Adapt or Perish:
Evidence of CEO Adaptability to Industry Shocks

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Abstract: Prior turnover literature documents that poor performance leads a board of directors to terminate the CEO, but does not explore the underlying causes of the CEO's poor performance. Recognizing that terminated CEOs have often been successful earlier in their tenure, we conjecture that changes in a firm's business environment can cause the board to decide that the existing CEO's skills do not fit with the firm's current leadership needs. Our results suggest that CEOs struggle to adapt to shocks to industry growth, investment, competition, and globalization, and that the well-documented relation between firm performance and CEO turnover depends on these industry shocks. We also find that the relation between industry shocks and CEO turnover depends on various features of corporate governance and whether the CEO is identified as having "generalist" skills. Finally, we document that adaptable CEOs command a pay premium and that turnover among other top five executives is a complex function of industry shocks and the turnover decision regarding the CEO.

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1. Introduction

Prior turnover literature documents that various signals of poor performance, such as stock returns and earnings, lead a board of directors to terminate the CEO, but does not explore the underlying causes of the CEO's poor performance.[1] In many cases, terminated CEOs have been successful earlier in their tenure as CEO. At some point, however, the board decides that the existing CEO's skills do not match the current leadership needs of the firm, and so switches to a new CEO. The question of why these previously successful CEOs are terminated (apart from retirements or voluntary departures) remains largely unanswered.[2]

We conjecture that some previously successful CEOs are unable to adapt to changes in business conditions within the industry. If changes in industry business conditions alter a firm's leadership needs, and the board perceives the CEO's skills do not match those needs, then the CEO is more likely to be terminated. For example, assume a CEO's skills are effective in managing manufacturing activities domestically. When faced with new competitive forces that dictate a more global strategy, some CEOs may have the skills to successfully manage foreign manufacturing operations. Other CEOs, however, may have difficulty adapting their skills to match the new strategic needs of the firm, and these CEOs will face a higher probability of being terminated. We note that all CEOs can adapt to changing business conditions to some degree. The interesting question then, is whether one can identify the types of changes or "shocks" that CEO's have trouble adapting to, and identify CEOs that are more (or less) capable of adapting.

[1] See, for example, Warner et al. (1988); Weisbach (1988); Morck et al. (1989), Denis and Denis (1995), Huson et al. (2004), Jenter and Kanaan (2012); Eisfeldt and Kuhnen (2013). For a review of the earlier literature, see Brickley (2003).

[2] To ensure that our analysis focuses on CEOs that have previously achieved some degree of success managing their firm, we restrict our sample to CEOs that have been in office for at least three years.

CEO adaptability has received little discussion in the prior turnover literature. Prior work on CEO turnover is largely based on the standard principal-agent paradigm which emphasizes the role of ex post performance measures and governance mechanisms in resolving agency conflicts and terminating poor performing CEOs. Although our analysis gives consideration to such agency conflicts, our focus is on turnover stemming from poor matching between a firm's needs and their CEO's skills. A related literature on manager "style" argues that CEOs have individual-specific preferences regarding investing, financing, and organizational practices that they carry over time and from firm to firm (e.g., Bertrand and Schoar, 2003).[3] An interesting question raised by this research is whether CEOs are set in their styles, or whether they can adapt their styles to fit the firm's needs at specific points in time. In other words, are CEO styles simply preferences, or do they instead reflect constraints on the CEO's ability to effectively manage certain types of firms or within certain types of business environments? Another related literature argues that CEOs differ in terms of their "generalist" and "specialist" skill sets (e.g., Murphy and Zabojnik, 2007; Custodio et al., 2013). We expect that generalist/specialist skills may differentially affect a CEO's ability to adapt to changes in the business environment, but that the sign of this relation is unclear, ex ante, and may depend on the type of shock.

In this paper, we analyze the relation between firm-level executive turnover and changes in the firm's business environment. Consistent with empirical evidence and economic theory, we assume that boards consider expected future firm performance when making CEO termination decisions (e.g., Denis and Denis, 1995; Huson et al., 2004). Specifically, we use industry-level shocks to growth, investment, and product markets as proxies for changes in the firm's business environment. If the board perceives the CEO cannot adapt to changes in the firm's business

[3] See also Malmendier et al. (2011) and Schoar and Zuo (2011).

environment, and thus expects weakened future performance, we expect that directors are more likely to terminate the CEO. Specifically, a termination in response to an industry shock suggests that the board anticipates a decrease in future performance large enough to justify the switching cost of replacing the CEO. Alternatively, if the board anticipates that the CEO can adapt, such that the predicted decrease in future performance does not exceed the replacement cost of firing the CEO, the CEO will be retained. Thus, for industry shocks where the board expects CEOs cannot (can) adapt, we predict a positive (no) relation between the industry shock and turnover (although we also explore the possibility that the board's ability to fire a CEO is influenced by governance-related frictions).

We begin our analysis by estimating a base model of "forced" CEO turnover using determinants common in the prior turnover literature. We find results consistent with those of prior studies and, in particular, we observe the well-documented negative relations between forced turnover and both stock-price and accounting performance. We then include various measures of industry shocks in the turnover model to explore the types of changes in the firm's business environment that pose adaptability problems for CEOs. Some of our industry shocks, such as shocks to investment, R&D, and advertising, are based on key corporate practices examined in Bertrand and Schoar's (2003) analysis of CEO "styles". Other shocks, such as changes in industry competition, growth options, sales, assets, and the extent of globalization, are selected based on our reading of the literature on organizational change, as well as conjectures about innovations in corporate strategies that might cause CEO adaptation difficulties.[4]

[4] For example, see Ilinitch et al. (1996) and Markovic (2008) for reviews and discussions of literature on the demand for changes in management strategy caused by organizational change, globalization, and other structural shifts in organizations. See Parrino (1997), DeFond and Park (1999), and Fee and Hadlock (2000) for empirical evidence on CEO turnover in relation to characteristics of the product market, and Bushman et al. (2010) and Eisfeldt and Kuhnen (2013) for recent analytical evidence.

We find evidence of positive relations between CEO turnover and shocks to industry competition, investment, growth options, sales, assets, and the extent of globalization, suggesting that CEOs in our sample are, on average, perceived to have difficulty adapting to these types of shocks. We also examine how boards use observed changes in the business environment to infer whether current period performance reflects potential CEO adaptability problems. For example, consider a CEO that is currently suffering from poor performance. In deciding whether to terminate the CEO, the board will assess whether the CEO's poor performance is expected to be transitory, or instead, to persist into the future (consistent with the findings in Denis and Denis, 1995, and Huson et al., 2004). We conjecture that if poor performance occurs contemporaneously with a shock to the business environment that can pose adaptability problems, the board will place greater weight on current performance when deciding to terminate the CEO. Consistent with this hypothesis, we find that underperforming CEOs are more likely to be terminated following industry shocks, suggesting that when boards observe such shocks, they put greater weight on current period performance in the turnover decision. Further, we find that industry shocks attenuate the weight placed on prior period performance in the turnover decision. These findings are consistent with the notion that when the business environment has changed, performance in earlier periods (the current period) becomes less (more) relevant when assessing whether the CEO is a good fit. Overall our performance results suggest that industry shocks can raise a red flag regarding CEO adaptability, and can lead boards to give more weight to recent performance and less weight to prior performance when making turnover decisions.

Extending these main results, we conduct several tests documenting cross-sectional variation in the relation between industry shocks and turnover. First, we examine whether CEO entrenchment attenuates the effects of the industry shocks on turnover by shielding managers

from dismissal in response to a shock. We find that the likelihood that a CEO will be terminated following an industry shock is higher when activist investors hold a greater proportion of shares, and is lower when the CEO has longer tenure and when the CEO is also the Chairman of the Board. These findings suggest that CEO entrenchment can create frictions that make it more difficult for a board to terminate inadaptable CEOs.

We next examine whether adaptability varies with the employment background of the CEO, in particular, whether the CEO's skills appear to be more "generalist" or "specialist" in scope. We gather data on whether the CEO's prior position was at a different firm and/or in a different industry, as well as the CEO "generalist ability" index constructed by Custodio et al. (2013) using data from the CEO's resume. We find that CEOs hired from outside the firm and CEOs with greater generalist ability are more adaptable in that they are less likely to be terminated following industry shocks. Interestingly, CEOs whose prior position was in a different industry appear to be less adaptable than those hired from within the industry, suggesting that CEOs are better able to handle industry shocks when they have more experience managing firms within their own industry. We also find that CEOs with higher pay in excess of standard economic and governance/agency determinants are less likely to be terminated following industry shocks. To the extent that we have effectively controlled for other determinants of pay, this suggests that adaptable CEOs command a pay premium in the labor market relative to their peers.

Finally, we examine turnover of top management beyond the CEO by re-estimating our main specifications, but replacing CEO turnover with turnover of the non-CEO, top five executives (specifically, the four highest paid executives disclosed in the proxy statement, excluding the CEO). We show that non-CEO executives are more likely to be terminated

following industry shocks to assets, investment, sales, competition, and advertising. We also find that when the CEO is not terminated, non-CEO executives are more likely to be terminated in response to a shock to assets, investment, sales, and competition. Interestingly, however, with respect to shocks to R&D, globalization and advertising, the opposite appears to be true as the CEO's termination increases the probability of non-CEO executive turnover. These results suggest that adaptability varies with the role the executive plays within the organization, and that other executives may be terminated in response to changing leadership needs even if the CEO is not.

As a validation check of our results, we examine whether future operating performance is lower in cases where the CEO is predicted to be terminated by the board, but is not in realization. That is, our analysis suggests that certain industry shocks combined with poor performance increase the probability that a CEO will be terminated, but that in some cases, such CEOs are not terminated because of entrenchment-related frictions. In cases where the CEO is predicted to be terminated, but is not, we find that their respective firms do in fact experience lower future operating performance.

Our analyses are robust to a variety of validity checks regarding measurement of industry shocks, control variables, and research design. Overall, our results support the hypothesis that boards consider CEO adaptability when making termination decisions. Moreover, we find that boards condition their turnover decisions on not only industry shocks and poor performance, but also on whether the poor performance occurs in conjunction with industry shocks. In essence, our results document a potential omitted variable of the prior turnover literature: expected future performance, as represented by CEO adaptability. Further, we document rich cross-sectional

variation in the relation between industry shocks and executive termination, with important considerations related to CEO entrenchment, generalist ability, and the non-CEO executive team.

Our findings contribute to the literature on CEO turnover by documenting underlying causes of poor matching between firms and their CEOs. In this regard, we extend the work documenting that industry-level poor performance signals bad CEO-firm matches and predicts CEO turnover.[5] Importantly, our analysis provides potential underlying causes for firm-CEO mismatches, and also emphasizes that shocks to industry conditions, both positive and negative, can cause firm-CEO matching problems. Further, our results help inform the debate over CEO "style" by suggesting that beyond just reflecting a preference, style may impede a CEO's ability to adapt to changes in the business environment. Finally, we highlight various aspects of CEO entrenchment that attenuate the board's ability to terminate CEOs that are unable to adapt to changing industry conditions.

The remainder of this paper is organized as follows. Section 2 reviews previous literature on manager style and CEO turnover. Section 3 describes our research design. Section 4 presents our sample selection and variable measurement. Section 5 presents our results and sensitivity tests. Finally, Section 6 concludes.

2. Prior literature

2.1. "Style" and adaptability

Much of the prior literature on manager ability focuses on how a manager's idiosyncrasies, or "style", affect various firm characteristics and policies, ranging from capital structure decisions to disclosure practices. Bertrand and Schoar (2003) analyze manager fixed

[5] See Jenter and Kanaan (2012); Fee et al. (2013); Eisfeldt and Kuhnen (2013).

effects on key firm policies, such as investment and advertising. By following CEOs over time and across different firms, Bertrand and Schoar (2003) document significant manager fixed effects in relation to firm activities. Their results suggest that CEOs exhibit various styles in decision-making processes at the companies they head. However, little emphasis is placed on whether CEOs can change their styles, and in particular, whether they can adapt their styles to fit the current operating, investing, and financing needs of the firm.

Bertrand and Schoar's (2003) findings remain open to multiple interpretations with regards to CEO adaptability. One perspective is that managers specialize in one or perhaps a few areas (e.g., research and development, capital restructuring, mergers and acquisitions, etc.), and that their styles reflect those specialties. Such specialists may be unable to perform at the same, high level in other areas or in response to changing demands of the firm. In this case, the firm retains the managers best suited for the business conditions at hand, changing CEOs when business conditions dictate that a CEO with different skills or specialties might be better suited for the position at a given point in time. An opposing interpretation is that although managers show a particular style in their decision making, they are proficient working in other areas as well. These managers may have expertise in many areas, and their "style" simply reflects a particular response to business conditions (e.g., Fee et al., 2013). Such managers can adapt their style to fit the changing demands of the firm and its business environment. Further, any analysis of CEOs that move to a different firm begs the question of how the skills of the transient CEOs differ from CEOs that do not change positions. Specifically, transient CEOs may be the least adaptable CEOs, and analyses showing that such CEOs stick to a certain style may not be generalizable to the large group of CEOs that only hold one chief executive position during their career.

If the view that CEOs specialize is correct, we expect that firms select CEOs based on the "fit" between the CEO's specialized skills and the firm's current demand for those skills. If the business environment changes and the firm requires a CEO with a different set of specialized skills, the board dismisses the current CEO and searches for a replacement with expertise in the new areas of need. If the alternative view that CEOs can adapt is correct, firms should not need to replace their CEOs in response to changes in the external environment. That is, when the business environment changes, the CEO adapts her leadership style to fit the firm's current demands. Of course, it is certainly the case that all CEOs can adapt to some degree to changing business conditions. The interesting question then, is whether one can identify specific changes in the business environment, if any, that raise adaptability problems for CEOs. By examining whether CEO turnover varies in response to an array of exogenous industry shocks to investment, profitability, competition, and globalization (several of which are studied in Bertrand and Schoar, 2003), we shed light on the degree to which boards view CEOs as being adaptable.

A related literature attempts to identify some of the root causes of a manager's style. For example, Malmendier et al. (2011) consider a manager's personal history and its effect on corporate decision making. They find that a CEO's early-life experiences (e.g., serving in the military) explain systematic differences in firm activity and operations. Similarly, Schoar and Zuo (2011) document that managers who start their careers during a recession employ conservative firm policies once they become CEO. The authors note that these results suggest either that managers develop a set of skills early in their careers that carry through to later decision-making, or that managers are promoted and become successful when they have innate styles that fit the leadership needs of the time period. In sum, these papers raise the possibility that manager styles constrain the ability of CEOs to adapt to changing business conditions.

Specifically, although these papers do not provide evidence regarding whether or when CEO performance suffers due to a lack of flexibility or adaptability in management style, their arguments offer a framework for thinking about why such inadaptability might exist. We pursue this line of argument in this paper and provide evidence regarding the types of industry shocks that impede adaptability and CEO success.

We also note a connection between our work and recent literature on "generalist" and "specialist" managers. Murphy and Zabojnik (2007) propose that improvements in technology make firm-specific data easier to access, resulting in a greater, recent emphasis on general skills. Frydman (2009) alludes to enhancements in strategic analyses as another explanation for the shift in relative skill values. These papers, along with Custodio et al. (2013), argue that there is greater demand for generalist skills than for specialist skills and find evidence consistent with this conjecture; that is, executive compensation increases with generalist skills relative to firm-specific skills (where, for example, in Custodio et al. (2013), generalist skills are measured based on the number of positions the executive has held, the number of firms at which the executive has worked, and the number of industries in which the executive has worked). Skill is undoubtedly multidimensional. With respect to the specific dimension of interest in this paper, manager adaptability, we consider the possibility that CEOs whose backgrounds suggest that they are "generalists" are better prepared to adapt to shocks to the firm's business environment than CEOs whose backgrounds suggest that they are "specialists."

2.2. CEO turnover and adaptability

Previous literature documents numerous performance determinants of turnover, with several papers documenting the expected negative relation between turnover and both firm-level stock returns and accounting returns (e.g., Warner et al., 1988; Weisbach, 1988; Engel et al.,

2003). The intuition for these results is straight-forward: poor firm-level performance suggests a poor firm-CEO match and therefore predicts termination of the CEO. However, there is mixed evidence of this result at the industry-level (e.g., Morck et al., 1989; Jenter and Kanaan, 2012; Eisfeldt and Kuhnen, 2013).[6] Morck et al. (1989) provide evidence that although boards terminate CEOs that perform poorly relative to industry peers, boards appear to have difficulty terminating CEOs when the overall industry is performing poorly. Eisfeldt and Kuhnen (2013) argue that industry-level poor performance signals bad firm-CEO matches and greater turnover. They provide both analytical and empirical evidence consistent with this prediction. Our analysis of the relation between exogenous industry shocks and CEO turnover also provides perspective on why boards might fire CEOs for outcomes beyond their control. Our evidence provides insight into the types of changing industry conditions that can drive poor performance and the demand for CEOs with different skills. Importantly, our analysis of changing industry conditions differs from the emphasis on poor industry performance in Morck et al. (1989) and Eisfeldt and Kuhnen (2013). Because both increases and decreases in industry-level variables can represent changing industry conditions, we do not make ex ante predictions regarding whether a given change in conditions is "good" or "bad" from the perspective of a given firm's CEO leadership skills (although in supplementary analysis, we do explore whether our results differ for positive and negative industry shocks).

Our objective is to open the "black box" of the performance-turnover relation and to develop an understanding of why and when historically successful CEOs begin having difficulty managing the firm. In other words, what causes a historically successful firm-CEO match to

[6] Among others, Engel et al. (2003) and Fee et al. (2013) find evidence that the board's turnover decision filters out industry performance. Jenter and Kanaan (2012) investigate the relation between peer performance and turnover and provide evidence that, contrary to prior expectations, boards include peer performance in their decision to fire a CEO, even though it is seemingly beyond the manager's control. Bushman et al. (2010) find a similar result.

become a bad firm-CEO match? Further, we consider not only how the board uses recent performance to evaluate the CEO, but also how the board uses information about changes in the business environment to develop expectations about the CEO's *future* performance (which is presumably of critical importance when deciding whether to incur the costs of terminating the CEO). Some earlier studies have noted the importance of this issue. For example, Wiersema and Bantel (1993) argue that CEOs have difficulty adapting to "environmental" instability. In a sample of 85 large firms, Wiersema and Bantel (1993) find that changes in industry size and the number of industry participants tend to destabilize the firm-CEO match and lead to greater turnover.

Our analysis is also related to prior literature that discusses determinants of turnover beyond firm performance. For example, Huson et al. (2004) analyze cross-sectional differences in firm performance around CEO turnovers as a function of corporate governance variables. They document that certain governance structures, such as low institutional ownership and a low percentage of outside directors on the board, create frictions that reduce the probability that turnover decisions result in performance improvements. Bushman et al. (2010) introduce "talent risk," defined as uncertainty about a CEO's talent level, as a determinant of CEO turnover. They find a positive relation between talent risk and CEO turnover and infer that when boards are more certain about a CEO's talent level, they are less likely to fire the CEO, thereby avoiding the costs of hiring a replacement with an uncertain talent level. We incorporate these papers into our analysis by controlling for talent risk and by considering how CEO entrenchment influences turnover decisions in the context of CEO adaptability.

3. Research design

To test for CEO adaptability, we estimate the relation between forced CEO turnover and industry shocks, controlling for other determinants of turnover. We begin by estimating the probability of forced CEO turnover (*Turnover*) as a function of a standard set of economic determinants:

$$Turnover = \alpha + \gamma\ Controls + \varepsilon \quad (1)$$

Following prior research (e.g., Warner et al., 1988; Weisbach, 1988; Parrino, 1997; Murphy, 1999; and Huson et al., 2001), we include the natural log of market value of equity at the end of the year (*Size*), the ratio of market value to book value of assets at the end of the year (*MB*), earnings before extraordinary items scaled by beginning of period assets and adjusted for the industry mean (*ROA*), current and prior period stock returns in excess of the equal-weighted industry return (*Return* and *LagReturn*), and the age of the CEO (*Age*). Additionally, following DeFond and Park (1999) and Bushman et al. (2010), we include the standard deviation of residuals from a regression of monthly stock returns on the equal-weighted market return and the equal-weighted industry return (*Volatility*), and the sum of squared market shares of all firms in the industry (*Competition*).[7] We next include each respective industry shock in the model.

$$Turnover = \alpha + \gamma\ Controls + \beta\ Shock + \varepsilon \quad (2)$$

We estimate this model separately for each industry shock. Because the shock variable takes the same value for all firms in a given industry-year, we base inferences on standard errors clustered by industry and year, which allows for arbitrary within-industry and within-year dependence (Petersen, 2009).

[7] Inferences are robust to not industry-adjusting accounting and stock performance and to industry-adjusting using value-weights rather than equal-weights. In untabulated analysis, we include additional lags of *ROA* but find them to be insignificant.

We consider industry-level shocks to eight firm characteristics and policies defined in Appendix A and discussed further in Section 4.2: assets, market-to-book assets, investment in capital expenditures, research and development expenditures, sales, industry competition, globalization, and advertising expenditures (the latter being a proxy for a shock to industry-level customer development). Some of these shocks, such as capital expenditures, R&D, and advertising, are selected from the key corporate practices in Bertrand and Schoar (2003). The other shocks are based on our reading of the literature on organizational change (e.g., Ilinitch et al., 1996; Markovic, 2008) and our conjectures as to potential industry-level shocks to corporate strategies that may require CEOs to take adaptive actions.

We hypothesize that if a CEO cannot adapt to an industry shock, the board will revise its expectation about future firm performance downward and, for a sufficiently large downward revision, will ask the CEO to leave or will terminate her. Importantly, because stock returns capture both expected future performance and expected turnover, even in the absence of information asymmetry between the board and the stock market, current stock returns will not reflect the downward revision in the board's expectations. Thus, if the board perceives the CEO cannot adapt to the shock, we expect a positive relation between turnover and the industry shock incremental to current period performance. Accordingly, estimating equation (2) separately for each shock allows us to identify the industry shocks to which boards believe CEOs have difficulty adapting (i.e., the shocks with positive coefficients).

While estimating equation (2) using a pooled sample is consistent with prior research, it cannot identify whether the effect of industry shocks comes from explaining variation in turnover across industries (cross-sectional variation) or variation in turnover within an industry (time-series variation). To assess whether industry shocks explain time-series variation in

turnover within an industry, we estimate equation (2) including industry fixed effects.[8] Industry fixed effects also control for the fact that industries will differ with respect to what constitutes a normal or routine change to these shock variables.

4. Data and variable measurement

4.1. Sample

Our sample covers the years from the start of ExecuComp, 1992, through 2008.[9] We restrict our sample to CEOs who have been in office a minimum of three years and exclude financial firms (SIC codes 6000 to 6999) and utilities (SIC codes 4900 to 4942). By using a minimum tenure of three years, we avoid situations of companies headed by an interim CEO while the board searches for a long-term replacement, thus restricting ourselves to those CEOs that the board originally considered a good match for the company's needs.

We also require financial statement information from Compustat and data on CEO pay and CEO age from ExecuComp. In some cases where CEO age is missing from ExecuComp, we hand-collect the age from proxy statements and company websites. We also hand-collect data on whether the CEO was promoted internally or hired from outside the firm, and in the case of the latter, the CEO's prior employer. Our data for the control variables are collected from a combination of the Compustat, ExecuComp, and CRSP databases. All the data are winsorized at the 1% and 99% levels. In total, this results in a sample of 13,878 firm-year observations with the requisite information.

[8] Inferences are unaffected if we estimate equation (2) using firm fixed effects rather than industry fixed effects. Because non-linear probability models, such as probit and logit regression, cannot accommodate a large number of fixed effects we estimate equation (2) using a linear probability model.

[9] The sample ends in 2008 because the coding of our primary turnover variable (*Turnover*) requires data on the employment of the CEO in years t+1 and t+2, and in our tests of future operating performance, we require future performance data for up to three years after the termination year.

4.2. Variable measurement

4.2.1. Industry-level shocks

As discussed above, we approach the CEO retention decision within the context of a matching problem, where the firm's needs are matched to CEOs with appropriate skill sets. In this paradigm, any "shock" to industry business conditions that alters the firm's needs could perturb the match and result in CEO turnover. We define industries according to the Fama-French 48 industry groups classification and calculate each industry shock by first aggregating the respective firm-level variable to the industry-level.[10] We measure a shock as the absolute percentage change in the industry average from one fiscal year to the next. In other words, the shocks are defined as the absolute value of the percentage change in the industry mean between year t–1 and year t.[11] A distinguishing feature of our predictions is the focus on industry changes without regard to whether the changes are "good" or "bad", i.e., unsigned industry shocks. For example, both a large decrease and a large increase in industry investment indicate a change in business conditions, and thus under the matching paradigm could perturb the firm-CEO match and give rise to turnover. In subsequent analyses, however, we separately examine increases and decreases in the respective industry-level shocks.

Our eight industry shocks are defined as follows: *Assets* is the change in industry assets; *MB* is the change in industry market-to-book assets ratio (as a proxy for growth options);

[10] We require at least ten firms per industry-year. We also consider industry groups based on the Fama-French 12 industry group classification and two digit SIC codes. We find similar results with both approaches, but tabulate results using the 48 industry groups, as the 12 industry groups remove variation in the industry shocks, and the two digit SIC groups are often sparsely populated.

[11] Since ExecuComp firms are often among the largest few firms in each of the 48 industry groups, we calculate industry means using equal-weights rather than value-weights. Calculating the shocks using value-weights would result in the large sample firms having greater influence on the measure of the industry shock, making the shock more likely to be influenced by actions of the managers in our sample, and less likely to be exogenous. Nevertheless, in untabulated analysis, we find that inferences are robust to calculating the mean using value-weights. Results are also robust to computing the shocks using a three-year industry average, rather than a one-year average.

Investment is the change in industry capital expenditure; *R&D* is the change in industry research and development expense; *Sales* is the change in industry sales; *Competition* is the change in the Herfindahl index of industry concentration; *Globalization* is the change in industry U.S. sales-to-total sales ratio; and *Advertising* is the change in industry advertising expense.[12]

4.2.2. CEO turnover

We define total CEO turnover (*TotalTurnover*) as having occurred if the executive listed as CEO in ExecuComp in year *t* is not listed as CEO in either *t*+1 or *t*+2. We use a two-year turnover period to account for the varying amounts of time boards might take to decide whether to release a CEO based on a specific year's information.[13] Formally, *TotalTurnover* is an indicator variable equal to 1 if the CEO in year *t* turns over in year *t*+1 or *t*+2, and zero otherwise. Using *TotalTurnover* as a starting point, we then define *Turnover* as an indicator variable equal to 1 for forced turnover events in year *t*+1 or *t*+2, and zero otherwise. The forced turnover measure is our main construct of interest in the tests. Figure I shows a time line of our shock and turnover variable measurement.

We distinguish between forced and non-forced CEO turnover using the classification scheme described in Parrino (1997) and updated by Bushman et al. (2010). Specifically, CEO turnover events are first identified using Standard & Poor's (S&P) ExecuComp database for the time period 1992–2010. The Factiva news database is then searched for details about the turnover and each CEO turnover is classified as forced if the news announcement reports that the

[12] Our primary analysis uses continuous measures of industry shocks. In untabulated analysis, we assess the sensitivity of our results to using discrete measures of the absolute value shock variables, specifically by estimating our specifications with four indicator variables for shocks in the 2nd, 3rd, 4th, or 5th quintile (using the 1st quintile as the base group). Consistent with a loss in information from using discrete rather than continuous measures, we find similar but somewhat weaker inferences when using this approach. When we repeat this test on signed shocks, we generally find that the results are stronger for the quintile #1 and #5 partitions (although there is some variation across the shock variables).

[13] Inferences are robust to defining turnover relative to year *t*+1 only.

CEO is fired, demoted, retires, or resigns under questionable circumstances (e.g., policy differences, pressure, lawsuits). Cases where the CEO retires at age below 60 are also classified as forced if the article does not report the reason as death, poor health, or the acceptance of another position. CEO turnovers due to death, mergers, or spinoffs are excluded from the analysis.

The standard classification scheme for forced turnover used in prior literature is based on the disclosed reason for the CEO leaving. However, following poor firm performance or an industry shock to which the CEO cannot adapt, the board may first offer the CEO the opportunity to resign (e.g., to preserve her reputation, or as a bargaining tool for a smooth termination). In such a case, the listed reason for resignation may appear voluntary (e.g., "to pursue other interests", or for "family reasons") even though the turnover was performance-related. We attempt to incorporate these seemingly voluntary, forced turnovers into our analysis by coding turnovers that occur within two years after severe negative stock price performance as forced, regardless of the stated reason for departure. We define severe negative performance as industry-adjusted stock returns in the bottom quartile of the sample, which equates to annual year *t* industry-adjusted returns of less than –26% in our data.

For illustrative purposes, we discuss two illustrations of forced CEO turnover that are explicitly linked to the shocks we examine in our analyses. In 1993, the steel industry (Fama-French industry = STEEL) experienced large positive shocks to the market-to-book ratio and investment well above the 75th percentiles in our sample (increases of 31.90% and 25.23% respectively). In a profile of the industry, the EPA Office of Compliance (1995) summarizes these developments:

> *"After years of collapsing markets, bankruptcies, mill closings and layoffs, the steel industry experienced a turnaround in 1993. […] This increase in demand is due in part to the weak*

dollar [… and] to a strong demand from the steel industry's two largest customers - the automotive and construction sectors."

Subsequently, four out of the twelve steel industry CEOs in our sample were forced out in the following two years. In many cases press coverage of these turnovers reference the inadaptability of the outgoing CEO. For example, McKenna (1993) describes the change in leadership at Alcan Ltd.

"Alcan Aluminium Ltd., suffering through the worst slump in its history, is shuffling its top brass in a move aimed at becoming 'a really low-cost producer.' Headlining the sweeping management shakeup announced yesterday, chief executive David Morton, who turns 64 next month, will give up his CEO post in November, a year earlier than planned. […] Mr. Morton and Mr. Bougie [his successor] differed on the best way to cope with low aluminum prices, a flood of cheap Russian aluminum on world markets and the global recession."

Another illustration comes from the computers industry in 1997 (Fama-French industry = COMPS), which experienced a large positive shock to the market-to-book ratio well above the 75th percentile (increase of 33.15%). This substantial increase in growth options appears to be driven primarily by the "new" market for home computers. As Markoff (1997) summarizes the state of the industry:

"Figures from both Dataquest Inc. and the International Data Corporation indicate that the personal computer industry grew by about 16 percent worldwide during this year's first quarter...Compaq Computer remains the world leader in PC sales, the latest figures show that struggling Apple Computer has fallen from the global top five PC makers for the first time...the top five computer makers for the quarter on a worldwide basis were Compaq, I.B.M., Dell, Packard Bell-NEC and Toshiba. Both [Dataquest and International Data] noted the remarkable strength of Dell Computer, which does not sell through retail sales channels as do other leading computer makers like Compaq, I.B.M., and Packard Bell-NEC. Dell has traditionally sold personal computers only via telephone, mail order and directly to corporations, and, in the last year, the computer maker has been one of the most aggressive to develop the World Wide Web as a method of selling directly to Internet-savvy consumers."

Six of the twenty-two computer-industry CEOs in our sample firms were forced out in the following two years, and in many cases press coverage of these turnovers references the inadaptability of the outgoing CEO. Among these executives is Eckhard Pfeiffer, former CEO of

Compaq Computer Corporation. Babineck (1999) explicitly links Pfeiffer's departure to difficulties adapting to the low prices of PCs and the accompanying industry growth noting that,

> *"Pfeiffer, the executive who built Compaq into the world's largest personal computer maker, has struggled to maintain profits while PC prices are plummeting. […] 'We think the increasing complexity and changes in our business have required a change in leadership,' [Compaq] chairman Benjamin M. Rosen said in an interview Sunday."*

We acknowledge that our selection of industry settings and illustrations are non-random, but we view these cases primarily as descriptive and designed to illustrate that the phenomenon we document is occurring in practice. Whether CEO adaptability factors into turnover decisions beyond these illustrations is the focus of our formal statistical tests.

4.3. Descriptive statistics

Table 1 presents the descriptive statistics for our sample. Panel A shows that the mean CEO turnover rate (*TotalTurnover*) is 24%, and the mean forced turnover rate (*Turnover*) is 10%. Noting that our turnover measure is a two-year construct, these turnover rates are in line with prior research. For example, Bushman et al. (2010) report a mean one-year forced turnover rate of 4.67% between 1992 and 2005.

Mean (median) CEO tenure is 9.74 years (7 years).[14] With regard to the employment history of the CEO, 68% of the sample hold the position of chairman (*IsChair*), 25% were hired directly into the CEO position from another firm (*External*), and 27% came from a different industry than the firm's current industry (*NewInd*).[15] *ExcessPay* is the residual from a regression of total annual pay on governance and economic determinants, and is mean zero by construction. Table 1, Panel B shows the sample statistics for our industry shocks. For many of the shocks, the

[14] Note that mean tenure is not simply the reciprocal of the *TotalTurnover* rate because we measure turnover over a two year period.

[15] The *NewInd* figure includes approximately 4.82% of the sample where the CEO was promoted from within the firm, but prior to their promotion the firm operated in a different industry.

mean value approaches the 75th percentile, which indicates the distribution of these variables is right skewed, and is consistent with these variables measuring shocks to various industries (recall these variables are absolute values).[16]

Table 2 reports Spearman and Pearson correlations among industry shocks, and between our control variables and industry shocks. In Panel A, we find that the industry shocks primarily have low correlations with each other. In contrast to the other shocks, *Assets* has a relatively high correlation with *Investment* and *Sales* (Pearson correlations of 0.44 and 0.71, respectively). Panel B shows that the correlations between firm characteristics and industry shocks are generally small.

5. Results

5.1. Industry shocks and CEO turnover

The results from estimating equation (2) are shown in Table 3. Panel A presents results from a pooled regression, and Panel B presents results of regressions that include industry fixed effects. Panel A suggests that the signs of the coefficients on our control variables comport with those of the prior literature. In particular, we find a significant negative relation between CEO turnover and current and prior period stock performance, indicating that better performing CEOs are less likely to be terminated (e.g., Weisbach, 1988; Denis and Denis, 1995; Huson et al., 2004), a positive relation between industry competition and turnover, indicating greater forced turnover in more competitive industries (e.g., DeFond and Park, 1999), and a positive relation

[16] In untabulated analyses, we follow Belsley et al. (1980) and assess the robustness of our findings to outliers by excluding observations whose studentized residuals are greater than three in absolute value. We find that inferences are unaffected.

between volatility and turnover, indicating more forced turnover when there is greater uncertainty (e.g., Bushman et al., 2010).

Among the eight industry shocks we study, Panel A suggests that shocks to assets, market-to-book, investment, R&D, sales, competition, and globalization have positive and significant effects on CEO turnover. In Panel B, we include industry fixed effects in the model such that the coefficients on industry shocks are based on within-industry, time-series variation, rather than between-industry, cross-sectional variation. The fixed effects specification gives consideration to the likely case that shocks of a given magnitude might be common in one industry but less common in other industries. The results in Panel B are similar to those in Panel A, with shocks to assets, investment, sales, and globalization having positive and significant effects on turnover, even in the presence of industry fixed effects. In terms of economic magnitudes, after controlling for performance and other characteristics of the firm, we find the three shocks with the largest incremental effect on forced turnover are *Assets*, *Sales*, and *Globalization*: moving from the lowest decile to the highest decile of each of these shocks is associated with an increase in probability of forced turnover of 1.4%, 1.7%, and 2.0%, respectively. These magnitudes can be compared to the 10% unconditional probability of forced turnover that we observe in our sample (effects of the remaining shocks on the probability of forced turnover vary in size between 0.7% and 1.1%).

5.2. Effect of industry shocks on the relation between turnover and performance

We further explore the turnover-shock relation by investigating how industry shocks alter a board's assessment of whether a CEO's current period performance is expected to persist into the future. We expect that in the presence of an industry shock in year *t*, the board will place less weight on prior period performance (year *t-1*) and more weight on current period performance

(year *t*). The intuition for this prediction is that an industry shock is likely to focus boards on whether and how their CEO is adapting to the shock. Because business conditions have changed, CEO performance in prior periods (the current period) becomes less (more) relevant to whether the CEO will be able to successfully lead the firm forward. To test these predictions, we interact both current period stock return (year *t*) and prior period stock return (year *t*–1) with our industry shocks. Specifically, we estimate:

$$Turnover = \alpha + \gamma\ Controls + \beta\ Shock + \varphi_1\ Return*Shock_t + \varphi_2\ LagReturn*Shock + \varepsilon \quad (3)$$

where all variables are as previously defined.[17] Because prior research finds that current and prior period performance are negatively related to the probability of turnover, we predict $\varphi_1 < 0$ (more negative weight on current period returns in the presence of the shock) and $\varphi_2 > 0$ (less negative weight on lagged returns in the presence of a shock).[18]

Table 4 presents results from estimating equation (3). As predicted, we find that several industry shocks are associated with greater sensitivity of forced CEO turnover to current period stock price performance and lower sensitivity of turnover to prior period performance.[19] Specifically, we find that shocks to assets, investment, R&D, and sales are associated with larger negative weight on current-period stock performance, and that shocks to assets, investment, and sales are associated with smaller negative weight on prior period stock performance. Interestingly, industry shocks to market-to-book are associated with smaller weight placed on

[17] In addition to interacting the industry shock with stock price performance, in untabulated analysis, we also interact the shock with accounting performance. We find that the interaction with accounting performance is not incrementally significant to the interaction with stock performance.

[18] Throughout the paper, we estimate all models using a linear probability model so that coefficients on interaction terms can be directly interpreted as marginal effects. See Ai and Norton (2003) for econometric issues associated with interpreting the coefficient on interaction terms in non-linear models. Inferences are robust to using probit regression.

[19] We do not draw inferences on the main effects of the industry shocks in the presence of the interaction terms. To properly calculate the total effect of *Shock* on turnover in the presence of interactions, the partial derivative of the equation with respect to *Shock* must be evaluated at a specific level of the interacted variables.

both current-period and prior-period returns, suggesting that boards reduce emphasis on stock price performance in turnover decisions when the industry has experienced a shock to growth opportunities. The remaining shocks (e.g., competition, globalization and advertising) are unrelated to the sensitivity of turnover to current and prior period stock performance. Collectively, the evidence suggests that boards place more weight on performance that is contemporaneous with certain shocks and less weight on performance prior to that shock.

5.3. Governance and the effect of industry shocks on CEO turnover

Prior turnover literature documents a negative relation between turnover and entrenchment, with more entrenched CEOs being able to shield themselves from termination by the board or interested shareholder groups. We expect a similar logic holds for turnover in response to an industry shock, with entrenchment serving as a friction that makes it more difficult to oust a CEO that is not able to adapt to an industry shock. To test for this effect, we explore proxies for CEO entrenchment and follow a regression design similar to Table 4. Specifically, we consider three measures of entrenchment that are prominent in the literature and interact them with the industry shocks in our turnover regressions: the fraction of shares controlled by activist institutions (*Activists*), CEO tenure in years (*Tenure*), and an indicator for whether the CEO is also board chair (*IsChair*). We estimate the following specification:

$$Turnover = \alpha + \gamma\ Controls + \delta\ Governance + \beta\ Shock + \varphi\ Shock * Governance + \varepsilon \quad (4)$$

where *Governance* is a vector of governance/entrenchment variables consisting of *Activists*, *Tenure*, and *IsChair*, as defined in Appendix A.[20]

[20] In untabulated analyses we also consider the percentage of shares owned by all institutional investors (as opposed to just activist investors) and the percentage of shares owned by the CEO. We find insignificant coefficients on the additional interaction terms.

Since activist investors can pressure the board to fire the CEO if it is apparent the CEO is not well suited for the changing business environment, we expect the effect of industry shocks on CEO turnover to be larger when activists own more shares. However, if activist investors seek out firms where the CEO is adaptable to new business conditions, the relation between industry shocks on CEO turnover may be weaker when there are more activist investors.

Regarding tenure, if longer tenure allows the CEO to become entrenched and makes it costlier for the board or shareholders to oust her, then we expect forced turnover of CEOs with longer tenure is less sensitive to industry shocks. A similar relation could be observed, however, if tenure serves as an indirect proxy for adaptability. That is, adaptable CEOs may be more likely to survive through a long tenure, which in many cases will have been exposed to a variety of industry shocks. On the other hand, if long-tenured CEOs become accustomed to certain practices or set in their ways, then they are perhaps less adaptable to changes in the industry, and their turnover may be more sensitive to industry shocks.

Finally, we examine CEO-chairman duality, which is often used in the governance literature as a measure of entrenchment (e.g., Larcker et al., 2011). Consistent with prior work, a CEO that is also Chairman of the Board may be more difficult to remove, in which case we would expect the turnover of CEO-chairmen to be less sensitive to industry shocks.

Table 5 presents results from estimating equation (4). The results suggest that the presence of activist investors increases the probability of forced CEO turnover in response to industry shocks in assets, investment, sales, competition, and globalization. These results are consistent with activist investors having the ability to pressure the board to terminate the CEO if it is apparent she is not suited for the post-shock business environment. We also find that the sensitivity of forced CEO turnover to industry shocks to assets, R&D, and globalization is

weaker when the CEO has greater tenure. These results are consistent with the notion that a longer tenure entrenches the CEO and shields the CEO from industry shocks, or alternatively that CEOs are able to achieve longer tenure when they are more adaptable. Finally, with respect to CEO-chair duality, we find that the forced turnover of CEO-chairs is less sensitive to industry shocks related to investment and competition (interestingly, CEO-chairs are more likely to be terminated following shocks to industry growth opportunities, as proxied by the market-to-book ratio). Collectively, we interpret these results as suggesting that entrenchment shields CEOs from turnover, even when they are perceived to be inadaptable to a specific industry shock (recognizing, however, that alternative interpretations may exist for some of these findings).

5.4. Generalist/specialist CEOs and the effect of industry shocks on CEO turnover

We next examine the effect of generalist ability on the relation between industry shocks and forced turnover. Specifically, we estimate equation (4), but interact the shocks with proxies for generalist ability rather than entrenchment. Following prior literature, we construct proxies for whether the CEO is a "generalist" or "specialist" using indicator variables for whether the CEO was hired directly from outside the firm (*External*), and whether the CEO's prior position was in a different industry (*NewInd*). CEOs that have experience managing multiple firms and/or firms in multiple industries are argued to more likely be generalists. We also examine Custodio et al.'s (2013) index of generalist ability (*GAIndex*), which is constructed by conducting principal component analysis on five proxies for general managerial ability gleaned from the CEO's resume. The generalist ability proxies are CEO career characteristics, such as the number of and types of positions held by the CEO, as well as the number of firms and industries for

which the CEO has worked. The final index is increasing in the extent to which the manager is thought to be a generalist.[21]

Whether generalist ability gives managers an advantage in adapting to industry shocks is an empirical issue. If adapting to industry shocks requires broad expertise, then generalists may fare better in responding to certain types of shocks. If instead, adapting to industry shocks requires a deep understanding of the particular firm being managed and of the particular industry in which the shock has occurred, then specialists may fare better in handling certain types of shocks.

Table 6 presents results from estimating the interaction effect of generalist ability on the relation between industry shocks and forced CEO turnover. Panel A reports results using *External* and *NewInd* as indictors of generalist CEOs. First, consistent with external hires being generalists, and generalists being better able to adapt to industry shocks, we find that external hires are less sensitive to industry shocks to assets, investment, sales, competition, and globalization. However, we also find that a CEO whose prior position was in a different industry is *more* sensitive to industry shocks to assets, investment, sales, and globalization. These results suggest that detailed industry knowledge may help CEOs adapt to shocks within their industry, and highlights that the notion of a generalist CEO is related to, but is not the same as, the notion of an adaptable CEO.

Panel B reports results using Custodio et al.'s (2013) index of generalist ability (*GAIndex*). Consistent with the results in Panel A, we find that the sensitivity of forced CEO turnover to industry shocks to assets, investment, and sales is smallest when the CEO has a higher generalist index score. The evidence in Table 6 suggests that generalist CEOs may be

[21] Data on the generalist ability index are from Claudia Custodio's website.

better able to adapt to industry shocks related to assets, investment, and sales, but that this ability may stem more from experience managing multiple firms rather than experience managing firms across industries.

As a further exploration into how CEO ability influences adaptability, we examine whether CEOs that receive a pay premium (i.e., compensation above that explained by standard economic determinants) are more adaptable. As noted in Section 2.1, prior literature documents that generalist CEOs receive greater compensation than specialists (e.g., Murphy and Zabojnik, 2007; Custodio et al., 2013). Of course, a CEO pay premium could proxy for a variety of skills (beyond simply being a generalist) that are helpful in adapting to various strategic shocks, and therefore, we do not wish to over interpret the source of a CEO's pay premium. We also note that another explanation for high CEO pay is the presence of agency problems, including entrenchment (e.g., Core et al., 1999), and that as discussed above, more entrenched CEOs are less likely to be terminated in response to industry shocks. We attempt to control for this competing interpretation of a pay premium by including our entrenchment variables as determinants of the expected level of CEO pay. We recognize, however, that our ability to rule out this explanation is limited by the difficulty in constructing proxies for CEO entrenchment.

Table 7 presents results examining the relation between "excess" CEO pay, *ExcessPay*, and the sensitivity of forced CEO turnover to industry shocks. *ExcessPay* is the residual from a regression of the logarithm of one plus total CEO flow pay on *Size*, *MB*, *ROA*, *Return, Activists, Tenure,* and *IsChair.* If adaptable CEOs command higher wages, we expect a negative relation between "excess" CEO pay and the sensitivity of turnover to industry shocks. We find that greater CEO pay is associated with lower turnover sensitivity to industry shocks relating to assets, investment, sales, and globalization. This evidence is suggestive of higher paid CEOs

being better able to adapt to certain industry shocks. Although beyond the scope of our analysis, the results in Table 7 raise the question of whether CEO adaptability commands a pay premium in the labor market, and whether any such pay premium is distinct from the premium documented previously for generalist CEOs.

5.5. Industry shocks and non-CEO top management turnover

We next consider the possibility that the effect of industry shocks on executive turnover is not confined to CEOs, but rather may also influence non-CEO, top management turnover. Previous literature documents` that non-CEO management turnover is a function of the circumstances under which the CEO departs. For example, Hayes et al. (2006) documents that non-CEO management turnover increases when a CEO departs and that such turnover varies with the tenure of the departing CEO. Fee and Hadlock (2004) document a similar increase in non-CEO turnover around CEO departures and also find that such turnover is greater when the incoming CEO is an outsider (Shen and Cannella, 2002 document a similar finding).

To explore non-CEO turnover in response to industry shocks, we re-estimate equation (2), but using as a dependent variable the turnover of non-CEO, top five executives (i.e., the four highest-paid executives, excluding the CEO). Because of data constraints, such as the large number of non-CEO turnovers and the spotty public disclosures of such terminations, we are unable to accurately identify forced turnover for non-CEO terminations.[22] Our measure of top management turnover, *TurnoverTop5* is an indicator variable equal to one if one of the top five

[22] As robustness, we constructed a "quasi" forced turnover measure constructed as a function of recent stock performance. Specifically, we defined forced turnover for non-CEO managers equal to 1 if a non-CEO executive turns over ***and*** industry-adjusted stock returns are in the bottom quartile of the sample, and 0 otherwise. The results using this turnover measure are largely consistent with the current Table 8, with the coefficients on assets, market-to-book, investment, R&D, sales, and advertising remaining significant (but no longer obtaining significant results for shocks to competition and globalization).

officers other than the CEO is listed on ExecuComp in year *t* and not listed on ExecuComp in either year *t+1* or *t+2*, and equal to 0 otherwise.[23]

In addition to exploring the simple relation between non-CEO turnover and industry shocks, we also include CEO turnover (*Turnover*) as a control, and interact CEO turnover with the industry shock. This analysis allows us to explore the adaptability of non-CEO executives to industry shocks, and whether these executives have difficulty adapting to the same types of industry changes as do CEOs. Further, based on prior literature, we also include controls for CEO tenure (*Tenure*) and a proxy for an internal successor (*InternalAppt*), which the cited literature shows are correlated with non-CEO management turnover.[24]

Table 8 presents results from estimating the relation between industry shocks and non-CEO, top management turnover. Similar to our results for CEOs, we find that non-CEO executives are more likely to turn over following shocks to assets, investment, sales, and competition. However, in contrast to our CEO findings, shocks to advertising significantly increase the probability of turnover for non-CEO executives. Our model specification also allows the effect of the shock on turnover among non-CEO executives to vary with whether the CEO was terminated. The results in Table 8 suggest that if the CEO was (was not) forcibly terminated, non-CEO executive turnover is generally less (more) sensitive to industry shocks to assets, investment, sales, and competition, but more sensitive to industry shocks to R&D, globalization, and advertising.

[23] Because a decline in an officer's pay can drop the officer from the top five even when the officer remains with the firm, our non-CEO turnover measure is noisy.

[24] Our proxy for internal successor (*InternalAppt*) is based on the identity of the CEO listed on ExecuComp in the year following the turnover, and whether that executive was previously listed as a top five officer of the firm. We do not distinguish between interim CEOs and permanent replacement CEOs.

5.6. Sensitivity analyses

5.6.1. Future operating performance and predicted turnover

As a validity check of our inferences, we examine whether future operating performance is lower in cases where the CEO is predicted to be terminated by the board in response to a shock, but is not in realization. To elaborate, our analysis in Table 4 indicates that industry shocks combined with poor performance increase the probability that a CEO will be terminated. Additionally, our analysis in Table 5 suggests that this relation is attenuated when CEOs are more entrenched. If these inferences are correct, then we expect that when industry shocks predict that a CEO should be terminated, but the CEO is in fact not terminated, future performance will suffer. Such predictions are consistent with evidence in Denis and Denis (1995) and Huson et al. (2004) which indicates that boards and investors can anticipate future performance improvements following turnover. Further, these papers find that certain governance mechanisms can enhance the efficiency of the termination decision and the subsequent improvement in firm performance.

In Table 9, we show that future performance does indeed suffer in these cases. Specifically, we first estimate the probability of forced CEO turnover as a function of our eight industry shocks. We then take the predicted turnover probabilities from this model, *E[Turnover|Shocks]*, and include this measure as an independent variable in a model that predicts future accounting earnings for the CEOs that were not forcibly terminated, where future earnings are measured over years t+2 to t+5. We find that among CEOs that were not terminated, future firm performance is significantly lower for those CEOs that were predicted to have a high probability of turnover. That is, firm performance suffers when CEOs are not terminated in the wake of industry shocks.

The findings in Table 9 suggest that shareholders bear costs when inadaptable CEOs are allowed to continue. Equivalently, one could view these findings as the benefits to shareholders from terminating a CEO that is inadaptable. In light of these results, it is interesting to consider whether these benefits are sufficiently large in magnitude to justify the expected firing costs from terminating a CEO. Taylor (2010) estimates that directors behave as if the cost of firing a CEO is 5.9% of firm assets. He further estimates that this 5.9% is comprised of a 1.3% cost to shareholders from firing a CEO, and a personal cost to directors (cost of entrenchment) that equates to 4.6% of firm assets. To make a more transparent assessment of the economic magnitude of our post-turnover performance results, we re-estimate our Table 9 regressions using the scaled quintile rank of the independent variables (ranging from 0 to 1). Specifically, among CEOs that are not terminated, we estimate that future ROA is roughly 0.9% lower, *per year* over years t+2 through t+5 for CEOs in the top quintile of predicted turnover as compared to CEOs in the bottom quintile of predicted turnover. The cumulative effect on ROA over the next four years (using Taylor's assumed discount factor of 0.9) is about 2.8% of total assets. The magnitude of this profitability effect seems reasonable compared to the total turnover costs that Taylor (2010) estimates are relevant to the boards' turnover decisions: it exceeds the 1.3% cost to shareholders of firing the average CEO (not conditional on performance) but is below the boards' total perceived cost of 5.9% that includes the personal (entrenchment) cost to directors. The results in Table 9 help support our inference that CEO entrenchment attenuates the relation between turnover and industry shocks, and that CEO adaptability is likely to be an economically important consideration in termination decisions.

5.6.2. Sign of the industry shock

In motivating our tests, we appealed to the CEO retention decision being described within the context of a matching problem, where the firm's leadership needs are matched to a CEO with an appropriate skill set. In this paradigm, any change in industry business conditions that alters the firm's needs could potentially perturb the match and result in CEO turnover, and as such, our tests to this point focus on unsigned industry shocks. However, one could articulate reasons why the CEO-firm match could be differentially affected by positive versus negative industry shocks. For example, Morck et al. (1989) provide evidence that although boards terminate CEOs that perform poorly relative to industry peers, boards appear to have difficulty terminating CEOs when the overall industry is performing poorly. Further, Eisfeldt and Kuhnen (2013) argue that industry-level poor performance signals bad firm-CEO matches and greater turnover.

In Table 10, we assess the sensitivity of our results to using unsigned shocks. In particular, we regress turnover on the standard set of controls, the (unsigned) *Shock* main effect, an indicator variable equal one if the change in the respective industry-level variable decreased (*NegShock*) and the interaction term *NegShock*Shock*. If the sign of the relation between industry shocks and turnover varies with whether the underlying industry-level variable increases or decreases, we expect the coefficient on *NegShock*Shock* will be significantly different from zero (although we make no ex ante prediction regarding whether the incremental coefficient on negative shocks will be positive or negative).

Panel A of Table 10 shows that the interaction term on *NegShock*Shock* is significantly negative for shocks to the market-to-book ratio, and significantly positive for shocks to assets. These findings appear interesting, and although beyond the scope of our paper, future researchers may wish to explore why CEOs appear to have more difficulty adapting to a decrease in asset

base or to an increase in growth options. The interaction terms for the remaining shocks are not significant, however, suggesting the effects of most of our shocks on turnover do not vary systematically with whether the underlying industry-level variable is a positive or negative shock. Because a disproportionate number of shocks are positive (e.g., only 17.59% of shocks to industry sales are negative), Panel B of Table 10 repeats the tests in Panel A but uses an indicator variable for whether the signed change in the respective industry-level is above or below the industry average. The advantage of this approach is that a similar number of observations are above and below the mean, which may alleviate any power issues that arise in Panel A. The results in Panel B are very similar to those in Panel A, with only shocks to assets (market-to-book) exhibiting a stronger (weaker) relation with turnover for negative shocks. Collectively, the results in Table 10 are consistent with the notion that both large positive and large negative industry shocks can affect business conditions and perturb the CEO-firm match, giving rise to turnover.

5.6.3. Mean reversion in industry-level variables

An implicit assumption in our analysis is that the industry-level variables that we use to measure shocks do not mean revert. For example, if an increase in the industry-level series in period t is followed by an offsetting decrease in the industry-level series in period t+1 (i.e. the series mean reverts), then the shock does not represent a persistent change in the level of the respective variable. In this case, boards are less likely to replace the CEO over a short-term change that is expected to revert in the near-term.

In untabulated analysis, we estimate the rate of mean reversion by first calculating the mean reversion for the time-series of each industry-level shock variable, and then calculating the average rate of mean reversion for each variable. Two findings are of note. First, none of the

variables are purely mean-reverting; all have coefficients of mean reversion significantly below one. In many cases the industry-level variables appear more similar to random walks and have mean reversion coefficients close to zero. Second, our results above are consistently strongest for three shocks: growth, investment, and sales. One potential explanation for why these shocks give the strongest results, is that their respective series are the most persistent and have the least amount of mean reversion (coefficients of mean reversion of 0.01, 0.07, and –0.05, respectively), whereas market-to-book has the greatest amount of mean reversion.

6. Conclusion

In the manager turnover literature, two commonly asked questions are whether boards fire CEOs for reasons seemingly out of their control (e.g., reasons besides their idiosyncratic performance measures), and if so, why? We conjecture that if industry shocks alter a firm's leadership needs, and the board perceives the CEO cannot adapt their skills to fit those needs, then the CEO is more likely to be terminated.

We analyze the effect of industry shocks on turnover, incremental to current period performance. Consistent with the notion that CEOs have trouble adapting to certain industry shocks, we show that shocks to industry growth, investment, competition, and globalization are significant predictors of CEO turnover. We further find that when considering the CEO's ability to adapt to a shock, the board places more weight on contemporaneous performance and less weight on past performance. In an extension of our primary analyses, we document cross-sectional variation in the relation between CEO turnover and industry shocks relating to entrenchment and whether the CEO's background indicates "generalist" or "specialist". Our results suggest that CEOs who are entrenched and are generalists are less sensitive to industry shocks. Additionally, we find that CEOs who are able to adapt to industry shocks command a

pay premium, and that industry shocks induce turnover of other top executives (and more or less so depending on the nature of the shock and whether the CEO is simultaneously terminated). In total, our results suggest that the ability of executives to adapt to changes in the industry plays a significant role in boards' decisions regarding manager turnover.

Appendix A
Variable Definitions

Variable Definitions

TotalTurnover	Indicator variable equal to 1 if the CEO listed on ExecuComp in year *t* is not listed as CEO on ExecuComp in either year *t+1* or *t+2*. This variable does not distinguish forced and non-forced turnover among CEOs.
Turnover	Indicator variable equal to 1 if the CEO listed on ExecuComp in year *t* and is forcibly turned over in either year *t+1* or *t+2*. CEO turnover is classified as forced based on Parrino (1997) and Bushman et al. (2010), with the modification that any voluntary turnover where the firm's industry-adjusted stock return in year *t* is in the bottom quartile (less than –26%) is also classified as forced.
TurnoverTop5	Indicator if one of the top five officers, other than the CEO, is listed on ExecuComp in year *t* and not listed on ExecuComp in either year *t+1* or *t+2*. This variable does not distinguish forced and non-forced turnover among top five officers.
InternalAppt	Indicator if the new CEO listed on ExecuComp in the year following forced CEO turnover was previously listed as top five officer of the firm.
Size	Natural log of market value of equity at the end of year *t.*
MB	Ratio of market value to book value of assets at the end of year *t.*
ROA	Industry-adjusted return on assets. Return on assets is calculated as earnings before extraordinary items in year *t* (IB) scaled by beginning of period assets (AT).
Return	Industry-adjusted buy-and-hold return over year *t*.
LagReturn	Industry-adjusted buy-and-hold return over year *t*–1.
Age	Age of the CEO, in years, at the end of year *t.*
Volatility	Standard deviation of residuals from a regression of monthly stock returns on the equal-weighted market return and equal-weighted industry return.
Competition	Herfindahl index of industry concentration at the end of year *t*, calculated as the sum of squared market shares of all firms in the industry.
Activists	Percentage of shares held by activist institutional investors at the end of year *t*, where activist institutions are defined as in Cremers and Nair (2005) as the eighteen largest public pension funds.
Tenure	Tenure of the firm's CEO (in years) at the end of year *t.*
IsChair	Indicator variable for whether the CEO is also Chairman of the Board in year *t.*
External	Indicator variable for whether the CEO's prior position was with a different firm.
NewInd	Indicator variable for whether the CEO's prior position was in a different industry.
GAIndex	Custodio et al. (2013) generalist index based on CEO's lifetime work experience.
ExcessPay	Residual from a regression of the logarithm of one plus total CEO flow pay on *Size*, *MB*, *ROA*, *Return, Activists, Tenure,* and *IsChair.*
Future ROA(+2,+5)	Average earnings before extraordinary items in year *t* (IB) in years *t+2* through *t+5* scaled by beginning of period assets (AT).

Details on Industry Shocks

We calculate industry shocks by aggregating firm-level variables to the industry-level. We focus on shocks to eight industry variables related to the industry's business environment and product market. Industry shocks are the absolute value of the percentage change in the respective industry-level variables.

Assets	Change in industry assets.
MB	Change in industry market-to-book ratio.
Investment	Change in industry capital expenditure.
R&D	Change in industry research and development expense.
Sales	Change in industry sales.
Competition	Change in Herfindahl index of industry concentration.
Globalization	Change in industry U.S. sales-to-total sales ratio.
Advertising	Change in industry advertising expense.

We construct industry-level variables as follows. We require non-missing sales (SALE), assets (AT), market value (PRCC_F*CHSO), and SIC codes (SICH) from Compustat, and set missing values of capital expenditure (CAPX),

research and development expense (XRD), and advertising expense (XAD) to zero. We calculate industry assets, capital expenditure, research and development, sales, and advertising as the equal-weighted average of the respective firm-level variables. The industry market-to-book ratio is calculated as the sum of the market values of all firms on Compustat divided by the sum of the book value of assets of all firms on Compustat. The U.S. sales-to-total sales ratio is calculated as the sum of total sales of U.S. segments from the Compustat Geographic segment file scaled by the sum of total sales on Compustat. The Herfindahl index of industry concentration is calculated as the sum of squared market shares of all firms in the industry. Industry shocks are calculated for each industry-year as the absolute value of the percentage change in the respective industry-level variable over a one year period ($t–1$ to t). Industries are defined according to the Fama-French 48 industry groups, and we require at least 10 firms in each industry in years t and $t–1$.

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Figure 1
Variable measurement timeline.

This figure presents a timeline of when the variables in our analysis are measured.

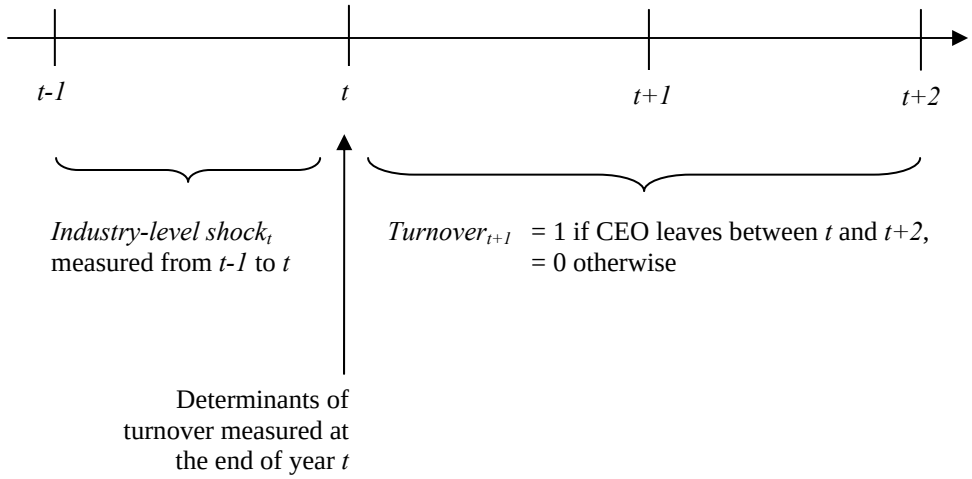

Table 1
Descriptive statistics.

This table presents descriptive statistics for firms in our sample. Our sample includes all firms on the intersection of ExecuComp, Compustat, and CRSP, with data on the respective variables for the time period 1992 through 2008. We require sufficient data to calculate turnover on ExecuComp over the years *t+1* and *t+2*. We remove observations where the CEO has not yet been in office for three years, and exclude financial firms (SIC codes 6000 to 6999) and utilities (SIC codes 4900 to 4942). The resulting sample covers a total of 13,878 firm-year observations with non-missing data for all variables. Panel A reports descriptive statistics for firm characteristics, and Panel B reports descriptive statistics for industry shocks. All variables are as defined in Appendix A.

Panel A: Firm characteristics

Variable	*Mean*	*Std*	*25th*	*Median*	*75th*
TotalTurnover	0.24	0.43	0.00	0.00	0.00
Turnover	0.10	0.30	0.00	0.00	0.00
Size	7.29	1.58	6.18	7.14	8.27
MB	1.63	1.54	0.67	1.14	1.99
ROA	0.33	0.31	0.10	0.24	0.50
Return	0.01	0.47	-0.26	-0.03	0.21
LagReturn	0.04	0.50	-0.25	-0.02	0.23
Age	56.31	7.50	51.00	56.00	61.00
Volatility	0.11	0.04	0.08	0.10	0.13
Competition	0.07	0.05	0.04	0.05	0.07
Activists	0.03	0.02	0.02	0.03	0.04
Tenure	9.74	7.29	4.67	7.00	12.25
IsChair	0.68	0.47	0.00	1.00	1.00
External	0.25	0.44	0.00	0.00	1.00
NewInd	0.27	0.44	0.00	0.00	1.00
GAIndex	–0.01	0.96	–0.73	–0.18	0.54
ExcessPay	0.00	0.81	–0.48	0.02	0.49

Panel B: Industry shocks

Variable	*Mean*	*Std*	*25th*	*Median*	*75th*
Assets	0.14	0.91	0.05	0.11	0.16
MB	0.20	0.22	0.06	0.13	0.27
Investment	0.18	1.14	0.05	0.12	0.21
R&D	0.61	4.03	0.06	0.13	0.27
Sales	0.13	0.49	0.05	0.10	0.15
Competition	0.10	0.23	0.03	0.06	0.10
Globalization	0.13	0.45	0.03	0.07	0.15
Advertising	0.78	18.11	0.07	0.14	0.30

Table 2
Correlation matrix.

This table presents correlations between various industry shocks and correlations between various firm characteristics and industry shocks. We calculate correlations annually and report the mean annual correlation in the table. Panel A reports correlations between various industry shocks. Spearman (Pearson) correlations appear above (below) the diagonal. Panel B reports Spearman correlations between various firm characteristics and industry shocks. All variables are as defined in Appendix A.

Panel A: Industry shocks

Industry shock	*Assets*	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Assets	1.00	0.02	0.28	0.20	0.56	0.15	0.10	0.18
MB	0.09	1.00	–0.03	–0.08	–0.04	–0.06	0.02	–0.03
Investment	0.44	0.05	1.00	0.14	0.31	0.22	0.11	0.16
R&D	0.18	0.00	0.10	1.00	0.19	0.11	0.21	0.10
Sales	0.71	0.03	0.47	0.13	1.00	0.11	0.14	0.17
Competition	0.37	0.05	0.31	0.13	0.28	1.00	0.10	0.19
Globalization	0.18	0.11	0.10	0.13	0.20	0.16	1.00	0.07
Advertising	0.23	0.03	0.11	0.03	0.16	0.15	0.14	1.00

Panel B: Firm characteristics and industry shocks

Industry shock: / Firm characteristic:	*Assets*	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Size	0.00	0.01	–0.03	–0.01	0.00	–0.02	0.00	–0.02
MB	0.03	0.06	–0.02	–0.05	0.02	–0.01	–0.08	–0.06
ROA	0.07	0.06	0.02	–0.09	0.04	–0.01	–0.17	0.00
Return	0.01	0.01	0.01	0.02	0.01	0.03	0.03	0.02
LagReturn	0.01	0.00	0.02	0.02	0.05	0.02	0.03	0.01
Age	0.00	–0.03	–0.01	–0.01	–0.01	–0.01	0.00	0.01
Volatility	0.01	0.08	0.02	0.00	0.01	0.00	0.00	–0.01
Competition	0.06	–0.02	0.04	–0.10	0.01	0.09	0.08	0.07
Activists	–0.02	–0.02	–0.01	–0.05	–0.02	–0.04	–0.03	–0.02
Tenure	0.01	0.00	0.01	0.02	0.00	0.01	0.01	0.00
IsChair	–0.02	–0.01	–0.01	0.00	–0.02	–0.02	0.01	0.01
External	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.00
NewInd	0.03	–0.01	0.01	–0.01	0.02	0.04	0.01	0.02
GAIndex	–0.01	–0.02	0.00	–0.05	0.00	0.00	–0.04	0.00
ExcessPay	–0.01	0.02	0.01	0.00	0.00	0.03	0.01	0.00

Table 3
Industry shocks and CEO turnover.

This table presents results from estimating the probability of turnover as a function of industry shocks and control variables, i.e., equation (2). *Controls* is a vector of control variables including *Size*, *MB*, *ROA*, *Return*$_t$, *LagReturn*, *Age*, *Volatility*, and *Competition*. *Shock* is the respective industry-level shock. All variables are as defined in Appendix A. Panel A presents results from estimating a pooled linear probability model, and Panel B presents results from estimating a linear probability model including industry fixed effects. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

Panel A: Pooled regression

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00
	(–0.62)	(–0.65)	(–0.62)	(–0.59)	(–0.62)	(–0.60)	(–0.65)	(–0.61)
MB	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****
	(2.34)	**(2.26)**	**(2.34)**	**(2.35)**	**(2.35)**	**(2.34)**	**(2.35)**	**(2.33)**
ROA	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****
	(–6.91)	**(–6.84)**	**(–6.96)**	**(–7.14)**	**(–6.85)**	**(–6.39)**	**(–7.05)**	**(–7.21)**
Return	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****
	(–17.79)	**(–17.92)**	**(–17.78)**	**(–17.81)**	**(–17.77)**	**(–17.77)**	**(–17.80)**	**(–17.76)**
LagReturn	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****
	(–8.29)	**(–7.93)**	**(–8.34)**	**(–8.36)**	**(–8.33)**	**(–8.93)**	**(–8.40)**	**(–8.38)**
Age	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****
	(3.87)	**(3.90)**	**(3.87)**	**(3.91)**	**(3.87)**	**(3.87)**	**(3.91)**	**(3.88)**
Volatility	**0.82*****	**0.80*****	**0.82*****	**0.82*****	**0.82*****	**0.82*****	**0.82*****	**0.82*****
	(6.88)	**(6.55)**	**(6.87)**	**(6.90)**	**(6.88)**	**(6.97)**	**(6.89)**	**(6.88)**
Competition	**0.14*****	**0.15*****	**0.14*****	**0.15*****	**0.14*****	**0.14*****	**0.14*****	**0.15*****
	(2.85)	**(2.88)**	**(2.86)**	**(2.94)**	**(2.83)**	**(2.85)**	**(2.89)**	**(2.94)**
Shock	**0.01*****	**0.03****	**0.01*****	**0.001****	**0.02*****	**0.02*****	**0.01*****	–0.00
	(11.01)	**(2.35)**	**(13.30)**	**(2.17)**	**(8.52)**	**(2.63)**	**(3.01)**	(–0.52)
F	88.07	73.05	89.75	72.50	79.20	72.25	73.92	77.46
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 3
Industry shocks and CEO turnover (cont'd).

Panel B: Industry fixed effects

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00
	(–1.05)	(–1.02)	(–1.05)	(–1.02)	(–1.05)	(–1.04)	(–1.05)	(–1.02)
MB	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****	**0.01****
	(2.29)	**(2.28)**	**(2.30)**	**(2.29)**	**(2.29)**	**(2.29)**	**(2.28)**	**(2.29)**
ROA	**–0.05*****	**–0.05*****	**–0.05*****	**–0.05*****	**–0.05*****	**–0.05*****	**–0.05*****	**–0.05*****
	(–4.68)	**(–4.43)**	**(–4.68)**	**(–4.65)**	**(–4.75)**	**(–4.57)**	**(–4.62)**	**(–4.67)**
Return	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****	**–0.17*****
	(–17.54)	**(–17.62)**	**(–17.54)**	**(–17.54)**	**(–17.51)**	**(–17.46)**	**(–17.53)**	**(–17.52)**
LagReturn	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****	**–0.03*****
	(–8.62)	**(–8.36)**	**(–8.69)**	**(–8.78)**	**(–8.66)**	**(–9.23)**	**(–8.83)**	**(–8.82)**
Age	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****	**0.002*****
	(4.52)	**(4.54)**	**(4.52)**	**(4.53)**	**(4.52)**	**(4.52)**	**(4.54)**	**(4.53)**
Volatility	**0.66*****	**0.66*****	**0.66*****	**0.66*****	**0.66*****	**0.66*****	**0.66*****	**0.66*****
	(4.62)	**(4.55)**	**(4.62)**	**(4.61)**	**(4.62)**	**(4.62)**	**(4.59)**	**(4.61)**
Competition	0.15	0.15	0.15	0.16	0.15	0.15	0.16	0.16
	(1.31)	(1.29)	(1.31)	(1.35)	(1.31)	(1.29)	(1.35)	(1.35)
Shock	**0.01*****	0.02	**0.01*****	0.00	**0.01*****	0.01	**0.01*****	–0.00
	(10.44)	(1.27)	**(9.53)**	(0.53)	**(6.63)**	(1.13)	**(5.74)**	(–0.55)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	75.72	70.40	72.98	68.21	72.21	68.83	69.80	68.89
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 4

Effect of industry shocks on the relation between CEO turnover and performance.

This table presents results from estimating a linear probability model of turnover as a function of industry shocks and control variables. Model specification follows Table 3, except that we allow the effects of current period and prior period stock performance (*Return* and *LagReturn*) to vary with the industry shock, i.e., equation (3). All variables are as defined in Appendix A. For parsimony, we report only coefficients on the industry shocks, current and prior period stock performance, and their interactions. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shock	**0.003*** **	0.02	**0.003** **	**0.001** **	0.01	**0.02***	**0.01***	–0.00
	(2.78)	(1.23)	**(2.45)**	**(2.17)**	(1.63)	**(1.73)**	**(1.93)**	(–0.80)
Return	**–0.17*** **	**–0.19*** **	**–0.17*** **	**–0.17*** **	**–0.17*** **	**–0.17*** **	**–0.17*** **	**–0.17*** **
	(–17.60)	**(–15.54)**	**(–17.92)**	**(–17.58)**	**(–17.84)**	**(–16.98)**	**(–17.03)**	**(–18.90)**
LagReturn	**–0.03*** **	**–0.04*** **	**–0.03*** **	**–0.03*** **	**0.04*** **	**–0.03*** **	**–0.03*** **	**–0.03*** **
	(–9.38)	**(–7.64)**	**(–8.40)**	**(–7.81)**	**(–8.68)**	**(–6.20)**	**(–5.70)**	**(–8.86)**
*Return * Shock*	**–0.01*** **	**0.06** **	**–0.01*** **	**–0.002*** **	**–0.02*** **	0.004	0.004	0.00
	(–9.56)	**(2.30)**	**(–9.14)**	**(–2.60)**	**(–4.66)**	(0.27)	(0.14)	(0.93)
*LagReturn * Shock*	**0.03*** **	**0.04*** **	**0.02*** **	0.001	**0.05** **	–0.02	–0.02	–0.00
	(4.95)	**(3.97)**	**(4.55)**	(1.37)	**(2.52)**	(–1.55)	(–1.37)	(–0.60)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	91.22	72.94	78.50	67.08	75.74	67.75	61.46	72.43
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 5

Governance and the effect of industry shocks on CEO turnover.

This table presents results from estimating a linear probability model of turnover as a function of industry shocks and control variables. Model specification follows Table 3, except that we include a vector of governance variables as additional controls and allow the effect of the shock to vary with these governance variables, i.e., equation (4). All variables are as defined in Appendix A. For parsimony, we do not report coefficients on control variables. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Activists	–0.09	–0.11	–0.12	–0.03	–0.14	–0.11	–0.07	–0.03
	(–0.60)	(–0.62)	(–0.75)	(–0.19)	(–0.91)	(–0.61)	(–0.42)	(–0.18)
Tenure	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **
	(–5.55)	**(–2.81)**	**(–5.68)**	**(–5.57)**	**(–5.72)**	**(–5.85)**	**(–5.23)**	**(–5.62)**
IsChair	0.00	–0.01	0.00	0.00	0.00	0.01	0.00	0.00
	(0.53)	(–0.65)	(0.60)	(0.50)	(0.55)	(1.45)	(0.21)	(0.52)
Shock	–0.00	–0.02	**–0.01*** **	**0.002** **	–0.01	**0.05*** **	–0.01	0.00
	(–0.97)	(–0.53)	**(–3.19)**	**(2.48)**	(–1.17)	**(5.16)**	(–0.48)	(0.03)
*Shock * Activist*	**0.55*** **	0.52	**0.53*** **	0.01	**1.06*** **	**0.73*** **	**0.36***	0.00
	(6.24)	(0.93)	**(11.29)**	(0.24)	**(6.21)**	**(2.66)**	**(1.64)**	(0.80)
*Shock * Tenure*	**–0.001** **	–0.00	–0.00	**–0.001*** **	–0.00	–0.00	**–0.001***	–0.00
	(–2.13)	(–0.01)	(–0.55)	**(–2.98)**	(–1.61)	(–0.29)	**(–1.64)**	(–1.37)
*Shock * IsChair*	–0.00	**0.05***	**–0.0003** **	–0.00	–0.00	**–0.07*** **	0.02	–0.00
	(–0.13)	**(1.68)**	**(–2.08)**	(–0.26)	(–0.04)	**(–4.79)**	(1.58)	(–0.59)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	170.36	61.05	151.30	56.71	90.02	58.24	58.56	64.23
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 6

Generalist CEOs and the effect of industry shocks on CEO turnover.

This table presents results from estimating a linear probability model of turnover as a function of industry shocks and control variables. Model specification follows Table 3, except that we include variables that proxy for whether the CEO is a generalist or specialist and allow the effect of the shock to vary with these proxies. Panel A includes indicator variables for whether the CEO's prior position was with a different firm (*External*) and whether it was in a different industry (*NewInd*). Panel B includes the Custodio et al. (2013) generalist index (*GAIndex*) constructed based on the CEO's lifetime work experience. All variables are as defined in Appendix A. The sample in Panel B is reduced to 11,430 firm-years with data on *GAIndex*. For parsimony, we do not report coefficients on control variables. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

Panel A: External and outside industry hires

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
External	**0.05*** **	**0.04*** **	**0.05*** **	**0.04*** **	**0.05*** **	**0.05*** **	**0.05*** **	**0.05*** **
	(4.95)	**(3.06)**	**(4.95)**	**(4.86)**	**(5.01)**	**(5.44)**	**(4.68)**	**(4.64)**
NewInd	**–0.02***	–0.01	**–0.02***	–0.01	**–0.02***	**–0.02***	–0.02	–0.02
	(–1.72)	(–0.90)	**(–1.72)**	(–1.38)	**(–1.77)**	**(–1.86)**	(–1.57)	(–1.44)
Shock	**0.01*** **	**0.03*** **	**0.01*** **	0.00	**0.01*** **	**0.03*** **	**0.01** **	**–0.0001** **
	(3.84)	**(2.59)**	**(5.30)**	(1.10)	**(3.53)**	**(5.43)**	**(2.11)**	**(–2.21)**
*Shock * External*	**–0.01*** **	0.01	**–0.01*** **	0.00	**–0.02*** **	**–0.08** **	**–0.02*** **	0.00
	(–14.49)	(0.28)	**(–9.81)**	(0.84)	**(–9.40)**	**(–2.13)**	**(–5.33)**	(0.47)
*Shock * NewInd*	**0.01*** **	–0.02	**0.01*** **	–0.00	**0.01*** **	0.03	**0.01***	–0.00
	(4.06)	(–0.60)	**(6.21)**	(–0.76)	**(3.01)**	(1.12)	**(1.82)**	(–0.51)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	422.98	55.21	417.87	50.51	227.31	50.78	52.73	62.81
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 6
Generalist CEOs and the effect of industry shocks on CEO turnover (cont'd).

Panel B: Custodio et al. (2013) generalist index

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GAIndex	**0.01*** **	**0.01** **	**0.01*** **	**0.01*** **	**0.02*** **	**0.01*** **	**0.01*** **	**0.01*** **
	(3.58)	**(2.52)**	**(3.58)**	**(3.53)**	**(3.75)**	**(3.33)**	**(3.56)**	**(3.52)**
Shock	**0.01*** **	**0.04*** **	**0.01*** **	**0.001*** **	**0.02*** **	**0.02*** **	**0.01*** **	–0.00
	(26.00)	**(5.22)**	**(20.44)**	**(2.89)**	**(8.63)**	**(3.18)**	**(5.32)**	(–0.96)
*Shock * GAIndex*	**–0.003*** **	0.02	**0.003*** **	0.00	**–0.01*** **	–0.00	0.00	–0.00
	(–7.08)	(0.95)	**(–5.61)**	(0.86)	**(–9.31)**	(–0.49)	(0.09)	(–0.25)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	78.24	53.11	78.68	48.33	54.75	48.20	49.31	53.73
N	11,430	11,430	11,430	11,430	11,430	11,430	11,430	11,430

Table 7

Abnormal pay and the effect of industry shocks on CEO turnover.

This table presents results from estimating a linear probability model of turnover as a function of industry shocks and control variables. Model specification follows Table 3, except that we include a measure of abnormal CEO flow pay (*ExcessPay*) as an additional control and allow the effect of the shock to vary with abnormal pay. All variables are as defined in Appendix A. For parsimony, we do not report coefficients on control variables. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExcessPay	–0.01	–0.01	–0.01	**–0.01***	–0.01	–0.01	–0.01	**–0.01***
	(–1.55)	(–1.15)	(–1.52)	**(–1.86)**	(–1.45)	(–1.55)	(–1.46)	**(–1.78)**
Shock	**0.01*****	**0.03****	**0.01*****	**0.001****	**0.01*****	**0.02*****	**0.01*****	–0.00
	(9.08)	**(2.44)**	**(11.44)**	**(2.49)**	**(6.86)**	**(2.77)**	**(3.47)**	(–0.30)
*Shock * ExcessPay*	**–0.01*****	–0.01	**–0.004*****	**0.001***	**–0.01*****	–0.00	**–0.01*****	–0.00
	(–22.28)	(–1.11)	**(–11.49)**	**(1.92)**	**(–12.98)**	(–0.49)	**(–5.11)**	(–0.17)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	353.30	60.57	102.59	60.35	175.87	60.94	65.37	67.51
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 8
Industry shocks and top management turnover.

This table presents results from estimating a linear probability model of turnover among top managers, other than the CEO, as a function of industry shocks and control variables. Model specification follows Table 3, except that we replace *Turnover* with *TurnoverTop5* as the dependent variable, include CEO tenure (*Tenure*), CEO turnover (*Turnover*), and whether the replacement CEO was internal to the firm (*InternalAppt*) as additional controls, and allow the effect of the shock on top management turnover to vary with whether the CEO was also turned over. All variables are as defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	**0.03*** **	**0.03*** **	**0.03*** **	**0.03*** **	**0.03*** **	**0.03*** **	**0.03*** **	**0.03*** **
	(8.80)	**(8.82)**	**(8.80)**	**(8.85)**	**(8.79)**	**(8.72)**	**(8.74)**	**(8.77)**
MB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.94)	(0.95)	(0.96)	(0.94)	(0.95)	(0.75)	(0.95)	(0.95)
ROA	–0.03	–0.03	–0.03	–0.03	–0.03	–0.03	–0.03	–0.03
	(–1.11)	(–1.08)	(–1.13)	(–1.12)	(–1.12)	(–1.01)	(–1.10)	(–1.09)
Return	**–0.04*** **	**–0.05*** **	**–0.04*** **	**–0.04*** **	**–0.04*** **	**–0.05*** **	**–0.04*** **	**–0.04*** **
	(–5.52)	**(–5.68)**	**(–5.52)**	**(–5.56)**	**(–5.50)**	**(–5.62)**	**(–5.55)**	**(–5.55)**
LagReturn	**–0.03*** **	**–0.04*** **	**–0.03*** **	**–0.03*** **	**–0.03*** **	**–0.04*** **	**–0.03*** **	**–0.03*** **
	(–2.90)	**(–2.96)**	**(–2.91)**	**(–2.89)**	**(–2.90)**	**(–3.01)**	**(–2.89)**	**(–2.89)**
Age	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.21)	(0.22)	(0.21)	(0.18)	(0.21)	(0.21)	(0.21)	(0.20)
Volatility	**0.88*** **	**0.87*** **	**0.88*** **	**0.88*** **	**0.88*** **	**0.87*** **	**0.88*** **	**0.88*** **
	(5.35)	**(5.46)**	**(5.34)**	**(5.36)**	**(5.35)**	**(5.36)**	**(5.36)**	**(5.35)**
Competition	–0.08	–0.08	–0.08	–0.08	–0.08	–0.09	–0.08	–0.08
	(–0.88)	(–0.84)	(–0.88)	(–0.85)	(–0.89)	(–0.93)	(–0.83)	(–0.85)
CEO Tenure	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **	**–0.003*** **
	(–3.10)	**(–3.10)**	**(–3.10)**	**(–3.10)**	**(–3.10)**	**(–3.10)**	**(–3.09)**	**(–3.09)**
CEO Turnover	**0.20*** **	**0.20*** **	**0.20*** **	**0.19*** **	**0.20*** **	**0.20*** **	**0.19*** **	**0.19*** **
	(27.85)	**(19.61)**	**(27.70)**	**(28.16)**	**(28.35)**	**(24.07)**	**(26.27)**	**(25.89)**
InternalAppt	**–0.14*** **	**–0.14*** **	**–0.14*** **	**–0.14*** **	**–0.14*** **	**–0.14*** **	**–0.14*** **	**–0.14*** **
	(–7.04)	**(–7.19)**	**(–7.05)**	**(–7.09)**	**(–7.04)**	**(–7.14)**	**(–7.13)**	**(–7.09)**
Shock	**0.01*** **	0.02	**0.01*** **	–0.00	**0.02*** **	**0.04*** **	–0.00	**0.0001***
	(6.23)	(1.08)	**(6.89)**	(–0.80)	**(5.57)**	**(4.21)**	(–0.52)	**(1.92)**
*Shock * CEO Turnover*	**–0.01*** **	–0.04	**–0.01*** **	**0.004** **	**–0.02*** **	**–0.04***	**0.01** **	**0.003***
	(–7.97)	(–1.01)	**(–7.96)**	**(2.07)**	**(–6.68)**	**(–1.77)**	**(2.38)**	**(1.91)**
F	59.79	52.61	56.27	54.05	54.35	53.12	53.58	52.67
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878

Table 9
Sensitivity analysis: Do firms perform poorly when turnover is expected but the CEO is not terminated?

This table presents results from estimating future operating performance as a function of predicted turnover and controls. We conduct this analysis in two stages. In the first stage, we estimate expected turnover due to industry shocks (*E[Turnover|Shocks]*) as the predicted value from a regression of CEO turnover on all industry shocks. In the second stage, we focus on those CEOs who were not turned over (*Turnover* = 0) and estimate the firm's future earnings from *t*+2 to *t*+5 (*Future ROA(+2,+5)*) as a function of predicted turnover due to shocks and control variables:

$$Future\ ROA(+2,+5) = \alpha + \gamma\ Controls + \varphi\ \mathrm{E}[Turnover|Shocks] + \varepsilon_i$$

Controls is a vector of control variables including *Size*, *MB*, *ROA*, and industry and year fixed effects. All variables are as defined in Appendix A. Model (2) presents results after transforming independent variables into scaled quintile ranks ranging from 0 to 1. The coefficients in Model (2) represent the change in future ROA when moving from the bottom quintile of the respective variable to the top quintile, *ceteris paribus*. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

	Future ROA(+2,+5)	
	OLS	OLS with quintile ranks
Variable	(1)	(2)
Size	**0.008*** **	**0.032*** **
	(4.74)	**(3.29)**
MB	**0.005***	**0.033****
	(1.93)	**(2.14)**
ROA	**0.333*** **	**0.076*** **
	(6.01)	**(4.12)**
E[Turnover|Shocks]	**–0.274****	**–0.009*** **
	(–2.41)	**(–2.80)**
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
N (Turnover = 0)	12,330	12,330

Table 10

Sensitivity analysis: Direction of shocks.

This table presents results from estimating a linear probability model of turnover as a function of industry shocks and control variables. Model specification follows Table 3 with two exceptions. First, in Panel A, we allow the effect of the shock to vary depending on the sign of the percentage change in the respective industry-level variable (e.g., whether the percentage change in competition was positive or negative). Specifically, we include *NegShock*, an indicator variable equal to 1 if the change in the respective industry-level variable was negative, and the interaction between *NegShock* and *Shock*. Second, in Panel B, we allow the effect of the shock to vary depending on whether the percentage change was above or below the industry average (e.g., whether the percentage change in competition was greater than or less the industry average). Specifically, we include *BelowIndAvg*, an indicator variable equal to 1 if the change in the respective industry-level variable was less than the industry average, and the interaction between *BelowIndAvg* and *Shock*. For parsimony, we do not report coefficients on control variables. *t*-statistics appear in parentheses and are based on standard errors clustered by industry and year. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two-tail), respectively.

Panel A: Positive and negative shocks

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shock	**0.01*** **	**0.05*** **	**0.01*** **	**0.001** **	**0.01*** **	**0.02*** **	**0.01*** **	–0.00
	(20.10)	**(5.39)**	**(19.73)**	**(2.37)**	**(20.81)**	**(4.19)**	**(4.27)**	(–0.42)
NegShock	**–0.02*** **	**0.02*** **	–0.00	0.00	**–0.02***	0.01	0.01	–0.01
	(–3.82)	**(4.25)**	(–0.53)	(0.48)	**(–1.76)**	(1.21)	(0.74)	(–1.44)
*NegShock * Shock*	**0.21*** **	**–0.11*** **	0.04	0.01	0.15	–0.03	0.05	–0.02
	(2.61)	**(–4.50)**	(0.45)	(0.59)	(1.37)	(–1.28)	(1.16)	(–1.01)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	96.60	63.03	85.05	59.52	72.97	59.84	62.07	64.72
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878
% Obs, NegShock =1	20.45	47.80	30.02	26.19	17.59	54.58	35.22	27.10

Table 10
Sensitivity analysis: Direction of shocks (cont'd).

Panel B: Above and below average shocks

	Industry shock:							
	Assets	*MB*	*Investment*	*R&D*	*Sales*	*Competition*	*Globalization*	*Advertising*
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shock	**0.01*** **	**0.06*** **	**0.01*** **	**0.001** **	**0.01*** **	**0.02*** **	**0.01*** **	–0.00
	(29.74)	**(5.61)**	**(24.70)**	**(2.25)**	**(20.45)**	**(5.45)**	**(5.92)**	(–0.82)
BelowIndAvg	**–0.02** **	**0.02*** **	–0.01	**0.002***	**–0.01** **	**0.01***	–0.00	**–0.01*** **
	(–2.41)	**(3.78)**	(–0.57)	**(1.87)**	**(–2.27)**	**(1.84)**	(–0.68)	**(–3.16)**
*BelowIndAvg * Shock*	**0.18*** **	**–0.12*** **	0.04	0.02	0.08	–0.04	0.05	–0.01
	(3.79)	**(–4.29)**	(0.51)	(1.59)	(1.12)	(–1.30)	(1.37)	(–1.35)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	123.44	62.78	95.92	60.16	83.47	60.58	61.15	66.65
N	13,878	13,878	13,878	13,878	13,878	13,878	13,878	13,878
% Obs, BelowIndAvg =1	49.96	52.18	51.66	57.26	51.09	55.99	54.46	59.46