CEO Turnover and Relative Performance Evaluation*

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Abstract

This paper examines whether CEOs are fired after bad firm performance caused by factors beyond their control. Standard economic theory predicts that corporate boards filter out exogenous industry and market shocks from firm performance before deciding on CEO retention. Using a new hand-collected sample of 1,627 CEO turnovers from 1993 to 2001, we document that CEOs are significantly more likely to be dismissed from their jobs after bad industry or bad market performance. A decline in the industry component of firm performance from its 75th to its 25th percentile increases the probability of a forced CEO turnover by approximately 50 percent. This result is at odds with the prior empirical literature, which showed that corporate boards filter exogenous shocks from CEO dismissal decisions in samples from the 1970s and 1980s. Our findings suggest that the standard CEO turnover model is too simple to capture the empirical relation between performance and forced CEO turnovers, and we evaluate several extensions to the standard model.

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Whether to retain or fire an incumbent CEO after bad stock price or accounting performance is one of the most important decisions made by corporate boards. Standard economic theory suggests that, in assessing the quality of its CEO, the board of directors should ignore components of firm performance that are caused by factors beyond the CEO's control. Previous studies that have examined the relation between (arguably exogenous) market or industry performance and CEO turnover have found evidence largely consistent with this hypothesis. Using a larger data set of CEO dismissals over a more recent time period and an improved methodology, we find to the contrary that CEOs are significantly more likely to be fired after negative performance shocks to their peer group.

In a newly assembled data set of 1,244 voluntary and 383 forced CEO turnovers in 2,548 firms from 1993 to 2001, we document that low industry stock returns and low market returns significantly increase the frequency of forced CEO turnovers. A decline in the industry component of firm performance from its 75th to its 25th percentile increases the probability of a forced CEO turnover by approximately 50 percent. There is some evidence that boards partially filter industry and market performance from their assessments of CEO quality, but the extent of the filtering is too limited to remove most of the peer performance effect. We conclude that boards fail to fully filter exogenous shocks to firm performance from their CEO retention decisions.

We document more effective filtering of more visible indicators of outside performance, such as the performance of the value-weighted market, suggesting that boards may use some rule-of-thumb relative performance evaluation when assessing CEO quality. We also find that industry and market performance have only weak effects on outperforming CEOs, but strongly affect the likelihood of dismissal for underperforming CEOs. A decline in peer group performance substantially raises the likelihood of being fired for an underperforming CEO, while CEOs who outperform their peer group are little affected by worsening industry or market performance. These results can be consistent with models in which CEOs are fired efficiently, but also with models in which too few CEOs are dismissed in good times, or too many in bad times.

Standard agency theory shows that there are benefits associated with evaluating agents on the basis of their relative performance whenever agents' performances are affected by common shocks (Holmström (1979, 1982), Diamond and Verrechia (1982)). Most of the theoretical literature on CEO dismissals envisions a situation in which the corporate board learns from firm performance and other signals about the quality of its CEO. If the board's assessment of CEO quality falls below some threshold, often equal to the expected quality of a replacement manager, then the board dismisses the CEO.[1] Since neither CEO nor match quality change as a function of the business cycle in these models, it follows that efficient boards do not force out more CEOs in down markets than in up markets. More generally, boards should filter all observable exogenous shocks from firm performance before updating their assessment of CEO quality. This prediction is strongly rejected by the empirical results we find, and we conclude that the simple framework used in much of the literature does not fully explain real-world CEO dismissal decisions.

We evaluate several extensions and modifications to the basic CEO turnover model that might explain our empirical results. There is a large literature aimed at understanding the well-documented absence of relative performance evaluation in CEO compensation.[2] Most of the explanations offered by this literature do not apply in the CEO turnover context.[3] We propose instead that the correlation between forced CEO turnover and peer group performance could be caused (i) by CEOs' actions affecting industry performance through strategic interactions in oligopolistic industries, (ii) by CEOs being dismissed for moving their firms into the wrong industries, (iii) by performance in recessions providing better information about CEO quality, (iv) by CEO skill requirements changing in recessions, (v) by shareholders incorrectly blaming the CEO for performance shocks beyond her control, and (vi) by shareholders whose limited attention is triggered by low levels of performance.

We analyze the relation between peer group performance and forced CEO turnover in detail to assess which of these six hypotheses are most likely to explain the empirical results. While our

[1] See, for example, Hirshleifer and Thakor (1994, 1998), Hermalin and Weisbach (1998, 2003), Warther (1998), Goldman, Hazarika, and Shivdasani (2003), and Adams and Ferreira (2005).
[2] For the empirical evidence see, among others, Murphy (1985), Coughlan and Schmidt (1985), Antle and Smith (1986), Gibbons and Murphy (1990), Janakiraman, Lambert, and Larker (1992), Garen (1994), Aggarwal and Samwick (1999a,b), Murphy (1999), and the review in Bebchuk, Fried, and Walker (2001).
[3] See the discussion in Section I.C.

tests are far from conclusive, none of the hypotheses find strong support in the data. We first show that the effect of industry performance on CEO turnover persists as we broaden the industry definition and as we restrict the sample to small firms. Since large industries are unlikely to be oligopolistic, and since small firms are unlikely to affect the product market equilibrium in their industries, these results speak against the hypothesis that our findings are driven by CEOs interacting in oligopolistic settings. We next show that the effect of industry performance on CEO turnovers persists when we benchmark firm performance against industry competitors from several years ago, which speaks against the idea that our findings are due to CEOs being punished for moving their firms into the wrong industries.

The two hypotheses that (a) performance in recessions is more informative about CEO skill than performance in booms and that (b) CEO skill requirements change as an industry enters a recession are closely related and yield similar predictions. If recessions reveal which CEOs have generally low skills or the wrong skill set to handle the downturn, then boards will be quicker to dismiss underperforming (but not outperforming) CEOs in recessions than in booms. This prediction is strongly confirmed by the data. We also test the closely related prediction that firm-specific performance should affect CEO turnover more strongly in recessions than in booms and find mostly confirmatory evidence, even though the result does not obtain in all specifications. On the other hand, we find no evidence that the effect of peer performance on CEO turnover is smaller for CEOs with longer tenure. This finding is surprising if we believe that recessions reveal deficiencies in CEO skills to boards. CEOs with long tenure should have already proven their skills in both good and bad times, and hence we expected the effects of recessions on CEO turnover to be larger for new CEOs, contrary to what we find in the data. We also find no evidence that CEO compensation reacts more strongly to performance in recessions than in booms, which is similarly inconsistent with the idea that performance in recessions is more informative about the CEO than performance in booms.

We next examine the hypothesis that boards mistakenly blame CEOs for exogenous performance shocks. The result that underperforming CEOs are more frequently dismissed in recessions than in booms, while outperforming CEOs are unaffected by peer performance, is consistent with this idea: Even with systematic attribution errors, outperforming CEOs should only rarely be

dismissed; they can always point out to their board that competitors are performing worse and induce the board to use relative performance evaluation. Underperforming CEOs, on the other hand, are less able to mount a strong defense against incorrect performance attribution in recessions, but will be happy to hide behind good industry and market performance in booms. This asymmetry between out- and underperformers is exactly what we find in the data. Following similar logic, more powerful CEOs may be better able to defend themselves against "unfair" dismissals in bad times, weakening the effect of peer performance on forced turnovers. Alternatively, more powerful CEOs may be better able to hide behind peer performance in good times, strengthening the effect of peer performance on turnovers. We therefore test whether CEOs who are founders, CEOs with large equity stakes, CEOs with less independent boards, and CEOs with more excess compensation are differently affected by peer group performance than other CEOs. We find no consistent effects of CEO power on firms' propensity to use relative performance evaluation in their CEO turnover decisions.

Finally, we directly test the hypothesis that our results are caused by shareholders or board members whose limited attention is triggered by bad performance. Limited attention may be a behavioral phenomenon or the result of an agency problem. In either case, efficient filtering of peer performance from CEO evaluations should obtain after sufficiently bad performance has caused investors and boards to wake up. We therefore expect the relative performance evaluation hypothesis to be confirmed for firms with sufficiently low levels of prior performance. Instead, the effect of peer group performance on CEO turnover persists even subsequent to very low returns. Furthermore, relative performance evaluation is also rejected for large and high-profile firms, which are likely to be continuously monitored by the press and professional investors. We conclude that limited investor attention is unlikely to explain the empirical failure of the relative performance evaluation hypothesis.

While far from conclusive, the results of our tests do not provide convincing support for any of the proposed explanations for the industry and market performance effect on CEO turnover. Given the obvious difficulties of measuring many of the variables of interest, and the wide standard error bounds in some of our tests, we cannot rule out that some of the examined ideas may nevertheless play an important role in explaining our results. In particular, our tests provide

mixed evidence on the idea that boards mistakenly credit or blame CEOs for performance beyond their control. The result that underperforming CEOs are more frequently dismissed in recessions than in booms, while outperforming CEOs are unaffected by peer performance, is consistent with this idea. On the other hand, it seems surprising that there would be no significant differences in the effects of board mistakes on more or less powerful CEOs.

An interesting finding suggestive of a bounded-rationality explanation is that boards do a better job filtering the performance of the value-weighted market and of the largest firms in their industry from firm performance before deciding on CEO retention. This suggests that boards may use intuitive rule-of-thumb benchmarking against the most salient benchmarks, while failing to properly account for other exogenous performance components. For further evidence on whether the observed turnover patterns are optimal or the symptom of a behavioral inefficiency, we examine the stock price reactions to CEO turnover announcements in our sample. We find no evidence of different stock price reactions in recessions compared to booms, and conclude that the market does not view the more frequent CEO dismissals in recessions as better or worse news than the less frequent dismissals in booms.

Independently of the underlying mechanism, the documented effects of industry and market performance on CEO turnover have interesting implications for our understanding of CEO incentives and horizons. Our findings are also important for the correct design of CEO turnover studies. The prior literature customarily assumes that CEOs are evaluated based on relative performance, and thus regresses turnover on market- or industry-adjusted stock returns only. Given our evidence that CEO dismissals are in fact determined jointly by firm-specific, industry, and market performance, the regressions using only peer-adjusted performance suffer from an omitted variable bias. To avoid this problem, future studies should include both firm-specific and peer group performance as explanatory variables.[4]

Our empirical results contrast with the small prior literature on the relationship between peer group performance and CEO turnover. Warner, Watts, and Wruck (1988) examine CEO turnover

[4] A further frequent cause of misspecification is the assumption that firm performance moves one-to-one with peer performance. Prior studies simply subtract index performance from firm performance, effectively imposing a beta of one on all firms. This assumption is often incorrect, as the sample betas in Tables 2, 6, and 9 demonstrate.

from 1963 to 1978 and find that stock returns relative to the overall market are a better predictor of CEO dismissals than absolute performance. The results involving lagged returns are ambiguous, and they find no evidence that industry shocks are filtered from the CEO dismissal decision. Morck, Shleifer, and Vishny (1989) examine turnovers of entire top management teams between 1980 and 1985 and find such turnovers equally likely to occur in troubled and in healthy industries, suggesting that industry shocks are filtered from the dismissal decision. Barro and Barro (1990) find evidence similarly consistent with complete filtering of peer performance in a sample of CEO turnovers in commercial banks from 1982 to 1987. All three studies are based on small samples, with 43 forced CEO turnovers in Warner et al., 93 cases of internally precipitated turnover in Morck et al., and 51 bank CEO turnovers in Barro and Barro. Gibbons and Murphy (1990), on the other hand, examine a large sample of 1,000 CEO successions over the 1974 to 1986 period and find evidence that both market and industry shocks are filtered from stock price performance for the CEO dismissal decision. In summary, most of the evidence from previous studies supports the hypothesis that corporate boards filter industry and market shocks from firm performance before deciding whether to fire their CEOs.[5]

In contemporaneous work, Kaplan and Minton (2006) analyze both internal (board driven) and external (through takeovers and bankruptcy) CEO turnover in Fortune 500 firms from 1992 to 2005. Consistent with our results, they find internal CEO turnover to be significantly related to firm-specific performance, industry performance, and the performance of the overall market. Interestingly, they also show that external turnover is not significantly related to any of the three performance components. Kaplan and Minton further document that the frequency of CEO turnover has increased over time, and that the sensitivity of internal CEO turnover to all three components of stock price performance is higher in the second half of their sample.

The next section reviews the theory behind relative performance evaluation in the CEO turnover context and derives the central testable hypothesis. Section I.B develops the empirical specification. Section I.C discusses a number of reasons why relative performance evaluation

[5] Warner et al. (1988), Morck et al. (1989), and Gibbons and Murphy (1990) do not formally test whether market or industry returns are completely filtered from firm performance for the management dismissal decisions. Barro and Barro (1990) do perform a formal test and find results consistent with complete filtering, with the caveat that their test imposes the assumption that firms have a stock return beta of one with respect to the benchmark return.

may not obtain in the CEO turnover context. Section II describes the construction of the CEO turnover sample, and Section III presents the main results on the effect of peer group performance on forced CEO turnover. Section IV examines the relationship between CEO dismissals and peer performance in more detail in an attempt to distinguish between different explanations for the observed pattern. The final section summarizes and concludes.

I. Theoretical background and hypotheses development

This section starts with an informal review of relative performance evaluation in the CEO turnover context. We use a simple model in which the board learns from firm performance about CEO ability to derive the prediction that CEO dismissals should be unrelated to industry and market performance. Section I.B restates this testable hypothesis in an instrumental variables (IV) framework in which market and industry performance act as instruments for firm performance. This reformulation forms the basis of the subsequent empirical analysis. Stating the relative performance evaluation hypothesis in an IV framework helps to illustrate the circumstances under which the hypothesis is likely to fail empirically. On this basis, Section I.C discusses several reasons why relative performance evaluation may not be observed in the CEO turnover context.

A. Relative performance evaluation and CEO turnover

The simple CEO turnover model sketched in this section is not meant to be an accurate description of the realities of CEO retention decisions, but illustrates the logic behind relative performance evaluation and delivers the central empirical prediction. Deviations from the simplifying assumptions of the model may render (complete) relative performance evaluation inefficient, as we discuss in Section I.C below. The derivation in this section relies heavily on Holmström (1982) and Gibbons and Murphy (1990).

Formally, let CEO *i*'s ability be given by α_i and the performance of firm *i* by y_i:

(1) $$y_i = \alpha_i + \varepsilon_i + \eta$$

Here ε_i is an idiosyncratic noise term affecting firm *i* only, and η is an unobserved shock common to all firms, of which there are *n* in the reference group. The board cannot observe CEO

ability and tries to learn it from observed firm performance. The board believes that α_i is normally distributed with mean zero and variance σ_α^2. Suppose further that ε_i and η are similarly normally distributed with mean zero and variances σ_ε^2 and σ_η^2, respectively. The common shock and the *n* CEOs' individual abilities and idiosyncratic shocks are mutually independent.

The board of directors of firm *i* observes the performance of firm *i* and the performances of the *n-1* other firms in the peer group. Given the distributional assumptions made, the board uses the standard formula for the conditional expectation of a multivariate normal variable to calculate the optimal estimate of CEO ability:

$$(2) \qquad E[\alpha_i \mid y_1,...,y_n] = \frac{\sigma_\alpha^2\left(\sigma_\alpha^2+\sigma_\varepsilon^2+(n-1)\sigma_\eta^2\right)}{\left(\sigma_\alpha^2+\sigma_\varepsilon^2\right)\left(\sigma_\alpha^2+\sigma_\varepsilon^2+n\sigma_\eta^2\right)}\left(y_i - \frac{\sigma_\eta^2}{\left(\sigma_\alpha^2+\sigma_\varepsilon^2+(n-1)\sigma_\eta^2\right)}\sum_{j\neq i}^{n-1} y_j\right)$$

The estimate of CEO *i*'s ability is positively related to the performance of her own firm, and negatively to the average performance of the firms in the reference group. The crucial insight is that the optimal estimate of CEO ability in (2) completely purges the (noisily estimated) common shock from firm performance. To see this, note that the term in parentheses is the residual from a population regression of firm *i*'s performance on the performance of all other firms in the peer group:

$$(3) \qquad \begin{aligned} y_i &= \beta_0 + \left(\sum_{j\neq i}^{n} \beta_j \cdot y_j\right) + \tilde{v}_i \\ &= \left(\frac{\sigma_\eta^2}{\left(\sigma_\alpha^2+\sigma_\varepsilon^2+(n-1)\sigma_\eta^2\right)}\sum_{j\neq i}^{n-1} y_j\right) + \tilde{v}_i \end{aligned}$$

The performance residual $\tilde{v}_i$ in (3) is the purely firm-specific component of firm *i*'s total performance. Combining (2) and (3), the optimal estimate of CEO *i*'s ability can be written as a function of this idiosyncratic performance component only:

$$(4) \qquad E[\alpha_i \mid y_1,...,y_n] = k \cdot \left(y_i - \frac{\sigma_\eta^2}{\left(\sigma_\alpha^2+\sigma_\varepsilon^2+(n-1)\sigma_\eta^2\right)}\sum_{j\neq i}^{n-1} y_j\right) = k \cdot \tilde{v}_i$$

Here *k* is a constant given by the first term in (2) above. It follows directly that the optimal estimate of CEO *i*'s ability is uncorrelated with the average performance of the reference group.

Said differently, the performance of the peer group has no predictive power for the ex-post assessment of CEO *i*'s ability. Good peer group performance does not make it any more or less likely that any individual CEO is assessed as having high or low ability than does bad peer group performance. Formally,

$$(5) \qquad Cov\left(E[\alpha_i \mid y_1,...,y_n], \frac{1}{n-1}\sum_{j\neq i}^{n-1} y_j \right) = \frac{k}{n-1} Cov\left(\tilde{v}_i, \sum_{j\neq i}^{n-1} y_j \right) = 0.$$

In standard models of CEO turnover, CEOs are dismissed when the board's estimate of CEO ability falls below some threshold $\underline{\alpha}$, usually determined by the expected ability of a replacement CEO.[6] Because the board completely filters the common shock from its assessment of CEO ability, it follows from (5) and the distributional assumptions made that the incidence of forced CEO turnover is uncorrelated with peer group performance:

$$(6) \qquad Cov\left(I[E[\alpha_i \mid y_1,...,y_n] < \underline{\alpha}], \frac{1}{n-1}\sum_{j\neq i}^{n-1} y_j \right) = \frac{1}{n-1} Cov\left(I[k \cdot \tilde{v}_i < \underline{\alpha}], \sum_{j\neq i}^{n-1} y_j \right) = 0.$$

Here I[.] is an indicator function that takes a value of one if the board's estimate of CEO ability falls below the threshold level $\underline{\alpha}$. Equation (6) states that forced CEO turnover is uncorrelated with the performance of the reference group, and is the central testable implication of the simple model of relative performance evaluation presented here. Assessing CEO competence in this framework is a standard signal extraction problem, and imperfect performance filtering would imply inefficient inferences about CEO ability, and ultimately inefficient CEO dismissal decisions.

B. The empirical strategy

The main implication of the performance evaluation model above is that CEOs should be evaluated based on the firm-specific component of firm performance only. Whether the reference group is booming or in a recession contains no information about CEO quality and has no predictive power for the likelihood of forced CEO turnovers. The prediction that peer group performance is *completely* filtered from the evaluation of the CEO has been termed the *strong-*

[6] The ability threshold below which the current CEO is dismissed has to be adjusted for any costs of firing the CEO and for any costs of finding a suitable replacement.

form relative performance evaluation hypothesis in the prior literature.[7] Our empirical strategy to test for strong-form relative performance evaluation in CEO turnovers borrows heavily from Bertrand and Mullainathan (2001), Wolfers (2002), and Garvey and Milbourn (2004).

We estimate the sensitivity of CEO turnover to peer performance using a two-stage regression approach: The first stage regression decomposes firm performance into a systematic component caused by peer group performance and a firm-specific component that should, in part, reflect CEO ability. In the second stage, we predict the probability of a forced CEO turnover using the peer group component and the residual component of firm performance estimated in the first stage.[8] This two-stage procedure is effectively an instrumental variables estimation, with peer group performance serving as instrument for firm performance:

$$(7)\quad \text{(i) } r_{i,t-1} = \beta_0 + \beta_1 \cdot r_{peer\ group,t-1} + \nu_{i,t-1}$$

$$\text{(ii) Probability(CEO dismissal}_{i,t}) = \gamma_0 + \gamma_1 \cdot \left(\hat{\beta}_0 + \hat{\beta}_1 \cdot r_{peer\ group,t-1}\right) + \gamma_2 \cdot \hat{\nu}_{i,t-1} + \varsigma_{i,t}$$

$$= \gamma_0 + \gamma_1 \cdot \hat{r}_{i,t-1} + \gamma_2 \cdot \hat{\nu}_{i,t-1} + \varsigma_{i,t}$$

Here $\hat{r}_{i,t-1}$ is the estimated exogenous component of firm performance common to the peer group and not attributable to CEO actions or skill, and $\hat{\nu}_{i,t-1}$ is the estimated firm-specific performance component. The prediction of strong-form relative performance evaluation is that the exogenous performance component does not affect CEO turnover, and hence $\gamma_1 = 0$. The interpretation of the γ_2 coefficient on firm-specific performance is more subtle since the residual variation in firm performance reflects in part CEO skill and in part unobserved shocks not related to peer performance. Given that firm-specific performance is partly driven by CEO skill, we expect that firm-specific performance is negatively related to the likelihood of CEO dismissal ($\gamma_2 < 0$).

[7] See, for example, Janakiraman et al. (1992) and Albuquerque (2005). We discuss the corresponding *weak-form* relative performance evaluation hypothesis below.

[8] Many variables other than firm and peer group performance affect the probability of a forced CEO turnover. As long as none of these other determinants are correlated with peer group performance, their omission should not affect our test of relative performance evaluation.

An important choice in the empirical design is whether to allow the sensitivity of firm performance to peer performance to differ across firms. Estimating firm-specific betas introduces estimation error into the peer performance term in the second stage regression, with two possible consequences: If the estimation error is simply noise, then the coefficient on peer performance in the CEO turnover regression is biased towards zero, making us more likely to accept the relative performance evaluation hypothesis. If, on the other hand, the estimation error introduces elements of firm-specific performance into the estimated peer performance term for some firms, then we may erroneously reject the relative performance evaluation hypothesis. To avoid these problems, and to be consistent with the related literature, we estimate a common peer performance beta for all firms in the first stage regression. As a robustness check, we repeat the estimations with industry- and with firm-specific betas and obtain similar results.

The instrumental variables interpretation clarifies the conditions under which we expect the predictions of strong-form relative performance evaluation to obtain in the data. The tests treat peer group performance as a plausibly exogenous instrument for the "luck" that has aided or hampered the CEO's running of the firm. For peer group performance to be a valid instrument, it is necessary that (i) the instrument is exogenous and (ii) the instrument does not have a direct effect on CEO dismissals independent from firm performance. Violations of these two assumptions correspond directly to the arguments against relative performance evaluation in CEO turnover that we discuss in the next section. Briefly, the exogeneity assumption could be violated because CEO skill or actions affect peer group performance, as may be the case in oligopolistic settings. The second assumption could be violated if times of high (or low) peer group performance are times in which boards receive more (or less) informative signals about their CEOs. For example, an industry downturn may test certain aspects of CEO skill which are otherwise unobservable to the board.

The two-stage regression approach in (7) is not used by the prior literature, which does not test for *strong-form* relative performance evaluation in CEO turnover. Previous studies instead test the so-called *weak-form* implication of the theory: The likelihood of CEO dismissals should be negatively related to firm performance, and positively to the performance of the reference group. Unlike strong-form relative performance evaluation, this weak-form hypothesis does not predict

complete filtering of peer-group performance, and instead predicts only that *some* performance filtering is used by corporate boards. Following, among others, Gibbons and Murphy (1990) and Barro and Barro (1990), we test for weak-form relative performance evaluation using the following single-stage regression model:

(8) Probability(CEO dismissal$_{i,t}$) = $\gamma'_0 + \gamma'_1 \cdot r_{peer\ group,t-1} + \gamma'_2 \cdot r_{i,t-1} + \vartheta_{i,t}$

Weak-form relative performance evaluation predicts that CEO dismissals are negatively related to firm performance ($\gamma'_2 < 0$), holding peer performance constant, and positively related to peer performance ($\gamma'_1 > 0$), holding firm performance constant. Including both firm and peer performance in the same single-stage regression produces coefficients which are hard to interpret. The estimated γ'_1 coefficient on peer performance is the product of the sensitivity of firm performance to peer performance from the first stage regression 7(i) and the difference between the peer and the firm-specific performance coefficients from the second stage regression 7(ii): $\gamma'_1 = \beta_1 \cdot (\gamma_1 - \gamma_2)$. Hence the estimated coefficient can be small either because firm performance is not sensitive to peer performance, or because boards do not distinguish between peer performance and firm-specific performance when evaluating CEOs. The two-stage IV procedure circumvents this problem by separating firm-specific from peer performance and by rescaling the effect of peer performance on firm performance.[9]

C. Reasons for the absence of full relative performance evaluation in CEO dismissals

The previous sections have made the case for relative performance evaluation in CEO retention decisions. In this section we discuss several reasons why peer group performance may not be, or at least not be fully, filtered from firm performance when boards decide whether to dismiss their CEOs. We review six hypotheses which posit that the simple agency model used to develop the relative performance evaluation predictions is not descriptively valid for CEOs, and which

[9] Some papers in the CEO compensation literature incorrectly test for strong-form relative performance evaluation by testing the restriction that γ'_1 and γ'_2 are of opposite sign and equal magnitude $(\gamma'_1 + \gamma'_2 = 0)$ in equation (8). The correct test instead requires testing the non-linear constraint $\gamma'_1 / \gamma'_2 = -\beta_1$, where β_1 is the sensitivity of firm performance to peer performance from equation 7(i). See Janakiraman et al. (1992) for a paper implementing the correct test in the CEO compensation context.

instead predict that peer performance should affect the likelihood of forced CEO turnovers. The first four hypotheses interpret a peer performance effect on CEO dismissals as an efficient contracting outcome, while the last two hypotheses interpret it as a behavioral inefficiency.[10]

Hypothesis 1: CEOs in oligopolistic industries interact strategically

Linking CEO retention decisions to rival firm performance may serve shareholders by softening competition in oligopolistic industries. Aggarwal and Samwick (1999a) show, in an environment with strategic interactions between imperfectly competitive firms, that the optimal compensation contract may put positive weight on both own-firm and rival-firm performance, in contrast to the standard relative performance evaluation prediction. In the CEO turnover context, boards may dismiss CEOs for low industry performance if such performance is caused by CEO actions, for example because the CEO started a price war with competitors. We evaluate this hypothesis empirically in Section IV.A by testing whether the effect of industry performance on CEO turnover vanishes as the industry definition broadens (as broader industries are less likely to be oligopolistic) and whether the effect is weaker for small firms (which are less likely to affect the product market equilibrium in their industry).

Hypothesis 2: CEOs are fired for choosing the wrong industry

Optimal CEO evaluations may not filter peer performance out because CEOs have at least some control over the peer group among which their firm operates. Dye (1992) argues that relative performance evaluation motivates executives to invest in industries where they can outperform their competitors, rather than in industries that offer the highest absolute returns. The problem described by Dye can be solved by selecting the peer group benchmark for each CEO *before* any industry relocation choices are made. Practically speaking, firms should be benchmarked against their direct competitors from several years ago. Such a benchmark provides the CEO with efficient incentives: Moving her firm into the industry with the highest expected returns allows

[10] The executive compensation literature provides a number of explanations for the absence of relative performance evaluation in CEO pay above and beyond the ones discussed in this section. Examples are marginal products of CEO labor which rise and fall with industry fortunes (Barro and Barro (1990), Himmelberg and Hubbard (2000), and Oyer (2004)), the futility of indexing compensation when CEOs can trade the index (Core and Guay (2001), Jin (2002), Jenter (2002), and Garvey and Milbourn (2003)), and the favorable accounting treatment of non-indexed options compared to indexed options (Core, Guay, and Larcker (2003) and Hall and Murphy (2003)). None of these explanations seem applicable to the CEO turnover context.

her to outperform the competitors from her prior industry. We incorporate the Dye hypothesis into our empirical tests in Section IV.B by lagging industry affiliation by five years.

Hypothesis 3: Performance in recessions reveals more about CEO quality than performance in booms

Industry or market-wide recessions may allow boards to learn more about the quality of their CEO than booms, for example because recessions test aspects of CEO skill which are otherwise difficult to observe. On the simplest level, a recession tests whether a CEO has anticipated and properly prepared for the downturn, and such preparation is likely an important part of CEO performance. This hypothesis does not argue against relative performance evaluation, but simply posits that relative performance evaluation yields more informative signals in recessions.

Four testable predictions follow from this hypothesis. The first implication is that any increased probability of CEO dismissals in recessions should be concentrated on underperforming CEOs. Underperformance in bad times sends an especially strong signal about CEO quality and should lead to forced turnovers. The second and closely related implication is that CEO turnover should be more sensitive to firm-specific performance in recessions than in booms. Further, if recessions reveal deficiencies in CEO skills to boards, then the effects of recessions on CEO turnover should be largest for new CEOs. Long tenured CEOs, on the other hand, should have already proven their skills in both good and bad times. Finally, if performance in recessions is indeed more informative about CEOs, then CEO *pay* should also be more sensitive to performance during bad times. We test all four predictions in Section IV.C.

Hypothesis 4: Different CEO skills are required in recessions than in booms

Boards may replace more CEOs in industry or market-wide recessions because lean times may require specific skills that not all CEOs possess. For example, the ability to cut costs and streamline operations is likely to be especially valuable in recessions and may not be shared by all CEOs. The hypothesis is closely related to Hypothesis 3 above, and the empirical predictions are similar: The effect of peer performance on CEO turnover should be concentrated on underperforming CEOs, CEO turnover should be more sensitive to firm-specific performance in recessions than in booms, and the effect of peer performance on CEO turnover should be largest

for new CEOs who have not yet proven their ability to handle recessions. Because of their similar empirical predictions, Hypothesis 3 and 4 are tested together in Section IV.C.

Hypotheses 1 to 4 show that an effect of peer group performance on CEO dismissals may be the result of efficient and rational decision making by corporate boards. The next two hypotheses are more behavioral in nature and explain peer performance effects on CEO turnover based on either systematic attribution errors or limited investor attention.

Hypothesis 5: Corporate boards commit systematic attribution errors

Corporate boards and shareholders may make systematic mistakes in attributing performance and blame or credit CEOs for performance caused by factors beyond their control.[11] Social psychologists and economists studying attribution have found that subjects tend to take insufficient account of background and environmental factors, and as a result blame and credit individuals too much for observed outcomes.[12] Boards may therefore dismiss their CEOs following bad performance even if the bad performance is caused by industry or market shocks. The effect of attribution errors on forced CEO turnovers is unlikely to affect all CEOs symmetrically. During recessions, CEOs who outperform their peer group are likely to bring that fact to the board's attention and to argue successfully against being punished for bad performance caused by outside factors. Underperforming CEOs, on the other hand, are less able to defend themselves against attribution errors in recessions, but are happy to hide behind high industry performance in booms. It follows that peer performance should have only weak effects on outperforming CEOs, but should strongly affect the likelihood of dismissal for underperforming CEOs. This prediction is shared with Hypotheses 3 and 4 and is tested in Section IV.C. Following similar logic, more powerful CEOs may be better able to defend themselves against "unfair" dismissals, and may thus be less affected by peer group

[11] Bertrand and Mullainathan (2001) propose the same argument in the CEO compensation context. Fisman, Khurana, and Rhodes-Kropf (2005) propose a model in which shareholders misattribute firm-specific instead of peer performance to the CEO rather than circumstance.

[12] Systematic attribution errors have been documented in several contexts. Shea (1998) finds that the salaries of Major League baseball hitters (pitchers) are higher (lower) in more hitter-friendly home ballparks. Durell (2001) provides experimental evidence that employers underweight task difficulty when assessing the productivity of employees. Weber, Rottenstreich, Camerer, and Knez (2001) find that experimental subjects tend to underweight group size when assessing the ability of group leaders to inspire coordination outcomes. Wolfers (2002) shows that U.S. voters irrationally reward state governors for economic fluctuations that are unrelated to gubernatorial actions.

performance. Alternatively, more powerful CEOs may be better able to hide behind peer group performance in good times, and may thus see their dismissal probability decline more in booms. We therefore test in Section IV.D whether CEOs who are founders, CEOs with higher equity stakes, CEOs with less independent boards, and CEOs with more excess compensation are more or less affected by peer group performance than other CEOs.

Hypothesis 6: Shareholder attention is triggered by bad performance

Shareholders may not be able to monitor all firms in their portfolios simultaneously, and may instead selectively direct their scrutiny to firms which have triggered their attention. Similarly, outside board members may exert little effort on monitoring unless events at the firm force their attention. Bertrand and Mullainathan (2001) propose that stock and accounting returns are easily observable and likely to function as attention triggers for otherwise passive investors. Once investors pay attention to a firm, we expect underperforming CEOs to be removed and outperforming CEOs to be retained. This hypothesis has three testable implications: First, larger and more high-profile firms, which are likely to be continuously monitored by the press and investors, should show a smaller effect of peer performance on CEO turnovers. Second, efficient filtering of peer performance from the CEO dismissal decision should obtain after sufficiently bad performance, because investors have woken up and correctly assess CEO performance. Hence, peer group performance should not affect forced CEO turnovers for firms with sufficiently low levels of prior returns. Finally, and similar to Hypotheses 3, 4, and 5, the effect of firm-specific performance on CEO turnover should be strongest when peer performance is low, and the effect of peer performance on CEO turnover strongest when firm-specific performance is low, as shareholders are more likely to pay attention. We test these implications in Sections IV.C and IV.E.

To summarize, there are both rational and behavioral explanations for an effect of peer group performance on the frequency of forced CEO turnovers. Under the first four hypotheses discussed, a negative correlation between peer group performance and CEO dismissals is an efficient contracting outcome, while under the last two hypotheses it is a symptom of a behavioral inefficiency. We analyze the stock market reaction to turnover announcements for suggestive evidence of which view is closer to the truth in Section IV.F.

II. Data sources, sample construction, and variable definitions

CEO turnover is observed for all firms in the Standard & Poors ExecuComp database for the time period 1993 to 2001. The ExecuComp sample contains information on the top executives of all firms in the S&P 500, S&P MidCap, and S&P SmallCap indexes. We recognize a CEO turnover for each year in which the CEO identified in ExecuComp changes. We then search the Factiva news database for the exact turnover announcement date and classify each CEO turnover according to whether the turnover was forced or voluntary.

The classification of turnovers into forced and voluntary follows Parrino (1997): All departures for which press reports state that the CEO is fired, forced out, or retires or resigns due to policy differences or pressure, are classified as forced. All other departures for CEOs above and including age 60 are classified as voluntary. All departures for CEOs below age 60 are reviewed further and classified as forced if either the article does not report the reason as death, poor health, or the acceptance of another position (including the chairmanship of the board), or the article reports that the CEO is retiring, but does not announce the retirement at least six months before the succession. Finally, the cases classified as forced can be reclassified as voluntary if the press reports convincingly explain the departure as due to previously undisclosed personal or business reasons that are unrelated to the firm's activities. This careful classification scheme is necessary since CEOs are rarely openly fired from their positions. We exclude CEO turnovers caused by mergers and spin-offs from the analysis.

All accounting information comes from the Compustat Industrial Annual files, and all stock price and stock return information from the monthly CRSP tapes. Industry performance benchmarks are calculated as equal-weighted and value-weighted average stock returns for all firms on CRSP from the same industry as the sample firm. Industries are defined using the Fama and French (1997) classification of firms into 48 industries, with all firms in the "Other" industry dropped from the analysis. We exclude each sample firm from the construction of its industry or market benchmark to eliminate any artificial correlation between peer group performance and CEO turnover. The corporate boards evaluating the CEOs in our sample inevitably have access to

more precise measures of peer group performance than the market and industry benchmarks we employ. Using a less informative benchmark than the board in our tests biases us in favor of accepting the relative performance evaluation hypothesis.

III. Empirical results

A. Descriptive statistics

Table 1 presents an overview of the new CEO turnover data set. The final sample has 2,548 firms with 16,865 firm-year observations from 1993 to 2001 and contains 1,627 CEO turnovers. Of these, 1,244 are classified as voluntary and 383 are classified as forced. Panel A reports the frequencies of forced and voluntary CEO turnovers in the data. Panel B shows firm performances and characteristics by CEO retention outcome (CEO is retained, CEO leaves voluntarily, or CEO is dismissed). Firms in which the CEO is dismissed are smaller than firms with voluntary CEO turnover in terms of book assets, market value of equity, annual sales, and number of employees. Part of that difference is likely due to the fact that CEO dismissals are preceded by bad performance and associated declines in firm size. Average stock returns in the 12 months before a forced CEO turnover are -18.15%.

Notably, the average equal-weighted *industry* return is lower before forced (12.90%) than before voluntary turnovers (16.46%) or before CEO retentions (19.24%). Both differences are statistically significant. This suggests that CEO dismissals are most common in industries which have performed badly. Panel C, where we report CEO dismissal frequencies by industry performance quintile, confirms this result. Using equal-weighted industry returns, forced CEO turnovers are almost twice as likely in the lowest industry performance quintile compared to the highest quintile. The same patterns obtain in much weaker form for value-weighted industry returns, but the differences are not statistically significant. The results based on equal-weighted industry returns appear prima facie inconsistent with strong-form relative performance evaluation, which predicts no relation between peer group performance and CEO turnover. On the other hand, the analysis in Table 1 fails to control for systematic differences across CEOs, firms, and industries, which is why we turn to more careful regression analyses next.

B. Testing for strong-form relative performance evaluation in CEO turnover

Strong-form relative performance evaluation predicts that peer group performance is completely filtered from the CEO retention decision. In this section, we estimate the sensitivity of CEO turnover to peer performance using the two-stage approach described in Section I.B, and use industry stock returns as the measure of peer group performance. The first stage regression partitions variation in firm performance into a predictable component caused by industry performance and a residual firm-specific component. The second stage regresses an indicator variable for forced CEO turnovers on the predicted value (the peer performance component) and the residual (the firm-specific performance component) from the first stage regression.

We estimate the second stage CEO turnover regression using the Cox (1972) proportional hazard model. The Cox model flexibly accommodates the fact that each CEO's hazard rate, i.e., (approximately) the probability that a currently employed CEO is dismissed over the next month, is a function of the CEO's tenure as well as other CEO characteristics and control variables. We allow the baseline hazards to differ across industries in order to capture differences in the frequency of forced turnovers and in the relationship between CEO tenure and dismissal rates across industries. We treat voluntary turnovers as right-censored observations in the estimation. The base regressions include a dummy variable for CEOs between ages 63 and 66 to account for likely retirements, and a second dummy variable for CEOs who own more than 5 percent of their firm's equity to control for CEOs who may be difficult to dislodge. Only CEOs who have been in office for at least 24 months are included in the analysis.

Table 2 presents the main result of this paper: When regressing forced CEO turnover on idiosyncratic firm performance and the component of firm performance predicted by industry performance, both idiosyncratic and predicted performance strongly affect CEO dismissals. Column (1) uses equal-weighted industry returns over the previous two years as instruments for firm performance over the same time span. Instead of the expected coefficient of zero on predicted performance in the second stage turnover regression, we find that the point estimate on predicted performance for year t-1 (-1.986, robust z-stat. 5.88) is almost as large as the point estimate on idiosyncratic performance (-2.384, robust z-stat. 8.05). Similar results obtain for performance in year t-2. This implies that bad industry performance increases the likelihood of a

CEO dismissal by almost as much as bad firm-specific performance. Industry performance is clearly not fully filtered from the CEO retention decision, and strong-form relative performance evaluation is rejected. Adding control variables for CEO age and CEO stock ownership in column (2) strengthens this result.

Columns (3) and (4) repeat the analysis but replace equal-weighted by value-weighted industry returns. The negative coefficients on predicted performance in the second stage regression are smaller than before but remain large and statistically highly significant. The smaller effect of value-weighted industry performance on CEO turnover suggests that there may be better filtering of value-weighted than of equal-weighted peer performance from firm performance, a possibility we revisit below.

Instead of Cox hazard regressions, the prior literature on CEO turnover uses standard logit regressions to measure the effect of performance on turnover. To demonstrate that our results are not an artifact of using the (arguably more suitable) hazard model, we repeat the second stage turnover analysis using logit regressions in Table 3. Since the logit model by itself does not account for the effect of tenure on the frequency of CEO dismissals, we include CEO tenure as an explicit control in the specifications in columns (2) and (4). The logit results in Table 3 show an even more impressive rejection of strong-form relative performance evaluation than the results in Table 2. Low stock returns caused by bad industry performance predict CEO dismissals almost as strongly as low firm-specific stock returns, and the peer component of firm performance enters the second stage logit regressions with z-statistics between 3.9 and 8.9.

The effect of industry performance on the frequency of CEO dismissals is economically large. Table 4 presents the implied likelihood of a forced CEO turnover calculated from the logit models in columns (2) and (4) of Table 3. The average implied probability of a forced CEO turnover in the base case (all independent variables left at their actual values) is 2.45% and equal to the unconditional probability of a forced turnover in the sample. The low frequency of CEO dismissals is consistent with the prior literature.[13] The average implied probability of a forced

[13] See, for example, Warner, Watts, and Wruck (1988), Parrino (1997), Kaplan (1999), and Huson, Parrino, and Starks (2001) for forced turnover probabilities of a similar magnitude.

turnover increases to 3.49% (3.28%) when the component of year t-1 firm performance attributable to equal-weighted (value-weighted) industry performance is set to its 25th percentile value. The average implied probability falls to 2.11% (2.16%) when the peer component of performance is set to its 75th percentile. Hence a decline in the peer component of firm performance from its 75th to its 25th percentile increases the implied probability of a CEO dismissal by approximately 50%. Changing industry performance in both year t-1 and year t-2 simultaneously yields even larger effects.[14]

We conclude that industry-wide movements in stock returns are not fully filtered from firm performance before CEO retention decisions. The strong-form relative performance evaluation hypothesis is rejected by the data. This still leaves the possibility that corporate boards at least partially filter industry performance from firm performance when assessing their CEO, a hypothesis we test in the next section.

C. Testing for weak-form relative performance evaluation in CEO turnover

Most of the prior literature on CEO compensation and CEO turnover does not test for strong-form relative performance evaluation, but tests a weaker implication of the theory: CEO dismissals should be negatively related to firm performance, holding industry performance constant, and positively related to industry performance, holding firm performance constant. Unlike strong-form relative performance evaluation, the weak form of the hypothesis does not predict complete filtering of peer performance, and instead posits only that some filtering of peer performance from firm performance is done by corporate boards.

Tests for weak-form relative performance evaluation do not use the two stage approach from the previous section, and instead simply regress forced CEO turnover on both firm performance and peer performance. The corresponding results in Table 5 are consistent with partial filtering of industry shocks. Regressing forced CEO turnover on firm and industry performance over the previous two years, firm performance comes in strongly negatively, and industry performance comes in with the opposite sign, as predicted. On the other hand, the coefficients on industry

[14] An alternative method for calculating the implied probabilities is to set all independent variables to their respective means, rather than to their actual values, before varying the variable of interest. Both methods deliver qualitatively similar results.

performance are much smaller in absolute value (between 0.342 and 0.887 for year t-1) than the coefficients on firm performance (between -2.158 and -2.300 for t-1) and have lower statistical significance, consistent with the previous result that industry shocks are far from fully filtered from CEO retention decisions.[15] The coefficients on industry performance in year t-2, while positive, are not significantly different from zero.

The results in Table 5 support the notion that corporate boards do take at least some account of industry performance when assessing the performance of their CEOs. Interestingly, the regressions using value-weighted industry returns as measure of peer performance (columns (3) and (4)) are more supportive of relative performance evaluation than the regressions using equal-weighted industry returns, suggesting again that boards pay more attention to value-weighted industry performance. One possible explanation is that boards intuitively benchmark the performance of their CEOs against the largest and most visible firms in their industry, but fail to properly account for other, less salient components of industry performance.

D. Market returns as the measure of peer group performance

The previous two sections have shown that industry performance affects the frequency of forced CEO turnovers. We examine next whether market-wide stock returns have a similar effect. We again decompose firm performance into its peer group and its firm-specific components using the two-stage regression approach described in Section I.B.

Table 6 presents turnover regression results using peer performance measured as equal-weighted (columns (1) and (2)) and value-weighted (columns (3) and (4)) stock market returns. The results using equal-weighted market returns are similar to the ones using industry returns: Both the firm-specific and the market-induced performance components strongly affect the frequency of CEO dismissals. The increase in the likelihood of a forced CEO turnover caused by low market returns is of the same order of magnitude as the increase caused by low firm-specific returns. The statistical significance of the peer performance effect is weaker than when using industry returns,

[15] In the notation of equations (7) and (8), complete filtering of industry performance from firm performance implies that $-\gamma'_1/\gamma'_2 = \beta_1$. Using the estimates from column (1) in Tables 2 and 5, we have $-\gamma'_1/\gamma'_2$ = 0.342/2.158 = 0.158 and β_1 = 0.899. Hence theory predicts five to six times more intense filtering than observed in the data.

which is unsurprising given the limited variation in market returns over our sample period. We conclude that the rejection of the strong-form relative performance evaluation hypothesis persists when peer group performance is measured by equal-weighted market returns.

Notably, the same is not true when peer group performance is measured by value-weighted market returns. Value-weighted market returns have no consistent effect on the likelihood of a forced CEO turnover, even though the first stage regressions confirm that value-weighted market returns significantly predict firm-level returns. It appears that corporate boards take the performance of value-weighted market indexes (such as the S&P 500) into account when assessing the performance of their CEOs. This result is confirmed in Table 7, which uses single-stage regressions to show that forced CEO turnover is significantly positively related to value-weighted (but not equal-weighted) market returns, holding firm stock returns constant. These findings reinforce the impression that boards use rule-of-thumb relative performance evaluation against the most salient benchmarks, while ignoring less directly visible outside influences on firm performance.

The finding that both industry and equal-weighted market performance affect CEO dismissals raises the question whether these two measures of peer performance have independent effects on CEO turnover. To answer this question, we first purge industry performance of its market component by separately regressing returns for each industry on market returns over the full sample period. We then use the residuals from these regressions, which measure industry returns net of market returns, as the measure of peer performance in the same two-stage regression procedure as before. The results are reported in columns (1) and (2) of Table 8 and show that the component of firm performance attributable to industry performance net of market performance has a strong negative effect on CEO dismissals. Next, we repeat the two-stage regression procedure using once again the market as peer group, but exclude each firm's own industry from the calculation of market returns. The results are reported in columns (3) and (4) of Table 8 and show that equal-weighted market performance retains its effect on CEO dismissals even when each firm's own industry is dropped from the market index. We thus conclude that industry performance and equal-weighted market performance have separate and independent effects on forced CEO turnover.

E. Profitability as measure of performance

Several papers in the CEO turnover literature measure firm performance using accounting returns (e.g., Weisbach (1988), Parrino (1997)). We therefore examine next whether the industry component of firms' accounting performance has an effect on the probability of forced CEO turnovers. Accounting profitability is affected by many one-off items and displays strong mean-reversion, making it at best a noisy measure of firm performance. To alleviate some of the year-to-year noise, we use two-year changes in operating return on assets (ROA) as our measure of accounting performance. We again decompose firm performance into its peer group and its firm-specific components using the two-stage regression approach described in Section I.B.

Table 9 presents results with peer performance measured as either the industry median (columns (1) and (2)) or the industry mean (columns (3) and (4)) of two-year changes in ROA. The numbers show that both the firm-specific and the industry component of operating performance affect the likelihood of CEO dismissals. Hence the rejection of the relative performance evaluation hypothesis is confirmed with accounting returns as the measure of performance. The statistical significance of the peer-performance effect is substantially smaller than in the regressions using stock returns. In fact, it is easy to find measures of industry profitability that have no significant effect on the probability of forced CEO turnovers. The reason is that accounting performance is much less correlated across firms in the same industry than stock price performance, making industry profitability a weaker instrument for firm performance than industry stock returns (Sloan (1993)). The low predictive power of industry profitability for firm performance is illustrated by the low explanatory power of the first stage regressions in Table 9.

F. Robustness tests

In this section, we subject the basic regression results to a variety of robustness checks. First, we re-estimate the second stage hazard regressions allowing for *three* CEO turnover outcomes: retention, voluntary turnover, and forced turnover. We continue to use Cox hazard regressions and apply the method of Lunn and McNeil (1995) to estimate differential effects of the explanatory variables on voluntary and forced turnover. The hazard functions for the two types of CEO turnover are assumed to be additive, and hence the hazard of a CEO turnover in any

month is the sum of two risk processes. When observation of a CEO ceases due to a turnover or because of censoring, two survival times of the same duration are being observed, one for each process, with at least one being censored. Table 10 presents the results from the second-stage hazard regressions, using again firm and industry stock returns over the previous two years as measures of performance. The coefficient estimates for forced CEO turnover are remarkably similar to before, with both idiosyncratic and peer performance strongly predicting CEO dismissals. Unsurprisingly, the effects of the two performance components on voluntary CEO turnover are substantially weaker in both their economic and statistical significance. There is a small negative effect of idiosyncratic firm performance on the probability of voluntary turnover, but no evidence of any effect of peer group performance. The results using market returns as measure of peer performance are similar and are omitted to conserve on space.

The second robustness test allows for *industry*-specific peer performance sensitivities in the first stage regressions. Throughout, the results using industry-specific betas are almost indistinguishable from the ones using a common peer performance beta for all firms. As an illustration, Table 11 reports results from the two-stage estimation procedure using firm and industry stock returns over the previous two years as measures of performance. Panel A reports means and medians of the estimated industry-specific betas, and Panel B presents the CEO turnover regressions. The peer performance effect on CEO dismissals continues to be economically and statistically highly significant and is essentially unchanged from the base regressions in Table 2. Next, in untabulated results, we have re-estimated Table 11 allowing for *firm*-specific betas in the first stage regressions. Estimating firm-specific betas introduces estimation error into the peer performance term used in the CEO turnover regressions, as discussed in Section 1.B. Nevertheless, the peer performance effect on CEO dismissals remains both economically and statistically significant, but is smaller than in Tables 2 and 11.

In additional robustness tests available from the authors, we vary the time period over which firm and peer group performance are measured before the turnover decision. We replace the robust standard errors in the second stage regressions with bootstrapped standard errors to correct for any biases caused by the inclusion of generated regressors. We drop the industry stratification from the second stage turnover regressions, thereby forcing the baseline hazards to be the same

in all industries. This allows each industry's average performance over the sample period to affect the peer performance term. None of these modifications changes the conclusion that both firm-specific and peer group performance strongly affect the frequency of CEO dismissals.

IV. A more detailed examination of the peer performance effect on CEO dismissals

The results so far demonstrate that peer group performance is not fully filtered from CEO dismissal decisions. Instead, bad industry performance increases the likelihood of a CEO dismissal by almost as much as bad firm-specific performance. This pattern can be consistent with models in which CEOs are fired efficiently, but may also suggest that too few CEOs are dismissed in good times, or too many in bad times. We have discussed a number of reasons for a peer performance effect on forced CEO turnovers in Section I.C. In order to shed more light on why CEOs are more frequently fired when their peer group is not doing well, this section examines the relationship between CEO dismissals and peer performance in more detail.

A. The oligopolistic industry hypothesis

Linking CEO retention decisions to rival firm performance may serve shareholders by softening competition in oligopolistic industries. Boards may dismiss CEOs for low industry performance if such performance is caused by CEO actions, for example because the CEO started a price war with competitors. This strategic interaction hypothesis predicts that the effect of industry performance on CEO turnover should vanish as the industry definition broadens (as larger industries are less likely to be oligopolistic), and that the effect should be weaker for small firms (which are less likely to affect the product market equilibrium in their industry). The evidence presented so far speaks against the strategic interaction hypothesis: The 48 Fama and French (1997) industries used in our analysis are quite broad, with the majority of industries having more than one hundred publicly listed firms on CRSP at any point during the sample period. Furthermore, we saw in Tables 6 and 8 that the peer group effect on forced CEO turnover persists when peer performance is measured as equal-weighted market returns, a finding that is hard to reconcile with the strategic interaction hypothesis.

Table 12 tests whether the effect of industry performance on CEO dismissals vanishes for firms which are small relative to their industry and therefore unlikely to affect the product market equilibrium. In columns 1 and 2, small firms are identified as firms with equity market capitalizations below 1 percent of the total market capitalization of all firms in the same industry found on CRSP, which reduces the sample size by 33%. Columns 3 and 4 identify small firms as firms with book assets below 1 percent of the total book assets of all firms in the same industry found on Compustat, which reduces the sample by 37%. Independently of the exact definition of small firms, the results in Table 12 show that the industry component of firm performance continues to have a statistically and economically large effect on the likelihood of a forced CEO turnover. We conclude that the strategic interaction hypothesis is unlikely to explain the documented peer performance effect on forced CEO turnover.

B. The endogenous industry choice hypothesis

Dye (1992) argues that relative performance evaluation motivates executives to invest in industries in which they can outperform their competitors, rather than in industries that offer the highest absolute returns. If CEOs do in fact have (some) control over which industry their firm operates in, then efficient CEO evaluations may not filter industry performance out. On the other hand, there is a simple fix for the problem described by Dye: Boards should select the peer group benchmark for each CEO before any industry relocation choices are made. Practically speaking, CEOs should be benchmarked against their competitors from several years ago to provide them with efficient incentives to move their firms into the best-performing industries. We test the Dye hypothesis in Table 13 by re-running the base regressions from Table 2 with the industry affiliation lagged by five years, effectively comparing the current performance of each firm to the current performance of its competitors from five years ago. The results are qualitatively unchanged from Table 2 and show a statistically and economically large effect of peer group performance on CEO dismissals. We conclude that the endogenous industry choice hypothesis is unlikely to explain the main result of this paper.

C. Variation in the informativeness of performance *or* in the required CEO skills between recessions and booms

In this subsection we test two closely related hypotheses with similar empirical predictions. The first hypothesis is that performance in recessions allows boards to learn more about the quality of their CEO than performance in booms, for example because recessions test aspects of CEO skill which are otherwise difficult to observe. The second hypothesis is that boards replace CEOs in recessions because lean times require specific skills that not all CEOs possess. For instance, the ability to cut costs and streamline operations is likely to be especially valuable in recessions and may not be shared by all CEOs.

We examine four testable predictions of these two hypotheses. The first prediction is that the increased probability of CEO dismissals in recessions should be concentrated on underperforming CEOs. Underperformance in bad times reveals low CEO skills or a lack of the specific skills required to succeed in bad times, and thus leads to the CEO's dismissal. Table 14 tests this idea by estimating whether the sensitivity of CEO turnover to peer performance depends on whether a CEO underperforms or outperforms her benchmark. To ease the interpretation of the results, Panel B shows the marginal effects of peer performance on CEO dismissals separately for underperformers and for outperformers.[16] We find that the previously documented effect of industry-induced performance on CEO dismissals is almost entirely restricted to CEOs who underperform their industry. There is little effect of peer group performance on CEOs who outperform their benchmark.[17] Similar results obtain when peer performance is measured as equal-weighted market returns (unreported). We conclude that the peer performance effect on CEO turnovers is driven by boards being much more likely to remove underperforming (but not outperforming) CEOs in bad times than in good times.

[16] Because of the non-linearity of the hazard function, the coefficients on interaction terms in Cox hazard regressions are difficult to interpret directly. These coefficients are not the respective marginal effects of peer performance on CEO dismissals for under- and for outperformers, and thus their difference does not capture the difference in marginal effects. In fact, it is possible for the difference in the interaction coefficients and the difference in the marginal effects to have opposite signs (Powers (2004)). It is straight-forward to calculate the true differences in the marginal effects (evaluating all other variables at their means) and to use the delta method to assess their statistical significance, as done in Panel B of Table 14. The baseline hazard is normalized to one for simplicity.

[17] Including main effects, i.e. dummy variables for CEOs who have underperformed their peer group, leaves all other coefficients unchanged and produces insignificant coefficients on the dummy variables.

The closely related second prediction is that CEO turnover should be more sensitive to *firm-specific* performance in recessions than in booms. We test this prediction in Table 15 by interacting firm-specific performance with indicators for low, medium, and high industry performance in CEO turnover regressions. The marginal effects are reported in Panel B. The results support the prediction when firm and peer performance are measured over year t-1 before the turnover decision: The effect of firm-specific performance on CEO turnover is smallest when industry performance over the prior two years was high, and is largest when industry performance was low. The difference in slope coefficients and marginal effects is significant at the 5% level in columns (1) and (3) and at the 10% level in columns (2) and (4). The prediction is not supported by firm-specific performance in year t-2, which yields slope coefficients and marginal effects that are not significantly different from each other at different levels of industry performance. The results using equal-weighted market returns as peer performance are similar and show an effect of firm-specific performance on CEO dismissals that is largest when the market has performed badly over the prior 12 months (untabulated).

The third prediction is that the effect of peer performance on CEO turnover should be largest for new CEOs. For a CEO with long tenure, the board should have already obtained almost all information needed, and the CEO should have already proven her skills in both good and bad times. Hence, if we believe that recessions reveal deficiencies in CEO skills to boards, then the effect of recessions on CEO turnover should be largest for new CEOs. We test this prediction in Table 16 by allowing for different effects of industry performance on turnover for CEOs with less than four years of tenure and for CEOs with more than eight years of tenure.[18] Contrary to our prediction, there is no observable difference in the marginal effects of peer performance on forced turnover for CEOs with short compared to CEOs with long tenure. We thus reject the idea that the peer performance effect on CEO turnover is caused by inexperienced CEOs having their skill deficiencies exposed the first time they encounter an industry recession.

The final prediction is not concerned with CEO turnover, but instead with CEO *pay*. If performance in bad times is indeed more informative about CEO quality or actions than

[18] CEOs with less than four years of tenure make up 36.3% of the observations in our sample, and CEOs with more than eight years of tenure make up 39.0% of the observations.

performance in booms, then CEO pay should also be more sensitive to performance during bad times than during good times. We test this prediction in Table 17 by regressing CEO compensation and changes in CEO compensation on firm-specific and industry-induced performance. The compensation regressions are similar to the specifications in Aggarwal and Samwick (1999b). We interact firm-specific performance with indicators for low, medium, and high industry performance to test whether the pay-for-performance slopes differ between good and bad times. We find no evidence that the effect of firm-specific performance on CEO compensation is stronger when industry performance is low. Hence the compensation analysis does not support the idea that performance in recessions is more informative about CEO skills or actions than performance in booms. Notably, and consistent with the prior literature, we find that peer performance is as strong a predictor of CEO compensation as firm-specific performance, which confirms that the relative performance evaluation hypothesis is rejected in the compensation context as well.

D. The systematic attribution error hypothesis

Corporate boards and shareholders may make systematic mistakes in attributing performance, and credit or blame CEOs for performance caused by factors beyond their control. Such systematic attribution errors are unlikely to affect all CEOs symmetrically. CEOs who outperform their peer group are able to bring that fact to the board's attention and are unlikely to be dismissed during a downturn. CEOs who underperform their peer group, on the other hand, are less able to defend themselves against attribution errors in downturns, but are happy to hide behind good industry performance in booms. The attribution error hypothesis therefore predicts that industry performance should have only weak effects on outperforming CEOs, but should strongly affect underperforming CEOs. We tested this prediction in the previous section and found strong support in the data: The effect of industry and market performance on CEO dismissals is almost entirely restricted to CEOs who underperform their benchmarks. This result is consistent with the idea that boards commit systematic attribution errors when evaluating their CEOs, and that these attribution errors mainly affect underperformers.

Following similar logic, more powerful CEOs may be better able to defend themselves against "unfair" dismissals, weakening the effect of peer performance on forced turnovers. Alternatively,

more powerful CEOs may be better able to hide behind peer group performance in good times, thereby strengthening the effect of peer performance on turnovers. We therefore test next whether CEOs who are founders, CEOs with large equity stakes, CEOs with insider-dominated boards, and CEOs with more excess compensation are more or less affected by peer group performance than other CEOs.[19] The results are presented in Tables 18 to 21. We find no consistent effects of CEO power on firms' propensity to use relative performance evaluation. There is some evidence that the effects of *both* idiosyncratic and peer performance on CEO turnover are weaker for more powerful CEOs if power is measured by large equity stakes or excess compensation. But we find no evidence that the weakening of the turnover-performance relationship is different for peer performance than for idiosyncratic performance. In other words, while more powerful CEOs may be less frequently dismissed after bad performance, this reduction in the turnover-performance slope is as strong for "fair" as for "unfair" dismissals.

Table 18 examines whether industry performance affects CEO turnover differently for founder CEOs than for non-founders. Following Bebchuk, Cremers, and Peyer (2007), CEOs are classified as founders if they are in office at least five years before the first public listing of the firm.[20] The CEO turnover regressions in Panel A show that interactions between the founder dummy and peer-induced performance are insignificant. The marginal effects in Panel B confirm that dismissals of founder CEOs are as sensitive to industry performance as dismissal of other CEOs. Next, in Table 19, we test whether the effect of industry performance on CEO turnover differs for CEOs who own more than 5 (10) percent of the equity of their firm.[21] Panel B shows that the marginal effects of both peer and idiosyncratic performance on CEO turnover are significantly smaller for CEOs with large equity stakes. CEOs with large stakes are per se much less likely to be fired, and the increase in the firing probability caused by worsening peer or firm-specific performance is smaller for CEOs with large stakes.[22] Notably, the reduction in the

[19] We already know from Section III.C that the effect of peer performance on forced turnover is as strong for CEOs with short tenure as for CEOs with long tenure.

[20] This algorithm classifies 459 out of 3,792 CEOs as founders (12%). Prior studies showing that CEOs who are founders are less likely to be fired include Morck et al. (1989), Parrino (1997), and Huson et al. (2001).

[21] CEO stock ownership at the end of the prior fiscal year is obtained from ExecuComp. Seventeen percent of the CEO-year observations have CEO ownership of at least 5%, and 11% of the observations have CEO ownership of at least 10% of all outstanding shares. Prior studies showing that CEO ownership impedes forced turnovers include Salancik and Pfeffer (1980), Weisbach (1988), Mikkelson and Partch (1997), and Denis et al. (1997).

[22] Note how focusing on the (negative) coefficients on the interaction terms in Panel A, instead of the (positive) differences in marginal effects in Panel B, would lead to incorrect inferences (Powers, 2004).

marginal effects is more pronounced for firm-specific performance than for peer performance, but the difference in the reductions is not statistically significant.

In Table 20, we examine whether the peer performance effect on CEO turnover is related to the composition of the board. The number of independent directors on each board is obtained from the IRRC directors database and covers the S&P 500, S&P MidCaps and S&P SmallCaps from 1996 to 2001.[23] The results show no significant difference in the effect of industry performance on CEO turnover between firms with insider-dominated and firms with independent boards. The estimated marginal effects of peer performance on CEO turnover are actually *larger* in firms with more inside directors than in other firms, but the differences are insignificant. Finally, in Table 21, we test whether the effect of peer performance on CEO turnover is different for CEOs who are paid "excessive" levels of compensation. Excess compensation is determined by regressing annual CEO compensation on industry fixed effects, year fixed effects, CEO tenure, and measures of firm size and performance. The residuals from this regression are averaged over time for each CEO to provide an estimate of the average level of excess compensation for that CEO. We then use this measure of excess compensation as an explanatory variable in our two-stage CEO turnover regressions. We find smaller marginal effects of both idiosyncratic and industry-induced performance on CEO turnover for CEOs who are paid excessive levels of compensation, but the reduction in marginal effects is consistently significant only for idiosyncratic performance. More importantly, the reductions in marginal effects are of roughly equal size for both components of firm performance and are statistically indistinguishable.

Looking across all four measures of CEO power examined in Tables 18 to 21, we have found no consistent effects of CEO power on firms' propensity to use relative performance evaluation in their turnover decisions. There is some evidence that the effects of *both* idiosyncratic and peer performance on CEO turnover are weaker for more powerful CEOs, but no evidence that this weakening of the turnover-performance relationship is different for peer performance than for

[23] Merging reduces the CEO turnover sample by approximately half. A director is classified as an insider if she is a current or former employee of the firm, a family member of a director or executive, a recipient of charitable funds, a major customer, or if she provides professional services to the company. All other directors are classified as independents. The average fraction of independent directors on boards in the IRRC sample is 63 percent. Prior studies of the relationship between board structures and CEO turnover include Weisbach (1988), Borokhovich, Parrino, and Trapani (1996), Parrino (1997), Denis et al. (1997), and Huson et al. (2001).

idiosyncratic performance. Hence, while powerful CEOs may be less frequently dismissed after bad performance, this reduction in the turnover-performance slope is as pronounced for "fair" as for "unfair" dismissals.

E. The limited investor attention hypothesis

According to the limited investor attention hypothesis, otherwise passive shareholders scrutinize firms more closely after their attention has been triggered by low stock returns or other easily observable indicators of bad performance. As such shareholders are most likely to pay attention when both firm-specific and peer group induced performance are low, this hypothesis is supported by the results in Table 14 (the effect of peer performance on CEO turnover is strongest when the CEO underperforms) and by the results in Table 15 (the effect of firm-specific performance on CEO turnover is strongest when peer performance is low).

As a further test of the limited attention hypothesis, we repeat the base regressions from Tables 2 and 6 with the sample restricted to firms in the S&P 500 index. Since these high-profile firms are likely to be continuously monitored by the press and professional investors, we would expect that CEO dismissals are less sensitive to peer group performance. Instead, the results are qualitatively unchanged from Tables 2 and 6 and from the results for small firms in Table 12, which we interpret as evidence against the limited attention hypothesis. The regression results are omitted to conserve on space and are available from the authors.

A more direct test of the limited attention hypothesis examines whether CEOs are evaluated differently after investor attention has been triggered. If investors start paying attention to firms after bad performance, then we should observe efficient filtering of peer performance from CEO dismissal decisions after returns have been sufficiently bad. We therefore sort our sample by the level of prior returns, and test whether the industry component of firm performance continues to affect CEO turnovers even in firms with very low prior performance. Table 22 repeats the base regressions, but restricts the second stage CEO turnover regressions to observations with negative returns (columns (1) and (3)) and observations with returns below -20% (columns (2)

and (4)) over the prior 12 months.[24] The estimated coefficients on the industry-component of firm performance are as large and almost as significant as the ones estimated for the full sample in Table 2. We conclude that even for firms with prior stock returns below -20%, worse industry performance increases the likelihood of a forced CEO turnover. This result is further evidence against limited attention as the cause of the peer performance effect on CEO dismissals.

F. Stock price reactions to forced CEO turnovers across the industry business cycle

In this section we examine the stock market reaction to the announcement of a forced CEO turnover. In particular, we are interested in whether the stock market views the more frequent CEO dismissals in industry recessions as better or worse news than the less frequent dismissals in industry booms. A crucial caveat is that the stock price reaction captures only new information released on the announcement date, and conflates the market reaction to the dismissal with the reaction to any other news revealed at the announcement. For example, the market may react negatively to a CEO dismissal not because the market views the dismissal as a bad decision, but because the market was not fully aware of how bad the CEO's performance had been.[25]

Table 23 reports the market-adjusted stock price reaction to forced CEO turnovers using three and five trading day windows around the announcement date. The average stock price reaction in the sample is negative and statistically significant. Comparing dismissals of CEOs who outperformed their industries to dismissals of underperforming CEOs, we observe that the market reaction is more negative for CEOs who outperform, even though the difference is not statistically significant. The more negative reaction to the dismissal of outperforming CEOs may be due to the fact that such dismissals are less common and hence more surprising. Most interesting from our perspective, Table 23 shows that the stock market reaction to CEO dismissals does not depend on whether the event occurs in an industry recession or an industry boom. All differences in announcement returns to CEO dismissals between industries with above- and below-median performance have t-statistics below one. There is no evidence that the

[24] Observations with negative returns over the prior 12 months make up 35.2% of the sample, and observations with returns below -20% make up 17.1% of the sample.

[25] Hermalin and Weisbach (1998) predict that the stock price reaction to CEO dismissals is negative if the CEO is fired based on private information of the board, and positive if the CEO is fired based on public information.

market views the more frequent CEO dismissals in industry recessions as different from the less frequent dismissals in industry booms.

V. Conclusion

Using a new CEO turnover data set from 1993 to 2001, we document that low industry and low market returns significantly increase the frequency of forced CEO turnovers. We find some evidence that boards partially adjust for industry performance when making CEO retention decisions, but the adjustment is too small to remove most of the peer performance effect. We conclude that boards fail to fully filter peer performance from firm performance before evaluating their CEOs. The increase in the likelihood of a forced turnover following bad peer performance is concentrated on CEOs who have performed worse than their peers. Such underperforming CEOs are more likely to be removed following bad industry or market returns, while outperforming CEOs are mostly unaffected by peer performance. There is evidence for more effective filtering of more visible indicators of outside performance, such as the performance of the value-weighted market, suggesting that boards may use some rule-of-thumb relative performance evaluation when assessing CEO quality.

We consider several explanations for the failure of relative performance evaluation in our CEO turnover sample. While far from conclusive, our results do not provide fully convincing support for any of the proposed explanations for the observed peer performance effect on CEO turnover. Given the obvious difficulties of measuring many of the variables of interest, and the wide standard error bounds in some of our tests, we cannot rule out that some of the examined ideas may nevertheless play an important role in explaining our results. Independently of the underlying mechanism, the documented effects of industry and market performance on CEO turnover have important implications for our understanding of CEO incentives and horizons.

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Table 1
Summary statistics

This table presents an overview of the CEO turnover data set. Panel A shows the number of observations and the frequency of forced and voluntary CEO turnovers in the sample. Panel B shows firm characteristics and performances by CEO retention outcome. Panel C reports the frequency of forced CEO turnovers by industry performance quintile.

Panel A: Frequency of voluntary and forced CEO turnovers

Number of firm-years	Number of forced CEO turnovers	Number of voluntary CEO turnovers	Average percentage of firms with at least one CEO turnover in a year	Average percentage of firms with at least one *forced* CEO turnover in a year	Average percentage of firms with at least one *voluntary* CEO turnover in a year
16,865	383	1,244	9.14%	2.25%	7.24%

Panel B: Firm characteristics, firm performance, and industry performance by CEO turnover outcome

	CEO is retained	Voluntary CEO turnover	CEO is dismissed
	Firm characteristics		
Book assets ($m)	7,670	9,413	5,220
Market value of equity ($m)	4,696	6,603	3,345
Sales ($m)	3,329	4,504	3,275
Number of employees	16,001	20,584	17,020
	Firm and industry performance		
Stock return in the 12 months before the CEO turnover	29.70%	13.21%	-18.15%
[S.E.]	[0.65]	[1.79]	[2.33]
EW industry stock return in the 12 months before the CEO turnover [S.E.]	19.24% [0.26]	16.46% [0.90]	12.90% [1.53]
VW industry stock return in the 12 months before the CEO turnover [S.E.]	18.47% [0.20]	17.83% [0.76]	16.64% [1.39]

Panel C: CEO dismissal probabilities by industry performance quintile

EW industry stock return in the year before the CEO turnover		Probability of a forced CEO turnover	VW industry stock return in the year before the CEO turnover		Probability of a forced CEO turnover
Quintile [S.E.]	5	1.84% [0.24]	Quintile [S.E.]	5	2.64% [0.29]
	4	2.09% [0.25]		4	2.00% [0.25]
	3	2.09% [0.25]		3	2.13% [0.26]
	2	2.16% [0.26]		2	2.00% [0.25]
	1	3.43% [0.32]		1	2.86% [0.30]

Table 2

Two-stage hazard regressions of forced CEO turnover on firm and industry performance

The first stage regressions use industry stock returns to predict contemporaneous company stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and the residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Panel A: First stage regressions of firm performance on industry performance

	(1)	(2)	(3)	(4)
	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1
Constant	0.095	0.095	0.080	0.080
	[5.75]***	[5.75]***	[4.74]***	[4.74]***
EW industry stock return in year t-1	0.899	0.899		
	[15.79]***	[15.79]***		
VW industry stock return in year t-1			1.017	1.017
			[11.35]***	[11.35]***
R-squared	0.12	0.12	0.10	0.10
	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2
Constant	0.103	0.103	0.059	0.059
	[6.08]***	[6.08]***	[3.73]***	[3.73]***
EW industry stock return in year t-2	0.916	0.916		
	[19.86]***	[19.86]***		
VW industry stock return in year t-2			1.099	1.099
			[12.14]***	[12.14]***
R-squared	0.13	0.13	0.11	0.11

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.384	-2.469	-2.449	-2.535
	[8.05]***	[9.33]***	[8.03]***	[9.41]***
Industry-induced stock return in year t-1	**-1.986**	**-2.000**	**-1.523**	**-1.535**
	[5.88]* **	**[6.44]*** **	**[4.28]*** **	**[4.55]*** **
Idiosyncratic stock return in year t-2	-0.974	-0.954	-0.966	-0.951
	[6.44]***	[6.27]***	[6.56]***	[6.30]***
Industry-induced stock return in year t-2	**-0.869**	**-0.906**	**-0.732**	**-0.768**
	[2.41] **	**[2.48]** **	**[2.14]** **	**[2.22]** **
CEO of retirement age		-1.222		-1.230
		[3.33]***		[3.22]***
CEO with high equity ownership		-1.220		-1.220
		[4.99]***		[4.78]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3

Two-stage logit regressions of forced CEO turnover on firm and industry performance

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage logit regressions shown below predict forced CEO turnover using the predicted values and the residuals from the first stage regression as measures of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage regressions include industry fixed effects. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All z-statistics are calculated with robust standard errors clustered at the industry level.

Second stage logit regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Constant	-19.1	-18.502	-19.278	-18.703
	[83.17]***	[65.09]***	[87.17]***	[67.21]***
Idiosyncratic stock return in year t-1	-2.449	-2.552	-2.514	-2.610
	[8.82]***	[9.31]***	[8.68]***	[9.09]***
Industry-induced stock return in year t-1	**-2.344**	**-2.419**	**-1.792**	**-1.865**
	[7.86]* **	**[8.48]*** **	**[6.71]*** **	**[6.69]*** **
Idiosyncratic stock return in year t-2	-0.753	-0.800	-0.786	-0.835
	[6.10]***	[6.08]***	[6.54]***	[6.22]***
Industry-induced stock return in year t-2	**-1.181**	**-1.275**	**-0.714**	**-0.773**
	[5.13]* **	**[5.10]*** **	**[4.17]*** **	**[3.83]*** **
CEO of retirement age		-1.156		-1.150
		[3.84]***		[3.83]***
CEO with high equity ownership		-1.395		-1.393
		[5.03]***		[5.04]***
CEO tenure in months		-0.004		-0.004
		[4.50]***		[4.48]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Implied probabilities of a forced CEO turnover

The implied probabilities of a forced CEO turnover are calculated using the second stage turnover regression coefficients from columns (2) and (4) of Table 3. For the base case implied probability, all independent variables are set equal to their actual values and the associated implied probabilities are averaged across all observations. This implied probability equals the observed frequency of forced CEO turnovers in the data. The implied probability is then varied by setting either the idiosyncratic or the predicted component of firm performance equal to their 25th or 75th percentile values. The other independent variables remain at their actual values.

Implied probabilities of a forced CEO turnover for different levels of the independent variables		
	Per group performance measured as EW industry returns	Per group performance measured as VW industry returns
	Implied likelihood of a forced CEO turnover	
Base Case	2.45%	2.45%
Peer-group induced stock return in t-1 set to 25th percentile	**3.49%**	**3.28%**
Peer-group induced stock return in t-1 set to 75th percentile	**2.11%**	**2.16%**
Idiosyncratic stock return in t-1 set to 25th percentile	3.08%	2.94%
Idiosyncratic stock return in t-1 set to 75th percentile	1.00%	0.97%
Peer-group induced stock return in t-2 set to 25th percentile	**2.98%**	**2.80%**
Peer-group induced stock return in t-2 set to 75th percentile	**2.24%**	**2.31%**
Idiosyncratic stock return in t-2 set to 25th percentile	2.82%	2.79%
Idiosyncratic stock return in t-2 set to 75th percentile	2.02%	2.00%
Peer-group induced stock return in t-1 and t-2 set to 25th percentile	**4.01%**	**3.68%**
Peer-group induced stock return in t-1 and t-2 set to 75th percentile	**1.84%**	**2.03%**
Idiosyncratic stock return in t-1 and t-2 set to 25th percentile	3.54%	3.41%
Idiosyncratic stock return in t-1 and t-2 set to 75th percentile	0.80%	0.79%

Table 5

Single-stage hazard regressions of forced CEO turnover on firm and industry performance

The single-stage Cox hazard regressions predict forced CEO turnover using company and industry stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries. The regressions allow the baseline hazard rates to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All z-statistics are calculated with robust standard errors clustered at the industry level.

Single-stage hazard regressions of CEO dismissals on firm performance and industry performance				
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Firm stock return in year t-1	-2.158	-2.262	-2.199	-2.300
	[8.84]***	[9.60]***	[8.64]***	[9.35]***
EW industry stock return in year t-1	**0.342**	**0.381**		
	[2.37]**	**[2.49]****		
VW industry stock return in year t-1			**0.833**	**0.887**
			[4.83]***	**[4.84]*****
Firm stock return in year t-2	-0.719	-0.827	-0.725	-0.846
	[6.63]***	[7.23]***	[6.87]***	[7.41]***
EW industry stock return in year t-2	**0.119**	**0.134**		
	[0.42]	**[0.46]**		
VW industry stock return in year t-2			**0.412**	**0.493**
			[1.15]	**[1.35]**
CEO of retirement age		-1.306		-1.317
		[3.68]***		[3.63]***
CEO with high equity ownership		-1.116		-1.116
		[4.86]***		[4.85]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6

Two-stage hazard regressions of forced CEO turnover on firm and market performance

The first stage regressions use stock market returns to predict contemporaneous company stock returns. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and the residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow the baseline hazard rates to differ across the 48 Fama and French (1997) industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Panel A: First stage regressions of firm performance on market performance

	(1)	(2)	(3)	(4)
	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1
Constant	0.126	0.126	0.141	0.141
	[11.32]***	[11.32]***	[9.23]***	[9.23]***
EW market return in year t-1	0.728	0.728		
	[6.34]***	[6.34]***		
VW market return in year t-1			0.723	0.723
			[5.49]***	[5.49]***
R-squared	0.03	0.03	0.02	0.02
	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2
Constant	0.122	0.122	0.053	0.053
	[6.78]***	[6.78]***	[3.01]***	[3.01]***
EW market return in year t-2	0.797	0.797		
	[9.83]***	[9.83]***		
VW market return in year t-2			1.132	1.132
			[12.60]***	[12.60]***
R-squared	0.04	0.04	0.03	0.03

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.371	-2.442	-2.436	-2.512
	[8.42]***	[9.69]***	[8.05]***	[9.56]***
Market-induced stock return in year t-1	**-1.385**	**-1.417**	**0.778**	**0.773**
	[2.10]**	**[2.37]****	**[1.16]**	**[1.14]**
Idiosyncratic stock return in year t-2	-0.962	-0.947	-0.990	-0.980
	[7.51]***	[7.45]***	[7.02]***	[6.92]***
Market-induced stock return in year t-2	**-0.610**	**-0.749**	**-0.325**	**-0.454**
	[0.94]	**[1.24]**	**[0.63]**	**[0.88]**
CEO of retirement age		-1.213		-1.172
		[3.35]***		[3.22]***
CEO with high equity ownership		-1.214		-1.189
		[5.02]***		[4.75]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7

Single-stage hazard regressions of forced CEO turnover on firm and market performance

The single-stage Cox hazard regressions predict forced CEO turnover using company and stock market returns. The regressions allow the baseline hazard rates to differ across the 48 Fama and French (1997) industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All z-statistics are calculated with robust standard errors clustered at the industry level.

Single-stage hazard regressions of CEO dismissals on firm performance and market performance				
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Firm stock return in year t-1	-2.138	-2.226	-2.192	-2.297
	[8.95]***	[9.81]***	[8.99]***	[9.97]***
EW market return in year t-1	**0.564**	**0.425**		
	[1.44]	**[1.20]**		
VW market return in year t-1			**2.056**	**2.054**
			[5.03]* **	**[5.28]*** **
Firm stock return in year t-2	-0.700	-0.795	-0.720	-0.824
	[7.20]***	[8.28]***	[6.94]***	[7.59]***
EW market return in year t-2	**0.141**	**-0.113**		
	[0.32]	**[0.29]**		
VW market return in year t-2			**0.880**	**0.644**
			[1.99] **	**[1.50]**
CEO of retirement age		-1.297		-1.273
		[3.70]***		[3.61]***
CEO with high equity ownership		-1.114		-1.094
		[4.85]***		[4.79]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8
Two-stage hazard regressions of forced CEO turnover on firm, industry, and market performance

The first-stage regressions in columns (1) and (2) of Panel A use residuals from (unreported) regressions of industry returns on market returns to predict contemporaneous company stock returns. Columns (3) and (4) use market returns excluding each firm's own industry to predict company stock returns. The second stage Cox hazard regressions in Panel B predict forced CEO turnover using the predicted values and the residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow the baseline hazard rates to differ across the 48 Fama and French (1997) industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Panel A: First stage regressions of firm performance on peer group performance

	(1)	(2)	(3)	(4)
	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1
Constant	0.249	0.246	0.152	0.164
	[11.72]***	[9.93]***	[9.90]***	[9.73]***
EW industry stock return *net of the market* in year t-1	1.089			
	[15.82]***			
VW industry stock return *net of the market* in year t-1		1.038		
		[9.27]***		
EW market return *without own industry* in year t-1			0.639	
			[5.85]***	
VW market *return without own industry* in year t-1				0.644
				[5.26]***
R-squared	0.08	0.07	0.02	0.01
	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2
Constant	0.262	0.262	0.128	0.075
	[10.52]***	[10.55]***	[6.88]***	[3.47]***
EW industry stock return *net of the market* in year t-2	0.968			
	[17.17]***			
VW industry stock return *net of the market* in year t-2		0.981		
		[9.43]***		
EW market return *without own industry* in year t-2			0.721	
			[9.37]***	
VW market return *without own industry* in year t-2				1.048
				[11.78]***
R-squared	0.06	0.06	0.04	0.03

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry Net of Market	VW Industry Net of Market	EW Market Without Own Industry	VW Market Without Own Industry
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.316	-2.326	-2.274	-2.349
	[8.74]***	[8.96]***	[10.11]***	[10.32]***
Industry-induced stock return in year t-1	**-2.011**	**-1.901**		
	[5.70]* **	**[4.94]*** **		
Market-induced stock return in year t-1			**-1.440**	**0.999**
			[2.56] **	**[1.55]**
Idiosyncratic stock return in year t-2	-0.803	-0.803	-0.784	-0.831
	[5.86]***	[5.91]***	[7.12]***	[6.79]***
Industry-induced stock return in year t-2	**-1.055**	**-0.908**		
	[2.39] **	**[2.51]** **		
Market-induced stock return in year t-2			**-0.990**	**-0.202**
			[1.80]*	**[0.45]**
CEO of retirement age	-1.147	-1.150	-1.311	-1.261
	[3.02]***	[2.98]***	[3.61]***	[3.49]***
CEO with high equity ownership	-1.216	-1.220	-1.167	-1.160
	[4.98]***	[4.98]***	[5.36]***	[5.43]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9
Two-stage hazard regressions of forced CEO turnover on firm and industry operating performance

The first stage regressions use industry means (columns 1 and 2) and industry medians (columns 3 and 4) of two-year changes in operating return on assets (ROA) to predict contemporaneous changes in company operating performance. ROA is calculated as operating income divided by the average of beginning and end-of-year book assets. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and the residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of changes in company performance, respectively. The baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Panel A: First stage regressions of firm performance on industry performance

	(1)	(2)	(3)	(4)
	Change in ROA over the prior two years	Change in ROA over the prior two years	Change in ROA over the prior two years	Change in ROA over the prior two years
Constant	0.004	0.004	0.002	0.002
	[5.00]***	[5.00]***	[2.08]**	[2.08]**
Industry mean of change in ROA over the prior two years	0.723	0.723		
	[15.94]***	[15.94]***		
Industry median of change in ROA over the prior two years			1.027	1.027
			[26.50]***	[26.50]***
R-squared	0.04	0.04	0.05	0.05

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic change in ROA over the prior two years	-4.100	-4.284	-4.126	-4.316
	[7.85]***	[7.65]***	[8.00]***	[7.81]***
Industry-induced change in ROA over the prior two years	**-7.161**	**-7.799**	**-5.469**	**-5.721**
	[2.59]* **	**[2.56]** **	**[2.32]** **	**[2.05]** **
CEO of retirement age		-1.372		-1.369
		[3.46]***		[3.45]***
CEO with high equity ownership		-1.437		-1.435
		[5.51]***		[5.47]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10
Two-stage hazard regressions of voluntary and forced CEO turnover on firm and industry performance

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage Cox hazard regressions shown below predict forced and voluntary CEO turnover using the predicted values and the residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Second stage hazard regressions of forced and voluntary CEO turnovers on peer-group induced and idiosyncratic firm performance				
	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
Forced CEO turnover dummy	-1.398	-0.904	-1.491	-0.981
	[10.91]***	[6.71]***	[12.41]***	[7.81]***
Effects on forced CEO turnover:				
Idiosyncratic stock return in year t-1	-2.730	-2.828	-2.749	-2.861
	[11.89]***	[12.60]***	[11.95]***	[12.64]***
Industry-induced stock return in year t-1	**-2.050**	**-2.189**	**-1.619**	**-1.697**
	[7.63]* **	**[8.30]*** **	**[5.64]*** **	**[5.99]*** **
Idiosyncratic stock return in year t-2	-0.848	-0.837	-0.845	-0.848
	[4.94]***	[4.80]***	[4.88]***	[4.78]***
Industry-induced stock return in year t-2	**-0.597**	**-0.689**	**-0.411**	**-0.449**
	[2.48] **	**[2.79]*** **	**[1.73]* **	**[1.85]* **
CEO of retirement age		-1.423		-1.427
		[3.74]***		[3.74]***
CEO with high equity ownership		-1.776		-1.793
		[5.94]***		[5.98]***
Effects on voluntary CEO turnover:				
Idiosyncratic stock return in year t-1	-0.262	-0.220	-0.278	-0.256
	[3.82]***	[2.98]***	[4.07]***	[3.44]***
Industry-induced stock return in year t-1	**-0.009**	**-0.058**	**0.130**	**0.168**
	[0.07]	**[0.43]**	**[0.94]**	**[1.20]**
Idiosyncratic stock return in year t-2	-0.286	-0.260	-0.316	-0.293
	[3.94]***	[3.28]***	[4.40]***	[3.69]***
Industry-induced stock return in year t-2	**-0.093**	**-0.167**	**0.033**	**0.049**
	[0.71]	**[1.23]**	**[0.23]**	**[0.34]**
CEO of retirement age		1.438		1.442
		[21.01]***		[21.01]***
CEO with high equity ownership		-0.377		-0.374
		[4.16]***		[4.13]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11
Two-stage hazard regressions of forced CEO turnover on firm and industry performance using industry-specific beta estimates

The first stage regressions use industry stock returns to predict contemporaneous company stock returns. A different peer-performance sensitivity (beta) is estimated for each industry. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and the residuals from the first stage regressions as measures of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All t- and z-statistics are calculated with robust standard errors clustered at the industry level.

Panel A: Industry-specific beta estimates from first stage regressions of firm performance on industry performance

	(1)	(2)	(3)	(4)
	Firm stock return on EW industry performance		Firm stock return on VW industry performance	
Average beta estimate for year t-1	0.749		0.799	
Median beta estimate for year t-1	0.741		0.815	
Average beta estimate for year t-2	0.783		0.835	
Median beta estimate for year t-2	0.759		0.839	

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.375	-2.457	-2.455	-2.540
	[8.07]***	[9.34]***	[7.86]***	[9.17]***
Industry-induced stock return in year t-1	**-2.020**	**-2.042**	**-1.456**	**-1.451**
	[5.89]* **	**[6.59]*** **	**[4.58]*** **	**[4.63]*** **
Idiosyncratic stock return in year t-2	-0.972	-0.951	-0.956	-0.946
	[6.59]***	[6.42]***	[6.95]***	[6.74]***
Industry-induced stock return in year t-2	**-0.891**	**-0.952**	**-0.751**	**-0.769**
	[2.27]**	**[2.38]****	**[2.17]****	**[2.14]****
CEO of retirement age		-1.217		-1.224
		[3.31]***		[3.24]***
CEO with high equity ownership		-1.220		-1.224
		[4.99]***		[4.86]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Small firms only

The estimation is restricted to firms with equity market values less than 1% of total industry market value (columns 1 and 2) or to firms with book assets less than 1% of total industry assets (columns 3 and 4). The first stage regressions use industry stock returns to predict contemporaneous company stock returns. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage regressions allow the baseline hazard rates to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level.

Panel A: First stage regressions of firm performance on industry performance

	(1)	(2)	(3)	(4)
	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1
Constant	0.081	0.065	0.084	0.075
	[4.40]***	[3.51]***	[4.40]***	[3.59]***
EW industry stock return in year t-1	0.936		0.993	
	[13.82]***		[12.46]***	
VW industry stock return in year t-1		1.027		1.045
		[9.69]***		[7.87]***
R-squared	0.13	0.10	0.14	0.09
	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2
Constant	0.092	0.042	0.091	0.053
	[4.65]***	[2.17]**	[4.72]***	[2.28]**
EW industry stock return in year t-2	0.977		0.994	
	[21.70]***		[17.07]***	
VW industry stock return in year t-2		1.149		1.097
		[11.01]***		[7.93]***
R-squared	0.12	0.10	0.13	0.09

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.423	-2.456	-2.336	-2.385
	[9.39]***	[9.25]***	[9.23]***	[9.42]***
Industry-induced stock return in year t-1	**-1.825**	**-1.439**	**-1.882**	**-1.407**
	[7.43]* **	**[4.60]*** **	**[7.49]*** **	**[4.52]*** **
Idiosyncratic stock return in year t-2	-1.062	-1.039	-1.036	-1.031
	[6.94]***	[7.10]***	[6.66]***	[6.77]***
Industry-induced stock return in year t-2	**-0.991**	**-1.111**	**-1.048**	**-0.980**
	[2.39] **	**[2.99]*** **	**[2.64]*** **	**[2.72]*** **
CEO of retirement age	-1.654	-1.667	-1.648	-1.698
	[2.69]***	[2.56]**	[2.70]***	[2.59]***
CEO with high equity ownership	-1.299	-1.267	-1.442	-1.406
	[5.12]***	[4.84]***	[6.94]***	[6.43]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Industry affiliation lagged by five years

The first stage regressions use industry stock returns to predict contemporaneous company stock returns. The industry affiliations are lagged by five years, so that each firm is benchmarked against its industry competitors from five years ago. The second stage Cox hazard regressions predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage regressions allow the baseline hazard rates to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level.

Panel A: First stage regressions of firm performance on industry performance

	(1)	(2)	(3)	(4)
	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1	Firm stock return in year t-1
Constant	0.062	0.062	0.061	0.061
	[4.66]***	[4.66]***	[3.47]***	[3.47]***
EW industry stock return in year t-1	0.861	0.861		
	[11.65]***	[11.65]***		
VW industry stock return in year t-1			0.783	0.783
			[6.56]***	[6.56]***
R-squared	0.12	0.12	0.08	0.08
	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2	Firm stock return in year t-2
Constant	0.045	0.045	0.031	0.031
	[2.76]***	[2.76]***	[1.33]	[1.33]
EW industry stock return in year t-2	0.936	0.936		
	[9.85]***	[9.85]***		
VW industry stock return in year t-2			0.963	0.963
			[6.60]***	[6.60]***
R-squared	0.13	0.13	0.09	0.09

Panel B: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.204	-2.207	-2.351	-2.372
	[8.09]***	[8.22]***	[8.49]***	[8.57]***
Industry-induced stock return in year t-1	**-1.973**	**-1.971**	**-0.938**	**-0.935**
	[4.81]* **	**[4.84]*** **	**[1.98]** **	**[2.02]** **
Idiosyncratic stock return in year t-2	-1.170	-1.169	-1.258	-1.246
	[5.25]***	[4.93]***	[5.88]***	[5.30]***
Industry-induced stock return in year t-2	**-1.478**	**-1.562**	**-0.995**	**-1.067**
	[3.36]* **	**[3.55]*** **	**[2.01]** **	**[2.10]** **
CEO of retirement age		-0.874		-0.831
		[2.72]***		[2.54]**
CEO with high equity ownership		-1.359		-1.369
		[3.58]***		[3.42]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 14

Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different industry performance effects for under- and for outperformers

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. Underperformers (outperformers) are defined as firms with negative (positive) firm-specific residual performance in the first stage regression. Industry-induced performance in year t-1 is interacted with underperformer (outperformer) dummies based on residual performance in year t-1, and industry-induced performance in year t-2 with underperformer (outperformer) dummies based on the summed residual performance in years t-1 and t-2. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage regressions allow the baseline hazard rates to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(1)	(2)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.726	-2.768	-2.662	-2.702
	[8.94]***	[9.80]***	[8.43]***	[9.44]***
Industry-induced stock return in year t-1 for outperformers	**-0.241**	**-0.275**	**-0.360**	**-0.472**
	[0.41]	**[0.42]**	**[0.76]**	**[0.91]**
Industry-induced stock return in year t-1 for underperformers	**-2.342**	**-2.321**	**-1.786**	**-1.756**
	[6.41]* **	**[6.69]*** **	**[4.68]*** **	**[4.74]*** **
Idiosyncratic stock return in year t-2	-1.101	-1.032	-1.011	-0.969
	[5.63]***	[5.62]***	[5.54]***	[5.27]***
Industry-induced stock return in year t-2 for outperformers	**-0.266**	**-0.535**	**-0.528**	**-0.733**
	[0.48]	**[1.01]**	**[1.08]**	**[1.38]**
Industry-induced stock return in year t-2 for underperformers	**-0.967**	**-0.956**	**-0.791**	**-0.793**
	[2.62]* **	**[2.53]** **	**[2.15]** **	**[2.12]** **
CEO of retirement age		-1.195		-1.215
		[3.25]***		[3.20]***
CEO with high equity ownership		-1.233		-1.229
		[5.07]***		[4.80]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of peer-group induced performance on CEO dismissals for underperformers and for outperformers

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Industry-induced stock return in year t-1	Industry-induced stock return in year t-1	Industry-induced stock return in year t-1	Industry-induced stock return in year t-1
Marginal effect for outperformers	-0.18	-0.14	-0.27	-0.23
	[0.41]	[0.42]	[0.76]	[0.91]
Marginal effect for underperformers	-1.06	-0.71	-0.94	-0.63
	[6.41]***	[6.69]***	[4.68]***	[4.74]***
Difference in marginal effects	0.88	0.57	0.67	0.39
	[1.74]*	[1.57]	[1.82]*	[1.49]
	Industry-induced stock return in year t-2	Industry-induced stock return in year t-2	Industry-induced stock return in year t-2	Industry-induced stock return in year t-2
Marginal effect for outperformers	-0.16	-0.21	-0.33	-0.30
	[0.48]	[1.01]	[1.08]	[1.38]
Marginal effect for underperformers	-0.50	-0.34	-0.46	-0.31
	[2.62]***	[2.53]**	[2.15]**	[2.12]**
Difference in marginal effects	0.33	0.13	0.13	0.02
	[1.08]	[0.70]	[0.45]	[0.09]

Table 15
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for different levels of industry performance

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for different effects of idiosyncratic performance on CEO turnover depending on whether industry performance over the prior two years is in the bottom, middle, or top third of all observations. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1: high industry performance	-1.913	-2.118	-1.925	-2.060
	[4.88]***	[6.64]***	[6.44]***	[8.30]***
Idiosyncratic stock return in year t-1: medium industry performance	-2.174	-2.238	-3.122	-3.189
	[8.52]***	[9.00]***	[7.56]***	[8.06]***
Idiosyncratic stock return in year t-1: low industry performance	-2.909	-2.885	-2.873	-2.877
	[8.03]***	[7.70]***	[6.84]***	[6.68]***
Industry-induced stock return in year t-1	**-1.447**	**-1.587**	**-1.036**	**-1.080**
	[3.63]* **	**[4.64]*** **	**[2.79]*** **	**[3.28]*** **
Idiosyncratic stock return in year t-2: high industry performance	-0.991	-0.957	-1.096	-1.059
	[4.51]***	[4.31]***	[4.80]***	[4.50]***
Idiosyncratic stock return in year t-2: medium industry performance	-1.155	-1.193	-1.227	-1.302
	[4.69]***	[4.87]***	[5.36]***	[5.53]***
Idiosyncratic stock return in year t-2: low industry performance	-0.787	-0.765	-0.615	-0.583
	[3.28]***	[3.14]***	[1.96]**	[1.78]*
Industry-induced stock return in year t-2	**-0.581**	**-0.695**	**-0.409**	**-0.486**
	[1.44]	**[1.65]***	**[1.06]**	**[1.25]**
CEO of retirement age		-1.216		-1.256
		[3.29]***		[3.36]***
CEO with high equity ownership		-1.217		-1.240
		[4.90]***		[4.61]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of idiosyncratic performance on CEO dismissals given high or given low industry performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1
Marginal effect if industry performance high	-1.12	-0.80	-1.30	-0.93
	[4.88]***	[6.64]***	[6.44]***	[8.30]***
Marginal effect if industry performance low	-1.71	-1.09	-1.98	-1.31
	[8.03]***	[7.70]***	[6.84]***	[6.68]***
Difference in marginal effects	0.59	0.29	0.67	0.39
	[2.10]**	[1.67]*	[2.09]**	[1.78]*
	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2
Marginal effect if industry performance high	-0.58	-0.36	-0.74	-0.48
	[4.51]***	[4.31]***	[4.80]***	[4.50]***
Marginal effect if industry performance low	-0.46	-0.29	-0.42	-0.27
	[3.28]***	[3.14]***	[1.96]**	[1.78]*
Difference in marginal effects	-0.12	-0.07	-0.32	-0.21
	[0.61]	[0.58]	[1.17]	[1.12]

Table 16
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for different levels of CEO tenure

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for differential effects of peer performance on CEO turnover if the CEO has been in office for either less than four years or for more than eight years. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.470	-2.450	-2.529	-2.531
	[9.57]***	[9.14]***	[9.38]***	[9.36]***
Industry-induced stock return in year t-1	**-2.289**	**-1.865**	**-1.666**	**-1.524**
	[6.60]* **	**[5.88]*** **	**[3.67]*** **	**[4.96]*** **
...for CEOs with tenure <= 48 months	**0.747**		**0.320**	
	[2.45] **		**[0.56]**	
...for CEOs with tenure > 96 months		**-0.649**		**-0.057**
		[1.48]		**[0.10]**
Idiosyncratic stock return in year t-2	-0.953	-0.946	-0.949	-0.945
	[6.40]***	[6.14]***	[6.38]***	[6.17]***
Industry-induced stock return in year t-2	**-0.885**	**-0.778**	**-0.814**	**-0.637**
	[1.72]*	**[2.63]*** **	**[1.85]***	**[1.84]***
...for CEOs with tenure <= 48 months	**-0.032**		**0.131**	
	[0.05]		**[0.24]**	
...for CEOs with tenure > 96 months		**-0.575**		**-0.621**
		[0.71]		**[1.00]**
CEO of retirement age	-1.198	-1.210	-1.218	-1.245
	[3.33]***	[3.44]***	[3.24]***	[3.29]***
CEO with high equity ownership	-1.225	-1.226	-1.222	-1.223
	[5.00]***	[4.96]***	[4.81]***	[4.77]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of peer-group induced performance on CEO dismissals for CEOs with different levels of job tenure

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1
Marginal effect for CEOs with tenure <= 48 months	-0.56		-0.54	
	[4.62]***		[3.23]***	
Marginal effect for CEOs with tenure > 48 months	-0.69		-0.60	
	[6.60]***		[3.67]***	
Marginal effect for CEOs with tenure <= 96 months		-0.64		-0.59
		[5.88]***		[4.96]***
Marginal effect for CEOs with tenure > 96 months		-0.63		-0.52
		[5.34]***		[2.40]**
Difference in marginal effects	0.14	-0.01	0.06	-0.08
	[1.35]	[0.08]	[0.26]	[0.40]
	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2
Marginal effect for CEOs with tenure <= 48 months	-0.33		-0.28	
	[2.19]**		[1.58]	
Marginal effect for CEOs with tenure > 48 months	-0.27		-0.29	
	[1.72]*		[1.85]*	
Marginal effect for CEOs with tenure <= 96 months		-0.27		-0.25
		[2.63]***		[1.84]*
Marginal effect for CEOs with tenure > 96 months		-0.34		-0.41
		[1.52]		[1.92]*
Difference in marginal effects	-0.06	0.07	0.02	0.16
	[0.29]	[0.36]	[0.08]	[0.78]

Table 17
Two-stage regressions of CEO *compensation* on firm and industry performance
Different pay-for-performance slopes for different levels of industry performance

The first stage regression uses equal-weighted industry stock returns to predict contemporaneous company stock returns and is reported in column (1) of Table 2. The second stage regressions shown below explain CEO compensation (ExecuComp TDC1, which includes stock and option grants as well as bonuses) and changes in CEO compensation using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for different effects of idiosyncratic performance on compensation depending on whether industry performance is in the bottom, middle, or top third of all observations. As in Jensen and Murphy (1990) and Aggarwal and Samwick (1999b), performance is specified as the dollar change in market capitalization, i.e., by multiplying both the peer and the idiosyncratic component of returns by the market value of the firm at the beginning of the year. Following Aggarwal and Samwick, we allow the pay-for-performance slopes to differ as a function of volatility by interacting the two performance components with the volatility of total firm performance (columns (1) and (2)) or separately with the volatilities of peer-induced and idiosyncratic performance (columns (3) and (4)). Volatility is measured as the cumulative distribution function (CDF) of the variance of performance for firms in the sample, measured over the prior five years. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the regressions include both CEO and year fixed effects.

Second stage regressions of CEO compensation on peer-group induced and idiosyncratic firm performance

	(1) CEO compensation in year t	(2) Change in CEO compensation	(3) CEO compensation in year t	(4) Change in CEO compensation
Idiosyncratic performance in year t: high industry performance	1.386	1.581	1.482	1.510
	[3.57]***	[3.32]***	[3.95]***	[3.28]***
Idiosyncratic performance in year t: medium industry performance	0.927	1.300	0.938	1.259
	[2.40]**	[1.92]*	[2.53]**	[1.90]*
Idiosyncratic performance in year t: low industry performance	1.072	1.849	0.950	1.956
	[2.41]**	[3.35]***	[2.14]**	[3.61]***
Industry-induced performance in year t	0.881	1.692	1.161	1.737
	[2.21]**	[3.61]***	[2.87]***	[3.58]***
Variance of total firm performance (CDF)	2145.161	-847.472		
	[4.25]***	[1.42]		
Variance of idiosyncratic firm performance (CDF)			2459.006	217.392
			[2.29]**	[0.17]
Variance of industry-induced firm performance (CDF)			-158.450	-993.956
			[0.17]	[0.84]
Idiosyncratic performance: high industry performance x Variance of performance (CDF)	-1.369	-1.555	-1.470	-1.486
	[3.47]***	[3.21]***	[3.85]***	[3.17]***
Idiosyncratic performance: medium industry performance x Variance of performance (CDF)	-0.931	-1.280	-0.943	-1.239
	[2.33]**	[1.84]*	[2.45]**	[1.83]*
Idiosyncratic performance: low industry performance x Variance of performance (CDF)	-1.064	-1.840	-0.941	-1.953
	[2.32]**	[3.27]***	[2.06]**	[3.52]***
Industry-induced performance x Variance of performance (CDF)	-0.843	-1.696	-1.128	-1.742
	[2.08]**	[3.55]***	[2.74]***	[3.53]***
Constant	3843.524	597.022	3717.783	520.766
	[11.27]***	[1.44]	[10.31]***	[1.19]
CEO fixed effects	Yes	Yes	Yes	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 18
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for founder CEOs

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for differential effects of both idiosyncratic and peer performance on CEO turnover for CEOs who are founders. A CEO is classified as a founder if her tenure starts at least five years before the firm's listing date. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.465	-2.425	-2.531	-2.486
	[9.35]***	[9.43]***	[9.46]***	[9.49]***
...for founders		-0.445		-0.631
		[0.65]		[0.90]
Industry-induced stock return in year t-1	**-1.993**	**-1.946**	**-1.523**	**-1.499**
	[6.43]* **	**[6.31]*** **	**[4.52]*** **	**[4.61]*** **
...for founders		**-0.678**		**-0.204**
		[0.94]		**[0.26]**
Idiosyncratic stock return in year t-2	-0.952	-1.002	-0.949	-0.995
	[6.34]***	[5.30]***	[6.37]***	[5.18]***
...for founders		0.42		0.36
		[0.71]		[0.56]
Industry-induced stock return in year t-2	**-0.901**	**-0.910**	**-0.759**	**-0.793**
	[2.47] **	**[2.54]** **	**[2.20]** **	**[2.30]** **
...for founders		**-0.113**		**0.703**
		[0.14]		**[0.81]**
Founder	0.202	0.214	0.247	-0.168
	[0.87]	[0.45]	[1.10]	[0.37]
CEO of retirement age	-1.217	-1.211	-1.223	-1.209
	[3.34]***	[3.32]***	[3.25]***	[3.23]***
CEO with high equity ownership	-1.239	-1.249	-1.245	-1.265
	[5.21]***	[5.20]***	[5.02]***	[5.23]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of idiosyncratic and peer-group induced performance on CEO dismissals for founders and for non-founders

	EW Industry	VW Industry
	(2)	(4)
	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1
Marginal effect for founders	-0.96	-1.14
	[3.93]***	[4.18]***
Marginal effect for non-founders	-0.79	-0.93
	[9.43]***	[9.49]***
Difference in marginal effects	-0.17	-0.21
	[0.74]	[0.82]
	Industry-induced stock return in year t-1	Industry-induced stock return in year t-1
Marginal effect for founders	-0.87	-0.62
	[3.57]***	[1.89]*
Marginal effect for non-founders	-0.63	-0.56
	[6.31]***	[4.61]***
Difference in marginal effects	-0.24	-0.06
	[1.01]	[0.21]
	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2
Marginal effect for founders	-0.19	-0.23
	[1.16]	[1.15]
Marginal effect for non-founders	-0.33	-0.37
	[5.30]***	[5.18]***
Difference in marginal effects	0.13	0.14
	[0.68]	[0.59]
	Industry-induced stock return in year t-2	Industry-induced stock return in year t-2
Marginal effect for founders	-0.34	-0.03
	[1.03]	[0.10]
Marginal effect for non-founders	-0.30	-0.30
	[2.54]**	[2.30]**
Difference in marginal effects	-0.04	0.26
	[0.17]	[0.83]

Table 19
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for CEOs with large equity stakes

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for differential effects of performance on CEO turnover for CEOs who own more than 5% (10%) of their firm's equity. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazards are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.404	-2.444	-2.458	-2.513
	[9.09]***	[9.08]***	[9.18]***	[9.15]***
...for CEOs with ownership >=5%	-0.965		-1.236	
	[1.78]*		[1.82]*	
...for CEOs with ownership >=10%		-0.66		-0.847
		[0.99]		[1.08]
Industry-induced stock return in year t-1	**-1.948**	**-1.972**	**-1.504**	**-1.510**
	[6.05]* **	**[6.39]*** **	**[4.32]*** **	**[4.50]*** **
...for CEOs with ownership >=5%	**-0.956**		**-0.479**	
	[1.80]*		**[0.79]**	
...for CEOs with ownership >=10%		**-0.986**		**-0.942**
		[1.21]		**[1.35]**
Idiosyncratic stock return in year t-2	-1.068	-1.017	-1.067	-1.008
	[5.34]***	[5.63]***	[5.25]***	[5.42]***
...for CEOs with ownership >=5%	1.014		1.077	
	[2.32]**		[2.34]**	
...for CEOs with ownership >=10%		1.038		0.929
		[1.64]		[1.16]
Industry-induced stock return in year t-2	**-0.953**	**-0.926**	**-0.804**	**-0.810**
	[2.68]* **	**[2.50]** **	**[2.41]** **	**[2.39]** **
...for CEOs with ownership >=5%	**-0.087**		**-0.346**	
	[0.06]		**[0.22]**	
...for CEOs with ownership >=10%		**-0.901**		**0.811**
		[0.56]		**[0.52]**
CEO of retirement age	-1.218	-1.242	-1.218	-1.248
	[3.35]***	[3.36]***	[3.22]***	[3.24]***
CEO with equity ownership >= 5%	-1.456		-1.657	
	[2.96]***		[3.81]***	
CEO with equity ownership >=10%		-1.067		-1.54
		[1.96]**		[2.28]**

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of idiosyncratic and peer-group induced performance on CEO dismissals for CEOs with different levels of stock ownership

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1
Marginal effect for CEOs with ownership >= 5%	-0.25		-0.28	
	[6.22]***		[5.36]***	
Marginal effect for CEOs with ownership < 5%	-0.99		-1.18	
	[9.09]***		[9.18]***	
Marginal effect for CEOs with ownership >= 10%		-0.28		-0.35
		[4.75]***		[4.24]***
Marginal effect for CEOs with ownership < 10%		-1.00		-1.20
		[9.08]***		[9.15]***
Difference in marginal effects	0.73	0.73	0.89	0.85
	[6.88]***	[6.25]***	[7.04]***	[6.08]***
	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1
Marginal effect for CEOs with ownership >= 5%	-0.22		-0.15	
	[6.22]***		[3.79]***	
Marginal effect for CEOs with ownership < 5%	-0.80		-0.72	
	[6.05]***		[4.32]***	
Marginal effect for CEOs with ownership >= 10%		-0.26		-0.25
		[3.65]***		[4.03]***
Marginal effect for CEOs with ownership < 10%		-0.81		-0.72
		[6.39]***		[4.50]***
Difference in marginal effects	0.58	0.55	0.57	0.47
	[4.39]***	[4.06]***	[3.37]***	[2.71]***

Continued

Panel B: Continued

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2
Marginal effect for CEOs with ownership >= 5%	0.00		0.00	
	[0.16]		[0.03]	
Marginal effect for CEOs with ownership < 5%	-0.44		-0.51	
	[5.34]***		[5.25]***	
Marginal effect for CEOs with ownership >= 10%		0.00		-0.01
		[0.04]		[0.11]
Marginal effect for CEOs with ownership < 10%		-0.42		-0.48
		[5.63]***		[5.42]***
Difference in marginal effects	0.43	0.42	0.51	0.47
	[4.68]***	[4.16]***	[4.64]***	[3.47]***
	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2
Marginal effect for CEOs with ownership >= 5%	-0.08		-0.09	
	[0.63]		[0.69]	
Marginal effect for CEOs with ownership < 5%	-0.39		-0.38	
	[2.68]***		[2.41]**	
Marginal effect for CEOs with ownership >= 10%		-0.16		0.00
		[0.97]		[0.00]
Marginal effect for CEOs with ownership < 10%		-0.38		-0.39
		[2.50]**		[2.39]**
Difference in marginal effects	0.31	0.22	0.30	0.39
	[2.95]***	[2.06]**	[1.99]**	[2.36]**

Table 20
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for different levels of board independence

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group and of the idiosyncratic component of company stock returns, respectively. The second stage regressions allow for differential effects of both idiosyncratic and peer performance on CEO turnover for firms with at least 50% (67%) inside directors on the board. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazards are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.156	-2.292	-2.293	-2.418
	[8.16]***	[7.31]***	[8.10]***	[7.58]***
...for boards with >=50% insiders	-0.313		-0.379	
	[0.47]		[0.56]	
...for boards with >=67% insiders		0.928		0.697
		[1.08]		[0.81]
Industry-induced stock return in year t-1	**-1.521**	**-1.739**	**-1.195**	**-1.350**
	[3.93]* **	**[4.19]*** **	**[3.11]*** **	**[3.51]*** **
...for boards with >=50% insiders	**-1.095**		**-0.817**	
	[1.27]		**[0.93]**	
...for boards with >=67% insiders		**-1.866**		**-1.571**
		[0.99]		**[0.81]**
Idiosyncratic stock return in year t-2	-1.095	-0.896	-1.148	-0.927
	[3.95]***	[5.70]***	[3.98]***	[5.50]***
...for boards with >=50% insiders	0.443		0.54	
	[0.81]		[0.99]	
...for boards with >=67% insiders		-0.669		-0.667
		[1.25]		[1.20]
Industry-induced stock return in year t-2	**-0.861**	**-0.878**	**-0.585**	**-0.645**
	[1.81]*	**[1.79]***	**[1.54]**	**[1.71]***
...for boards with >=50% insiders	**-0.241**		**-0.501**	
	[0.44]		**[0.71]**	
...for boards with >=67% insiders		**-0.645**		**-1.084**
		[0.56]		**[0.76]**
Boards with >=50% insiders	0.176		0.24	
	[0.52]		[0.68]	
Boards with >=67% insiders		0.449		0.604
		[0.81]		[0.99]
CEO of retirement age	-1.364	-1.348	-1.339	-1.335
	[2.41]**	[2.44]**	[2.19]**	[2.25]**

CEO with high equity ownership	-1.492 [3.89]***	-1.523 [4.12]***	-1.498 [3.72]***	-1.475 [3.75]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of idiosyncratic and peer-group induced performance on CEO dismissals for different levels of board independence

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1
Marginal effect for boards with >= 50% insiders	-0.86 [3.46]***		-1.16 [3.81]***	
Marginal effect for boards with < 50% insiders	-0.85 [8.16]***		-1.10 [8.10]***	
Marginal effect for boards with >= 67% insiders		-0.43 [1.33]		-0.69 [1.73]*
Marginal effect for boards with < 67% insiders		-0.86 [7.31]***		-1.10 [7.58]***
Difference in marginal effects	-0.01 [0.05]	0.42 [1.59]	-0.06 [0.20]	0.41 [1.19]
	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1
Marginal effect for boards with >= 50% insiders	-0.91 [2.88]***		-0.87 [2.39]**	
Marginal effect for boards with < 50% insiders	-0.60 [3.93]***		-0.57 [3.11]***	
Marginal effect for boards with >= 67% insiders		-1.14 [-1.90]*		-1.17 [1.46]
Marginal effect for boards with < 67% insiders		-0.65 [4.19]***		-0.61 [3.51]***
Difference in marginal effects	-0.31 [1.03]	-0.49 [0.82]	-0.30 [0.78]	-0.56 [0.72]

Continued

Panel B: Continued

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2
Marginal effect for boards with >= 50% insiders	-0.23		-0.26	
	[1.90]*		[1.80]*	
Marginal effect for boards with < 50% insiders	-0.43		-0.55	
	[3.95]***		[3.98]***	
Marginal effect for boards with >= 67% insiders		-0.50		-0.64
		[3.24]***		[3.05]***
Marginal effect for boards with < 67% insiders		-0.33		-0.42
		[5.70]***		[5.50]***
Difference in marginal effects	0.20	-0.16	0.29	-0.22
	[1.01]	[0.93]	[1.16]	[0.96]
	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2
Marginal effect for boards with >= 50% insiders	-0.38		-0.47	
	[1.75]*		[1.61]	
Marginal effect for boards with < 50% insiders	-0.34		-0.28	
	[1.81]*		[1.54]	
Marginal effect for boards with >= 67% insiders		-0.48		-0.69
		[1.54]		[1.26]
Marginal effect for boards with < 67% insiders		-0.33		-0.29
		[1.79]*		[1.71]*
Difference in marginal effects	-0.05	-0.15	-0.19	-0.40
	[0.23]	[0.41]	[0.6]	[0.69]

Table 21
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Different turnover-performance slopes for different levels of excess compensation

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The industry definitions follow the Fama and French (1997) classification into 48 industries, and the baseline hazard rates are allowed to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. The second stage regressions allow for differential effects of both idiosyncratic and peer performance on CEO turnover for CEOs with different levels of excess compensation. Excess compensation is calculated as each CEO's average residual from a regression of the log of total annual CEO compensation (ExecuComp TDC1) on log sales, log CEO tenure, stock returns in year t and t-1, value-weighted industry returns in year t and t-1, the two-year change in return on assets, year fixed effects, and industry fixed effects. All standard errors are clustered at the industry level. The baseline hazards are set to one for the marginal effects calculations in Panel B.

Panel A: Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-2.096	-2.224	-2.200	-2.279
	[6.89]***	[8.30]***	[7.35]***	[8.59]***
... times dummy for excess compensation in top 40%	-0.936		-0.865	
	[1.89]*		[1.68]*	
... times dummy for excess compensation in top 20%		-1.377		-1.430
		[2.48]**		[2.40]**
Industry-induced stock return in year t-1	**-1.706**	**-1.716**	**-1.092**	**-1.304**
	[4.66]* **	**[5.82]*** **	**[2.73]*** **	**[3.72]*** **
... times dummy for excess compensation in top 40%	**-0.789**		**-1.107**	
	[1.37]		**[2.54]** **	
... times dummy for excess compensation in top 20%		**-1.733**		**-1.228**
		[3.09]* **		**[1.93]* **
Idiosyncratic stock return in year t-2	-0.792	-0.972	-0.736	-0.938
	[3.69]***	[4.61]***	[3.37]***	[4.47]***
... times dummy for excess compensation in top 40%	-0.316		-0.461	
	[1.24]		[1.66]*	
... times dummy for excess compensation in top 20%		0.202		0.101
		[0.68]		[0.32]
Industry-induced stock return in year t-2	**-0.721**	**-0.715**	**-0.792**	**-0.751**
	[2.03] **	**[2.16]** **	**[2.29]** **	**[2.25]** **
... times dummy for excess compensation in top 40%	**-0.415**		**0.123**	
	[0.55]		**[0.21]**	
... times dummy for excess compensation in top 20%		**-0.967**		**-0.009**
		[1.40]		**[0.02]**
Dummy for excess compensation in top 40%	-0.521		-0.585	
	[2.49]**		[2.94]***	

Dummy for excess compensation in top 20%		-0.394 [1.46]		-0.766 [2.46]**
CEO of retirement age	-1.418 [3.45]***	-1.430 [3.44]***	-1.440 [3.28]***	-1.432 [3.32]***
CEO with high equity ownership	-1.431 [5.13]***	-1.423 [5.15]***	-1.439 [5.08]***	-1.425 [5.10]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B: Marginal effects of idiosyncratic and peer-group induced performance on CEO dismissals for CEOs with different levels of excess compensation

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1	Idiosyncratic stock return in year t-1
Marginal effect for CEOs with excess compensation in top 40%	-0.45 [7.06]***		-0.52 [6.78]***	
Marginal effect for CEOs with excess compensation outside the top 40%	-0.72 [6.89]***		-0.86 [7.35]***	
Marginal effect for CEOs with excess compensation in top 20%		-0.42 [6.91]***		-0.48 [6.22]***
Marginal effect for CEOs with excess compensation outside the top 20%		-0.76 [8.30]***		-0.86 [8.59]***
Difference in marginal effects	0.27 [2.31]**	0.34 [3.31]***	0.34 [2.57]**	0.38 [3.39]***
	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1	Industry-induced return in year t-1
Marginal effect for CEOs with excess compensation in top 40%	-0.37 [5.47]***		-0.37 [6.86]***	
Marginal effect for CEOs with excess compensation outside the top 40%	-0.58 [4.66]***		-0.43 [2.73]***	
Marginal effect for CEOs with excess compensation in top 20%		-0.40 [5.70]***		-0.33 [4.56]***
Marginal effect for CEOs with excess compensation outside the top 20%		-0.59 [5.82]***		-0.49 [3.72]***
Difference in marginal effects	0.21 [1.51]	0.19 [1.90]*	0.06 [0.37]	0.16 [1.12]

Continued

Panel B: Continued

	EW Industry		VW Industry	
	(1)	(2)	(3)	(4)
	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2	Idiosyncratic stock return in year t-2
Marginal effect for CEOs with excess compensation in top 40%	-0.16		-0.20	
	[6.84]***		[7.46]***	
Marginal effect for CEOs with excess compensation outside the top 40%	-0.27		-0.29	
	[3.69]***		[3.37]***	
Marginal effect for CEOs with excess compensation in top 20%		-0.09		-0.11
		[4.16]***		[4.18]***
Marginal effect for CEOs with excess compensation outside the top 20%		-0.33		-0.35
		[4.61]***		[4.47]***
Difference in marginal effects	0.11	0.24	0.09	0.24
	[1.42]	[3.13]***	[0.94]	[2.77]***
	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2	Industry-induced return in year t-2
Marginal effect for CEOs with excess compensation in top 40%	-0.17		-0.11	
	[1.64]		[1.31]	
Marginal effect for CEOs with excess compensation outside the top 40%	-0.25		-0.31	
	[2.03]**		[2.29]**	
Marginal effect for CEOs with excess compensation in top 20%		-0.20		-0.10
		[2.15]**		[1.49]
Marginal effect for CEOs with excess compensation outside the top 20%		-0.24		-0.28
		[2.16]**		[2.25]
Difference in marginal effects	0.08	0.05	0.20	0.18
	[0.51]	[0.46]	[1.29]	[1.56]

Table 22
Two-stage hazard regressions of forced CEO turnover on firm and industry performance
Observations with negative prior stock returns only

The first stage regressions use industry stock returns to predict contemporaneous company stock returns and are reported in Panel A of Table 2. Columns (1) and (2) use equal-weighted and columns (3) and (4) use value-weighted industry returns as measure of peer group performance. The second stage Cox hazard regressions shown below predict forced CEO turnover using the predicted values and residuals from the first stage regression as estimates of the peer-group component and of the idiosyncratic component of company stock returns, respectively. The hazard regressions are run for firms with negative returns (columns (1) and (3)) and firms with returns below -20% (columns (2) and (4)) over the prior 12 months only. The industry definitions follow the Fama and French (1997) classification into 48 industries. The second stage regressions allow the baseline hazard rates to differ across industries. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. All standard errors are clustered at the industry level.

Second stage hazard regressions of CEO dismissals on peer-group induced and idiosyncratic firm performance

	EW Industry		VW Industry	
	Stock returns below 0%	**Stock returns below -20%**	**Stock returns below 0%**	**Stock returns below -20%**
	(1)	(2)	(3)	(4)
	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover	Forced CEO turnover
Idiosyncratic stock return in year t-1	-3.390	-2.933	-3.420	-2.944
	[7.93]***	[4.76]***	[7.88]***	[4.94]***
Industry-induced stock return in year t-1	**-2.792**	**-2.248**	**-2.561**	**-2.168**
	[5.44]* **	**[3.21]*** **	**[4.79]*** **	**[2.87]*** **
Idiosyncratic stock return in year t-2	-0.949	-0.744	-0.923	-0.699
	[6.07]***	[4.72]***	[6.51]***	[4.38]***
Industry-induced stock return in year t-2	**-0.832**	**-0.523**	**-0.868**	**-0.680**
	[1.85]*	**[0.93]**	**[2.14]** **	**[1.27]**
CEO of retirement age	-1.326	-2.350	-1.312	-2.315
	[2.53]**	[1.94]*	[2.43]**	[1.91]*
CEO with high equity ownership	-1.249	-0.794	-1.247	-0.785
	[4.72]***	[3.35]***	[4.33]***	[3.06]***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 23
Stock price reactions around forced CEO turnovers

This table reports 3- and 5-day market-adjusted announcement returns around forced CEO turnover announcements. Average announcement returns are calculated separately for underperforming and for outperforming CEOs (i.e., CEOs with negative and positive firm-specific stock returns in the 12 months preceding the turnover, respectively), and for observations with (equal-weighted) industry stock returns above and below the median industry stock return in the sample. Firm-specific stock returns are calculated as the residuals from a regression of stock returns on equal-weighted industry stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries.

Panel A: 3-day stock price reaction around announcements of forced CEO turnovers

	Industry performance below median		Industry performance above median		
	No. of observations	3-day announcement return	No. of observations	3-day announcement return	T-test for differences in means
Outperforming CEOs (positive idiosyncratic stock return in year t-1)	29	-4.71%	28	-3.48%	0.47
Underperforming CEOs (negative idiosyncratic stock return in year t-1)	182	-1.52%	131	-1.64%	0.09
T-test for differences in means		1.28		1.14	

Panel B: 5-day stock price reaction around announcements of forced CEO turnovers

	Industry performance below median		Industry performance above median		
	No. of observations	5-day announcement return	No. of observations	5-day announcement return	T-test for differences in means
Outperforming CEOs (positive idiosyncratic stock return in year t-1)	29	-3.53%	28	-4.83%	0.45
Underperforming CEOs (negative idiosyncratic stock return in year t-1)	182	-1.60%	131	-2.17%	0.36
T-test for differences in means		0.78		1.23	