value for χ^2	< 0.001		< 0.001		< 0.001		< 0.001	

Table continues on next page.

Table 2 - continued.

	Model 1	Model 2	Model 3	Model 4
Panel C: Model statistics and tests				
Total no. of observations	851	840	847	695
No. of censored observations	102	94	101	87
No. of uncensored observations	749	746	746	608
Log-likelihood	-644.21	-630.95	-623.95	-495.23
Wald χ^2 statistics for testing joint significance of two equations	$\chi^2(36) = 599.95$	$\chi^2(42) = 586.41$	$\chi^2(48) = 819.24$	$\chi^2(48) = 988.96$
P-value for χ^2	< 0.001	< 0.001	< 0.001	< 0.001
Estimate of ρ	-0.508	-0.465	-0.595	-0.882
Wald χ^2 statistics for testing $\rho = 0$ (tests of equations independence)	$\chi^2(1) = 5.95$	$\chi^2(1) = 3.50$	$\chi^2(1) = 8.21$	$\chi^2(1) = 0.21$
P-value for χ^2	0.015	0.062	0.004	0.648

Note to Table 2: The table presents the estimates of the sample selection models for top executive turnover (selection equation of Panel A) and CEO industry-adjusted compensation (regression equation of Panel B). Standard errors are adjusted for clustering of observations on each firm. The dependent binary variable of Panel A equals one for CEOs that were not replaced in a given year and zero otherwise. As far as regressors are concerned, industry-adjusted ROA is defined as industry-year median adjusted return on equity (in percentage terms) lagged one year. Likewise, abnormal stock return is lagged one year. Board size is defined as a natural logarithm of the total number of directors. Fraction of outside directors is expressed as a percentage of outsiders on the board. The last of the board characteristics is a dummy variable that equals one for CEOs serving at the same time the function of board chairmen. Firm size is proxied by a natural logarithm of the total book value of assets. Capital gearing is expressed in percentage terms. Company risk is measured as an annual volatility of stock returns. The Herfindahl-5 concentration index is calculated using the stakes of the five largest shareholders. The blockholding variables consist of insider stakes (the amalgamation of the shareholdings of the CEO, executive and non-executive directors). The outsider blockholdings are the amalgamation of the stakes held by financial institutions, families and individuals, the government and corporations, respectively, provided the individual stakes are 5% or above. The variables describing ownership dynamics correspond to increases (in percentage points) of cumulative stakes held by insider and outsider shareholders. In the regression equations (Panel B) the dependent variable is an industry-adjusted CEO cash compensation in the subsequent year. The explanatory variables are defined in the same way as in the selection equations. The only difference is that here time-varying regressors are lagged one year less compared to those from Panel A. The remuneration committee presence is a dummy variable that equals one for firm-years, when remuneration committee was in place.

Table 3. Hazard analysis of CEO turnover.

	Model 5		Model 6		Model 7		Model 8	
	Dependent variable is the marginal conditional probability that the CEO is replaced in the time instant Δ given that he was not replaced up to time *t*.							
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Performance indicators								
Industry-adjusted ROA in year *t*-1	-0.00805	0.002	-0.01056	0.002	-0.01430	0.041	-0.00947	0.053
Abnormal stock returns in year *t*-1	-0.00563	0.082	-0.00546	0.132	-0.00532	0.178	-0.00420	0.354
Board composition								
Board size	1.50628	0.000	1.46601	0.000	1.56217	0.000	1.47911	0.000
Fraction of outside directors	0.01338	0.026	0.01259	0.041	0.01213	0.050	0.01462	0.020
CEO is the board chairman	-1.07289	0.000	-1.05769	0.000	-1.03598	0.000	-1.08703	0.000
Firm size, leverage, and risk								
Firm size	-0.08824	0.238	-0.09642	0.218	-0.14245	0.089	-0.05975	0.435
Capital gearing	0.00303	0.400	0.00287	0.455	0.00297	0.453	0.00290	0.417
Risk	0.01898	0.024	0.01733	0.050	0.01355	0.117	0.01872	0.032
Ownership concentration								
Herfindahl-5 concentration index			0.92998	0.438				
Accounting perform. * Herfindahl-5 index			0.09558	0.105				
Stock Price perform. * Herfindahl-5 index			-0.00045	0.988				
Insiders' blockholdings					-0.01344	0.153		
Accounting perform. * insider stakes					0.00050	0.094		
Stock Price perform. * insider stakes					-0.00004	0.870		
Outside block holdings					0.00816	0.188		
Accounting perform. * outsider stakes					0.00021	0.351		
Stock Price perform. * outsider stakes					-0.00002	0.888		
Ownership dynamics								
Increase in insiders' blockholdings							0.02144	0.205
Accounting perform. * increase insider stake							0.00006	0.858
Stock Price perform. * increase insider stake							0.00034	0.630
Increase in outsiders' blockholdings							0.00866	0.385
Accounting perform.* increase outsider stakes							0.00009	0.594
Stock Price perform.* increase outsider stakes							-0.00015	0.306
Year and industry control variables								
Industry dummies	Yes		Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes		Yes	
Log-likelihood	-450.25		-440.56		-437.63		-437.91	
Wald test χ^2	$\chi^2(23) = 168.75$		$\chi^2(26) = 166.36$		$\chi^2(29) = 188.33$		$\chi^2(29) = 199.57$	
P-value for χ^2	< 0.001		< 0.001		< 0.001		< 0.001	
Pseudo-R^2	0.089		0.086		0.092		0.084	
No. of observations	1148		1136		1136		955	

Note to Table 3: The table presents the estimates of the Cox proportional hazard rate model for managerial tenure. Standard errors are adjusted for clustering of observations on each firm. Industry-adjusted ROA is defined as industry-year median adjusted return on equity (in percentage terms) lagged by one year. Abnormal stock return is lagged by one year as well. Board size is defined as a natural logarithm of the total number of directors. The fraction of outside directors is expressed as a percentage of outsiders on the board. 'CEO is board chairman' is a dummy variable that equals one for CEOs serving at the same time as chairman of the board. Firm size is proxied by the

natural logarithm of the total book value of assets. Capital gearing is expressed in percentage terms. Company risk is measured as an annual volatility of stock returns. Herfindahl-5 concentration index is based on stakes of the five largest shareholders. The blockholding measures represent cumulative total percentage stakes held by insiders (CEO, executive directors, non-executive directors) and outsiders (financial institutions, families and individuals, and corporations). The variables describing ownership dynamics correspond to increases (in percentage points) of cumulative stakes held by insiders (CEOs, executives, non-executives) and outsiders (financial institutions, families and individuals, and corporations).

Figure 1. Conditional estimates of CEO turnover sensitivity with respect to the accounting-based corporate performance for various levels of ownership concentration.

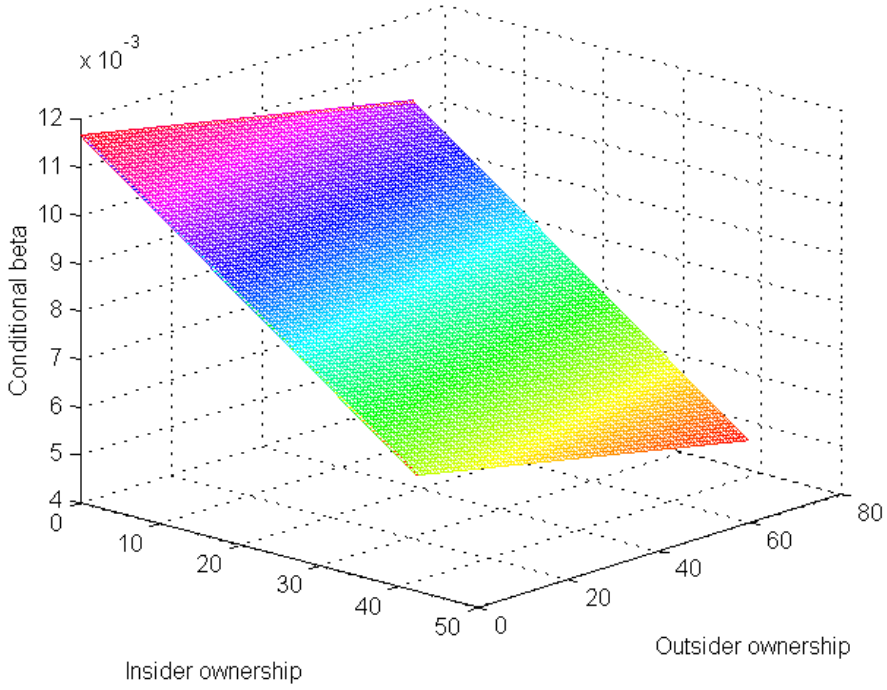
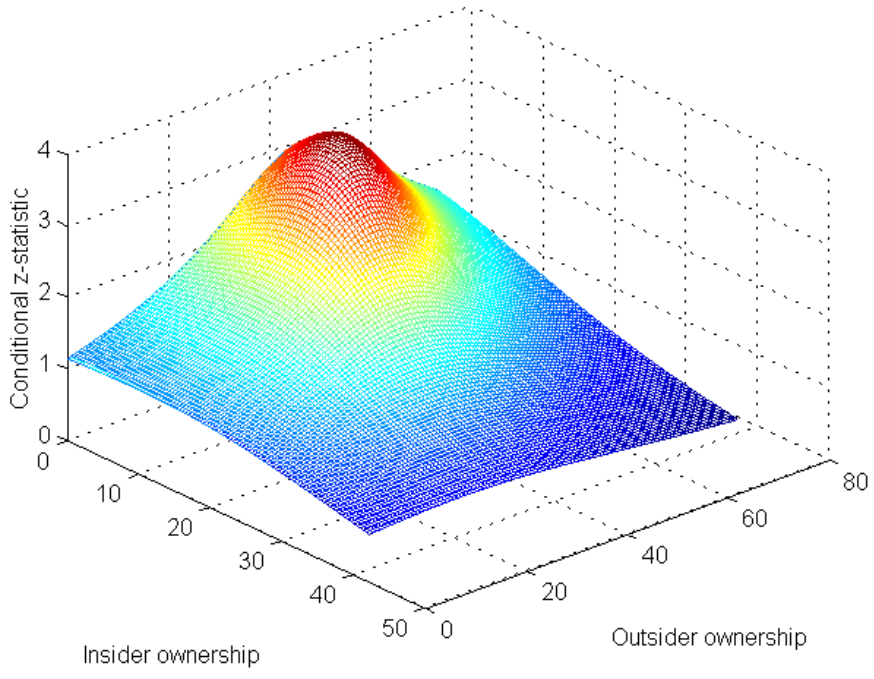


Figure 2. Significance of CEO turnover sensitivity with respect to the accounting-based corporate performance for various levels of ownership concentration.



Note: Values of the magnitude exceeding 1.96 are significant at 5% level (2-tail test).

Figure 3. Conditional estimates of CEO turnover sensitivity with respect to the stock price-based corporate performance for various levels of ownership concentration.

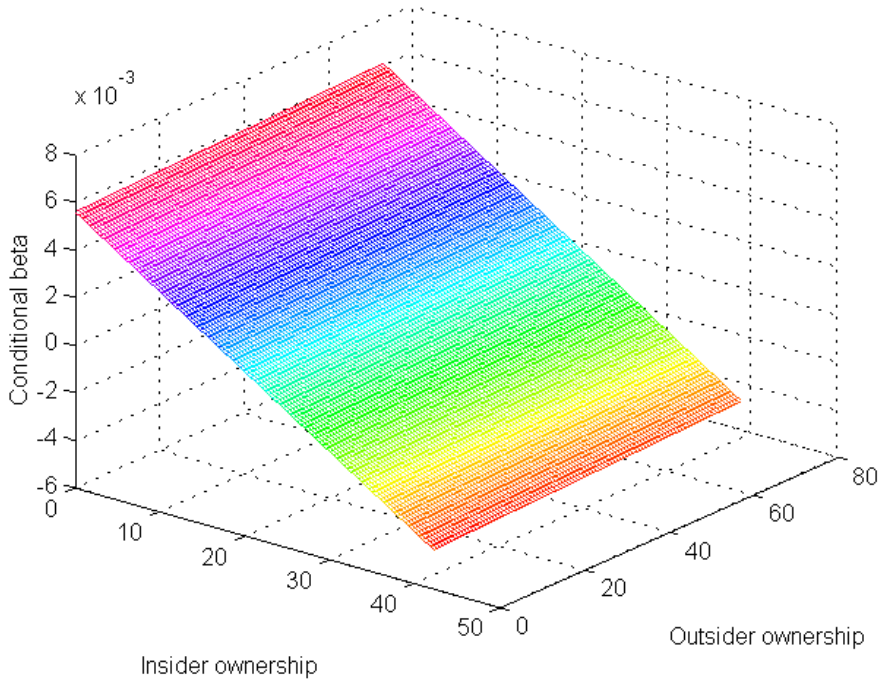
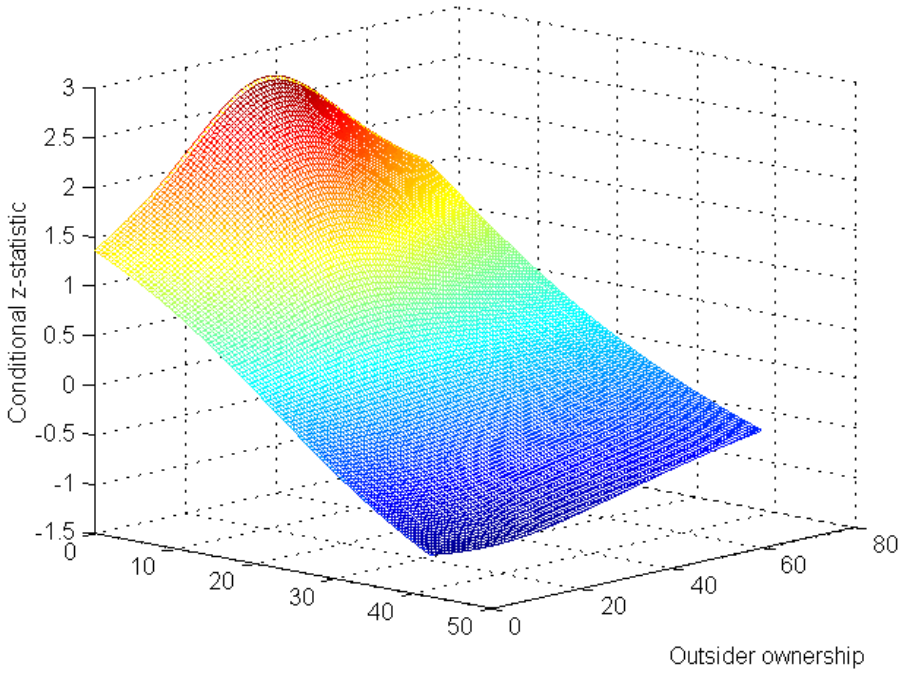


Figure 4. Significance of CEO turnover sensitivity with respect to the stock price-based corporate performance for various levels of ownership concentration.



Note: Values of the magnitude exceeding 1.96 are significant at 5% level (2-tail test).

Figure 5. Conditional estimates of CEO monetary compensation-sensitivity with respect to the accounting-based corporate performance for various levels of ownership concentration.

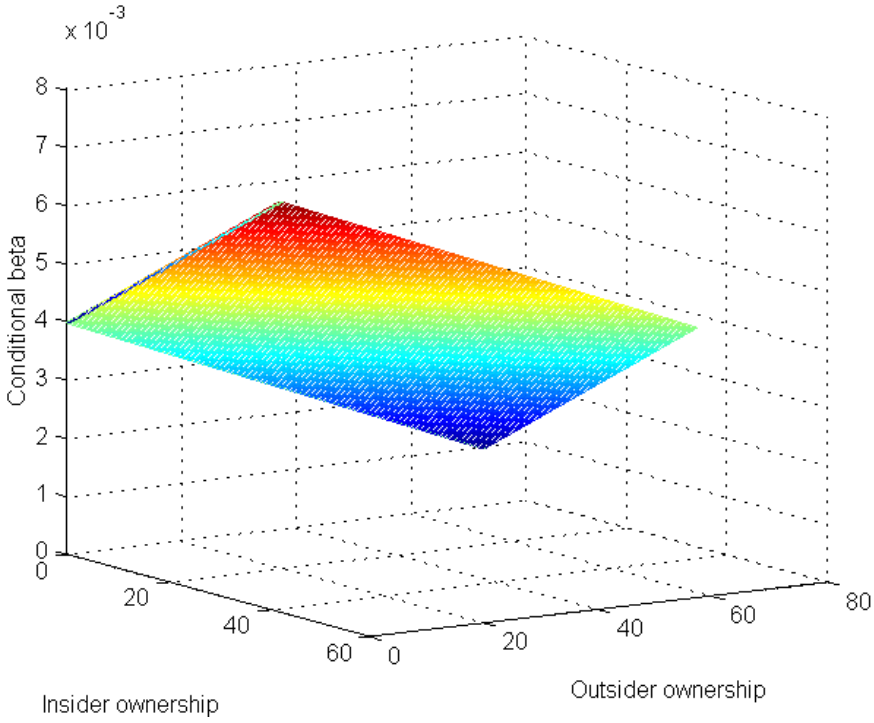
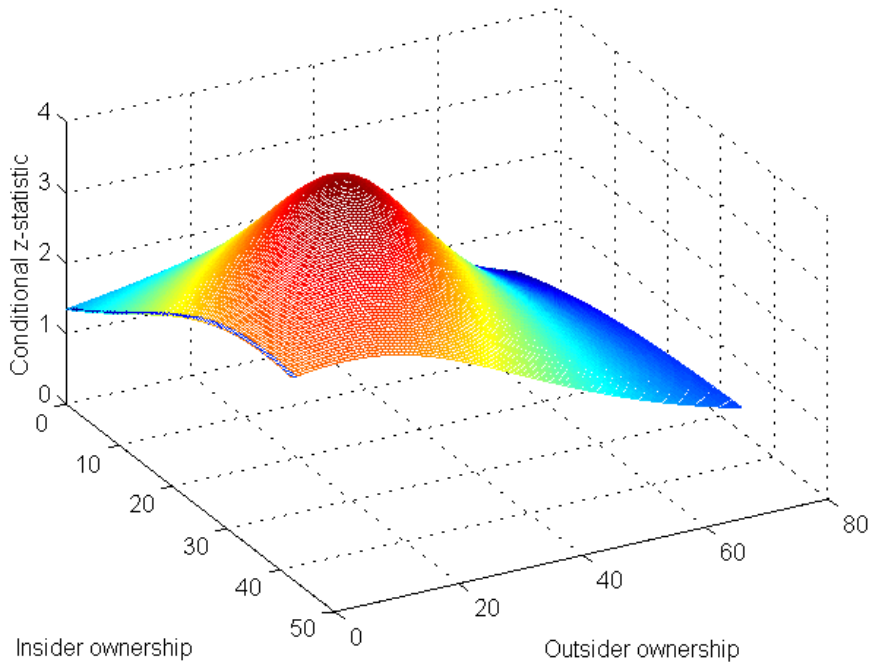


Figure 6. Significance of CEO monetary compensation-sensitivity with respect to the accounting-based corporate performance for various levels of ownership concentration.



Note: Values of the magnitude exceeding 1.96 are significant at 5% level (2-tail test).

Figure 7. Conditional estimates of CEO monetary compensation-sensitivity with respect to the stock price-based corporate performance for various levels of ownership concentration.

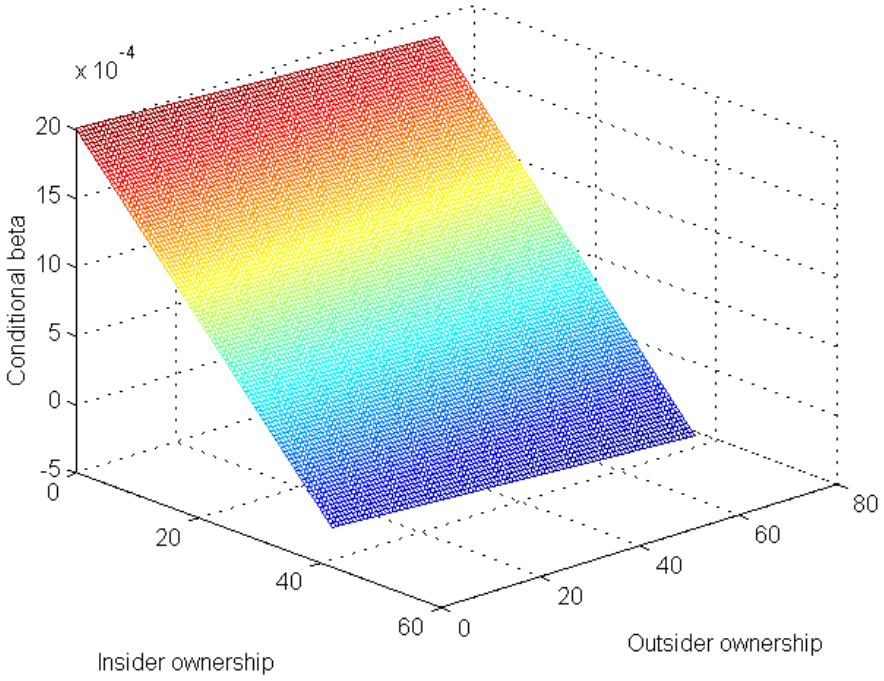
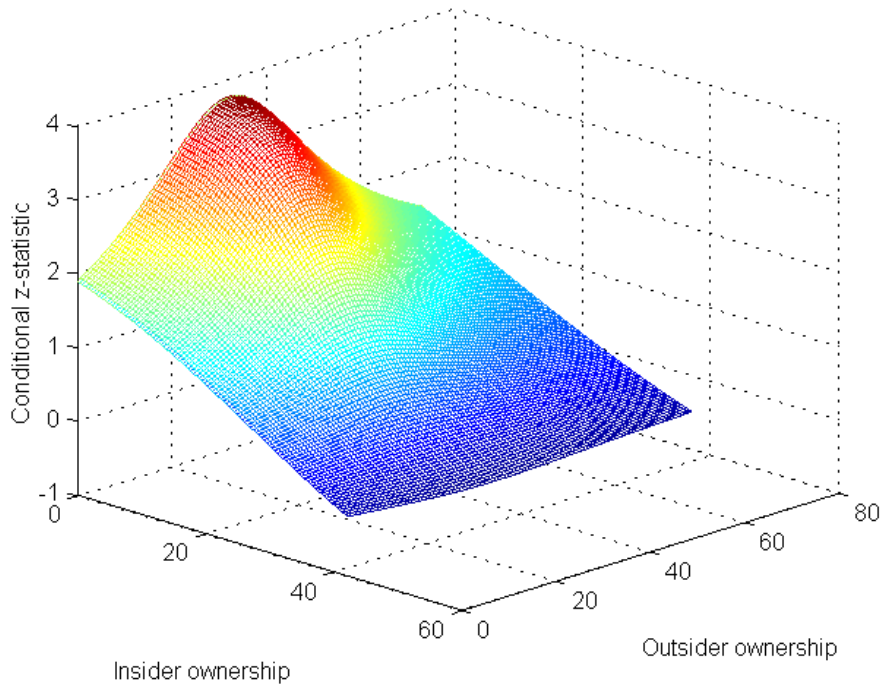


Figure 8. Significance of CEO monetary compensation-sensitivity with respect to the stock price-based corporate performance for various levels of ownership concentration.



Note: Values of the magnitude exceeding 1.96 are significant at 5% level (2-tail test).

Appendix

Table A. Fixed-effect panel regressions explaining CEO industry-adjusted cash compensation for censored sample (CEOs who are not newly appointed).

	Model 9		Model 10		Model 11		Model 12	
Panel A: Model estimates								
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	-0.50476	0.164	-0.49190	0.175	-0.45687	0.206	-0.54495	0.134
Performance indicators								
Industry-adjusted ROA in year *t*-1	-0.00006	0.923	-0.00033	0.653	0.00119	0.307	0.00085	0.390
Abnormal stock returns in year *t*-1	0.00079	0.006	0.00089	0.005	0.00099	0.007	0.00096	0.005
Board composition								
Board size	0.01739	0.789	0.01799	0.782	-0.00457	0.944	0.00631	0.923
Fraction of outside directors	0.00133	0.270	0.00146	0.230	0.00160	0.187	0.00123	0.309
CEO is the board chairman	-0.00781	0.805	-0.01275	0.688	-0.01118	0.724	-0.00601	0.850
Remuneration committee presence	-0.02152	0.440	-0.02386	0.395	-0.01463	0.601	-0.02225	0.427
Firm size, leverage, and risk								
Firm size	0.04618	0.085	0.04559	0.089	0.04585	0.086	0.04918	0.069
Capital gearing	-0.00017	0.780	-0.00012	0.842	-0.00028	0.653	-0.00018	0.770
Risk	-0.00215	0.241	-0.00216	0.241	-0.00149	0.420	-0.00114	0.552
Ownership concentration								
Herfindahl-5 concentration index			-0.62276	0.027				
Accounting perform. * Herfindahl-5 index			0.00785	0.528				
Stock Price perform. * Herfindahl-5 index			-0.00229	0.453				
Insiders' blockholdings					-0.00440	0.017		
Accounting perform. * insider stakes					0.00002	0.764		
Stock Price perform. * insider stakes					-0.00001	0.427		
Outside block holdings					-0.00080	0.381		
Accounting perform. * outsider stakes					-0.00008	0.049		
Stock Price perform. * outsider stakes					-0.00002	0.215		
Ownership dynamics								
Increase in insiders' blockholdings							-0.00095	0.724
Accounting perform. * increase insider stakes							-0.00006	0.676
Stock Price perform. * increase insider stakes							-0.00006	0.453
Increase in outsiders' blockholdings							-0.00003	0.970
Accounting perform.* increase outsider stakes							-0.00006	0.180
Stock Price perform.* increase outsider stakes							-0.00002	0.352
Other control variables								
Year dummies	Yes		Yes		Yes		Yes	

Table continues on next page.

Table A - continued.

	Model 9	Model 10	Model 11	Model 12
Panel B: Model statistics and tests				
σ_α	0.532	0.523	0.507	0.532
σ_e	0.199	0.199	0.198	0.199
ρ	0.878	0.874	0.868	0.877
F-test for all $\alpha_i = 0$	F(213,539) = 11.91	F(213,533) = 11.82	F(213,530) = 11.61	F(213,533) = 11.66
P-value for F	< 0.001	< 0.001	< 0.001	< 0.001
Corr(α_i, *Xb*)	0.467	0.435	0.445	0.477
Model F-test	F(13,539) = 5.13	F(16,533) = 6.47	F(19,530) = 4.31	F(19,533) = 3.71
P-value for F	< 0.001	< 0.001	< 0.001	< 0.001
R^2 - within	0.110	0.119	0.139	0.117
R^2 - between	0.425	0.414	0.457	0.413
R^2 - overall	0.343	0.340	0.378	0.353
No. of groups	214	214	214	214
No. of observations	766	763	763	766

Note to Table A: The table presents the estimates of the fixed-effect panel data model for CEO industry-adjusted compensation for a censored sample (i.e. for CEOs who were keeping their job for at least one year). The dependent variable is an industry-adjusted CEO cash compensation in a given year. As far as regressors are concerned, industry-adjusted ROA is defined as industry-year median adjusted return on equity (in percentage terms). Abnormal stock return is lagged by one year as well. Board size is defined as a natural logarithm of the total number of directors. The fraction of outside directors is expressed as a percentage of outsiders on the board. 'CEO is board chairman' is a dummy variable that equals one for CEOs serving at the same time as chairman of the board. The remuneration committee presence is a dummy variable that equals one for firm-years, when remuneration committee was in place. Firm size is proxied by the natural logarithm of the total book value of assets. Capital gearing is expressed in percentage terms. Company risk is measured as an annual volatility of stock returns. Herfindahl-5 concentration index is based on stakes of the five largest shareholders. The blockholding measures represent cumulative total percentage stakes held by insiders (CEO, executive directors, non-executive directors) and outsiders (financial institutions, families and individuals, and corporations). The variables describing ownership dynamics correspond to increases (in percentage points) of cumulative stakes held by insiders (CEOs, executives, non-executives) and outsiders (financial institutions, families and individuals, and corporations).

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