CEO JOB SECURITY AND RISK-TAKING

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Abstract

We use the time to expiration of employment contracts to estimate CEO turnover probability and its effects on risk-taking. Protection against dismissal should encourage CEOs to pursue riskier projects. Indeed, we find that firms with lower CEO turnover probability exhibit higher return volatility, especially idiosyncratic risk. An increase in turnover probability of one standard deviation is associated with a volatility decline of 17 basis points. This is driven mainly by changes in investment and is not associated with compensation or leverage. Our results are robust to controlling for firm- or industry-specific cycles and hold for new and continuing CEOs.

Keywords: Risk-taking, gambling for resurrection, CEO contracts, CEO turnover

JEL classifications: G34, J41, J63

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Dismissal is a serious threat to executives. It leads to the loss of current employment, to reduced future career options (Brickley et al., 1999), and sometimes to the loss of unvested equity-based compensation (Dahiya and Yermack, 2008). As public demand for increased managerial responsibility has grown over the last three decades, the probability of CEO turnover has risen substantially: its incidence increased from 13% during 1992–1997 to 17% during 1998–2005 (Kaplan and Minton, 2012; Peters and Wagner, 2013). It is therefore important to document the effects of the threat of dismissal on managerial incentives. Yet theoretical predictions concerning the effects of that threat are ambiguous, and empirical measurement of its effects is complicated by the endogeneity of turnover with respect to performance. This paper assesses the direction (and magnitude) of the effect of CEO turnover probability on risk-taking. We circumvent endogeneity issues by using the variation in turnover probability that results from the distance to ex-ante determined contract expiration dates.

Human capital risk leads managers to value risky projects differently than do shareholders or the board of directors. Low profitability due to the up-front costs of projects with uncertain future cash flows can be hard to distinguish from low profitability due to lack of effort or ability. As a result, managers for whom job security concerns predominate have an incentive to take less risk than is optimal for the firm. This argument, first advanced by Holmstrom (1982), has generated a large theoretical literature on related complications and potential remedies (e.g., Holmstrom and Ricart i Costa, 1986; Goel and Thakor, 2008).

However, Bebchuk and Stole (1993) and Iossa and Rey (2014) point out that the *direction* of this risk distortion depends on the information structure about the manager's ability and effort and/or the project's quality. Managers with greater career concerns (e.g., when renegotiation is imminent) may be expected to overinvest in risky projects if the costs of that investment are not observable before contract expiration or if investment can be

interpreted as exerting effort. Another motivation for greater risk-taking as turnover probability increases is the asset substitution or "gambling for resurrection" dynamic described in the literature on capital structure (e.g., Jensen and Meckling, 1976) and mutual funds (e.g., Chevalier and Ellison, 1997; Hu et al., 2011; Huang et al., 2011). In those contexts it is argued that the reward—firm survival in the former case, being highly ranked in the latter—is so valuable that the manager is willing to pursue projects with a negative net present value provided they have sufficient upside potential.

Although a substantial empirical literature explores the relationship between executive compensation and risk-taking, there is little empirical work that links CEO job security to risk-taking. Research focusing on firm performance prior to CEO turnover has yielded contradictory results. Gibbons and Murphy (1992) document a lower variance of stock returns but a higher variance of changes in shareholder wealth during the three years preceding such turnover. Murphy and Zimmerman (1993) argue that most observed changes in a firm's pre-turnover performance are more likely the cause than the effect of higher turnover probabilities. Disentangling these two possible dynamics is the main challenge for those seeking to analyze the causal effects (if any) of career concerns on risk-taking.

We use ex-ante expiration dates of employment contracts to obtain variation in turnover probability within the career of a given CEO. Many CEOs of US firms operate under fixed-term employment agreements. Such contracts set the "evaluation horizon" of the CEO's performance. Contract terms are credible because dismissal before the contractual termination date is costly and can lead to litigation. The cost of dismissal decreases as the CEO gets closer to contract expiration and increases upon renewal, so we can track the behavior of a given CEO as his contractual employment protection changes. Examining 3,954 of these contracts, we conclude that contractual protection is significantly related to turnover probability. We use a hazard model to estimate the likelihood of turnover as a function of the

CEO's contract horizon and tenure. Controlling for tenure, we find that being one year closer to the contract's expiration date translates into a 21% higher probability of termination.

A potential concern with our identification strategy is that the expiration date of the contract may be determined in conjunction with investment plans. However, we show empirically that investment cycles neither coincide with risk outcomes nor explain the observed relation between risk-taking and turnover probability. To ensure that the time remaining to contract expiration does not reflect investment plans that are not part of our investment cycle measure, we exploit the "sticky" nature of contract cycles (Hall, 1999; Shue and Townsend, 2013) and use previous contracts to predict the next contract's length. Therefore, this prediction is based solely on past information and is not affected by future investment plans. Using previous contracts to estimate the likelihood of turnover—while controlling for investment cycles—yields results that match those obtained when using actual contracts.

In accordance with the extant literature (e.g., Guay, 1999; Hayes et al., 2012; Gormley et al., 2013; Shue and Townsend, 2013), we use realized stock return volatility as our primary measure of risk-taking. We find a significant negative association between turnover probability and risk-taking so defined. An increase of one standard deviation in the likelihood of CEO turnover is associated with a decrease in return volatility of 17 basis points. Since this relation might not be linear, we split firms into quantiles of high and low turnover probabilities. There are no reversals of our base results in either the high- or medium-likelihood quantiles, which suggests that CEOs facing a high likelihood of termination do not gamble for resurrection by taking more risks. Note that when CEO turnover probability is high, speculation about possible re-appointment (or successors) may increase return volatility. Such effects may bias our results downwards.

We use a Fama–French three-factor model to decompose return volatility and show that the negative relation between turnover probability and return volatility is driven mainly by idiosyncratic rather than systematic risk. An increase in turnover probability of 10 percentage points is associated with a decrease in idiosyncratic risk of 0.6 percentage points, and there is no significant relation between turnover probability and market beta. We also explore the channels through which CEOs might take risks and find that this reduced volatility coincides with decreases in investment but not in leverage. These results suggest that CEOs take more (or less) risk via firm-specific projects and not by making adjustments in their leverage or hedging activity. This finding is consistent with the argument that job protection enables CEOs to take on riskier projects. It is less consistent with the notion that CEOs gamble, which is easier to do via changes in leverage and/or risk management. Finally, we show that the likelihood of CEO turnover has little effect on stock returns or accounting profitability. Such patterns of returns indicate that the effects of contract horizon are incorporated into prices. In particular, they reflect no evidence of successful gambling for resurrection.

Throughout the analysis, we control for executive–firm fixed effects. In other words, we hold the CEO–firm pair constant and exploit the variation in turnover probability throughout the CEO's tenure. A possible concern with this approach is that the effect of a new CEO's tenure on return volatility is mechanically related to the remaining time to contract expiration. However, when contracts are renewed, their length is reset and may be changed. Our results hold also when we use only the subsample of CEOs whose contracts have been renewed. Not all CEOs sign fixed-term employment contracts. We control for selection into such contracts by using a Heckman (1979) selection model that exploits the variation in employment law across states. Our findings are robust to controlling separately

for firm fixed effects and executive fixed effects, and they hold also when we control for age or tenure groups or for CEO compensation levels.

The contract expiration date delivers exogenously timed but imprecise changes in turnover likelihood. The time to contract expiration gives us a good estimate of turnover probabilities when the expiration date is distant, but it becomes less precise as that date approaches; then performance-related measures become a more important aspect of evaluations. Using prior performance to predict CEO turnover probability yields results that are similar to those obtained when using time to expiration.

Our analysis makes several contributions to the existing literature. First, this paper contributes to the literature on CEO turnover. Debate in this area has focused on how CEO turnover is related to firm performance and corporate governance. We introduce a predictor of CEO turnover that not only improves the precision with which turnover probabilities are estimated but also has other distinct advantages. Contractual terms establish a turnover timing structure ex ante and independently of performance. These characteristics enable empirical researchers to isolate the causal effects of turnover probability.

Second, our work adds to the literature on risk-taking incentives by establishing an empirical link between job security and stock volatility. Such a link has been assumed by the theoretical literature as far back as Fama (1980) and Holmstrom (1982), yet there is scant empirical evidence that clearly links career concerns and risk-taking. Notable exceptions include Gormley and Matsa (2011), who use risk arising from large, left-tail events as shocks to job security, and Low (2009), who documents changes in risk-taking behavior after legislation in Delaware increased protection against takeovers. Whereas Gormley and Matsa find that managers reduce operational risk in response to *increased* exogenous risk, Low finds the managers reduce such risk in response to *decreased* exogenous risk. Garfinkel et al. (2013) argue that the latter effect is driven by old CEOs who are more insulated from career

concerns in the event of a takeover. A related branch of empirical literature, starting with Chevalier and Ellison (1997, 1999), identifies a link between the career concerns of mutual fund managers and the risks that they take. However, the incentives of fund managers differ from those of CEOs; mutual funds are in competition to be ranked as top performers, but firms compete for investors by generating higher absolute returns (i.e., irrespective of between-firm rankings).

Third, there are only few empirical studies of CEO employment contracts. Schwab and Thomas (2005) analyze a sample of 375 contracts from a legal perspective. Gillan et al. (2009) report that many CEOs operate without a contract. Both of these papers examine the choice between explicit and implicit contracts. We build on this research by describing the effect of contract horizon on career outcomes and risk-taking behavior.

1. DATA

1.1. *Contracts*

Regulation S-K (Item 402) of the Securities Exchange Act of 1934 requires disclosure of the terms of employment contracts and agreements between US registrants and named executive officers. Following Schwab and Thomas (2005) and Gillan et al. (2009), we collect explicit contracts from Securities and Exchange Commission (SEC) filing exhibits and, when possible, from The Corporate Library. For all S&P 1500 firms that do not file an explicit contract, we read all proxy filings and Forms 10-K to obtain summaries of contract terms. Some executives sign at-will employment agreements that include compensation and severance clauses but do not specify any employment period. No such agreements are included in our sample. For 81 renewals in 1994 and 1995 we use the renewal agreement to obtain the characteristics of the original contracts that were not filed electronically. We obtain separation dates from ExecuComp, Risk Metrics, or BoardEx.

This procedure yields data on 3,954 fixed-term employment contracts, for 2,964 CEOs and 2,901 firms, that were entered into during the period 1992–2008. Table 1 reports the descriptive statistics. Accounting data are reported for the year prior to commencement of the contract.

TABLE 1 HERE

Panel A of Table 1 reports the number of contracts by length. Most contracts are for less than six years; the modal value is three years (1,515 contracts), followed by two-year (741) and five-year contracts (551). Of the 39 contracts that are for longer than ten years, 12 are explicitly linked to the executive's retirement age. Altogether, 28 contracts in our sample are explicitly linked to age. As Jenter and Lewellen (2011) document, such linkage typically occurs when the CEO's age reaches 65 (23 contracts). Most of the 64 contracts of less than a year's duration are renewals effective until the end of the current calendar year (38 contracts); the remaining 26 contracts in this group are for interim CEOs. So-called evergreen contracts, which are automatically renewed every day or month to retain the same time to contract expiration, are not that frequent (a total of 73 contracts). For each contract of a given type and length, we indicate what percentage it constitutes among all the sample contracts of that type. The distributions for first contracts and renewed contracts are quite similar. Upon renewal, CEOs tend to receive more evergreen contracts and longer contracts but do also receive some extremely short ones.

Employment contracts are typically governed by the law of the state in which the employee works. For CEOs, this is usually the state where the firm's headquarters is located—as confirmed by a brief perusal of these contracts. Panel B of Table 1 gives the number, length, and distribution of contracts for the 15 states with the most contracts in our sample. California is host to the greatest number of sample firms, followed by New York and then Texas. The distribution closely follows that of all firms in the Compustat database.

1.2. *Sample selection issues*

Although most companies disclose the length of their CEO's employment contract, some may omit such legally required disclosure even though their CEO is under a fixed-term contract. To put the number of our sample contracts into perspective: Gillan et al. (2009) survey all S&P 500 firms in 2000 and find that 255 (or 45%) of their CEOs had employment contracts. Our sample contains 236 contracts that were in place with S&P 500 firms in 2000; thus 19 (or 3.8%) are missing. Because S&P 500 firms tend to be large, they are likely to have better disclosure quality. For this reason, there is likely a higher percentage of omitted contracts in the rest of our sample.

Panel C of Table 1 compares firms with a fixed-term contract (accounting numbers are measured in the year before the contract starts except for AIMR data) to other firms. Our sample contains 3,954 fixed-term contracts and 23,238 firm-years for firms without fixed-term contracts. The mean firm size (as measured by book assets) of firms with fixed-term contracts is $1,756 million; return on assets (ROA) averages 2%, and the average market-to-book ratio is 2.62. Lang and Lundholm (1993) find that larger and better-performing firms earn better disclosure quality ratings from the Association for Investment Management and Research (AIMR). If the fixed-term contracts sample were biased toward firms with better reporting standards, then it would contain larger and more profitable firms. Yet this is not the case: a comparison with Compustat firms for which no CEO contract terms are available reveals that these firms are larger and more profitable, with mean assets of $2,621 million and mean ROA of 7.1%. One implication of these values is that our sample is not substantially biased on account of containing smaller firms. Industry adjusted (Brown and Hillegeist, 2007) AIMR scores in 1994 and 1995—the last rankings before they were discontinued—were actually higher for firms that did not disclose a contract (100%, as against 93% for those that did). The fixed-term contract firms also exhibit a greater frequency

of earnings restatements (4.7%, versus 4.5% for firms with no disclosed contract). Overall, these numbers do not support the objection that CEOs of firms with no observed fixed-term contract actually have a contract yet it is not disclosed owing to lower disclosure standards. We revisit this concern in Section 2.

1.3. *Descriptive statistics*

Table 2 reports summary statistics for firm-years under the fixed-term contracts described previously. These contracts constitute the sample for our subsequent analysis. The mean firm in our sample has assets of $1.8 million, an ROA of 4.6%, annual stock returns of 20%, a market-to-book ratio of 2.7, and leverage of 22%. We use three measures of risk: return volatility, market beta, and idiosyncratic risk. *Volatility* is the standard deviation of daily stock returns. *Beta* is the market beta from a Fama–French three-factor model estimated using one year of daily data, and *idiosyncratic risk* is the standard deviation of the residuals from that model. We report both volatility and idiosyncratic risk in percentage terms. The mean volatility is 3%, the mean beta is 0.94, and the mean idiosyncratic risk is 0.11%. On average, our sample firms spend 4% of their asset value on research and development (R&D) and 7% on capital expenditures (CAPEX); 21% of the sample observations are for firms that operate in the banking or insurance industry.

TABLE 2 HERE

Table 2 also gives descriptive statistics of CEO and corporate governance characteristics. The mean CEO age is 54 years, and 34% of the sample CEOs are under renewed contracts. On average, a CEO receives compensation of $5.2 million (TDC1, inflation adjusted to year-2000 value). For our sample firms, the average governance index (Gompers et al., 2003) is 9.15. More than half (52%) of the CEOs also hold the position of chairman, and 74% of CEOs are recruited from inside the firm.

2. EMPIRICAL STRATEGY

2.1. *Time to contract expiration and turnover probability*

In a fixed-term employment contract, the firm commits to paying compensation for a certain number of years and is obligated to do so even if the employee is terminated prematurely. As an immediate consequence, the cost of termination is increasing in the numbers of years left under the contract. An executive who is terminated early is typically entitled to a multiple of the base salary and the minimum bonus, although this sum can be augmented contractually. As an example, take John Mack's 2005 five-year contract with Morgan Stanley:

> *If, during the Employment Period, the Company shall terminate the Executive's employment other than for Cause, death or Disability or the Executive shall terminate employment for Good Reason: (i) the Company shall pay to the Executive in a lump-sum cash payment as soon as practicable after the Date of Termination the aggregate of the following amounts:*
>
> *…an amount equal to the product of (1) the Executive's Total Compensation for the most recently completed fiscal year and (2) the greater of (x) a fraction, the numerator of which is the number of days from the Date of Termination through the fifth anniversary of the Effective Date, and the denominator of which is 365 and (y) 1.*[1]

So in Mr. Mack's case, the cost of dismissal prior to contract expiration is the product of his total compensation and the number of years remaining until the contractual termination date. The total compensation of Mr. Mack was $45 million in 2006, the first year of his employment contract; therefore, severance pay for termination in 2006 would have exceeded $182 million. Assuming that compensation remains at this level, severance pay in 2009

[1] Morgan Stanley, Form 8K, Exhibit 10, filed 22 September 2005.

would have been only $45 million (i.e., $137 million less).[2] For the turnover decision, such severance pay must be compared with the potential benefits of dismissing a CEO prematurely. In contrast, Mr Mack is not obliged to pay penalties upon voluntary resignation.

FIGURE 1 HERE

In Figure 1, we plot the average turnover incidence against the number of remaining contract years. Turnover can occur at any time during a contract, not only at its expiration. The figure shows that, for example, CEOs with five years remaining under contract have a 3% likelihood of leaving. Turnover probability increases with every year closer to contract expiration, reaching 10% for the last year prior to expiration. This trend reflects not only the financial consequences of terminating a contract but also the role that contract horizons play in the evaluation of executives. As time passes and the expiration date approaches, firms are better able to judge how well the CEO fits with the firm—a judgment that (naturally) affects the likelihood of contract renewal. The increased incidence of turnover close to expiration may indicate an unfavorable renewal prognosis, prompting both parties to seek other options. The pattern of increasing turnover throughout a contract serves to identify our concept of job protection.

2.3. *Estimating turnover probability*

To confirm our univariate results in a multivariate setting, we estimate turnover using proportional hazard models of the general form

$$\lambda(s_i, X_{i,t}) = \lambda_0(s_i) e^{\beta' \mathbf{X}_{i,t}}. \tag{1}$$

Here λ denotes the probability of CEO departure after *s* years (conditional on having remained in office until that year), λ_0 is the baseline hazard rate, and $X_{\boldsymbol{i,t}}$ is a matrix containing the variables that predict turnover for firm-CEO pair *i* in year *t*. We use two

[2] For more details on severance pay, see Rusticus (2006), Goldman and Huang (2010), and Rau and Xu (2013).

models for the baseline hazard: a Cox (1972) partial likelihood model, which does not specify a functional form for $\lambda_0(s)$ and a Weibull specification, which sets

$$\lambda_0(s) = \lambda\alpha s^{\alpha-1} \quad (2)$$

In our baseline specification, we predict turnover using the number of years remaining to the expiration of the contract. Because contracts are signed prior to observing performance, this estimate is unrelated to the firm's actual performance and return volatility during the contract. We also include industry and year fixed effects (to capture fluctuations in the economy) as well as factors that vary across industries, such as the degree of competition and the supply of CEOs.

Toward the end of a contract, executives have accumulated a performance history that is relevant to the firm's decision about whether or not to renew. At this time, a CEO with a good track record should face a lower probability of being replaced. We therefore follow Jenter and Lewellen (2010) and compare the baseline specification to one that specifically accounts for endogenous performance. Those authors estimate CEO turnover as a function of book-to-market ratio (B/M), size, profitability, whether the firm pays dividends, and tenure performance. Tenure performance is defined as the cumulative stock return over the preceding five years or since the current CEO's tenure began (whichever is more recent).[3] Finally, in a third model we use all of these variables to gauge the importance of contracts relative to other factors.

In Table 3, Panel A summarizes the results of the estimated hazard models of CEO turnover. Column 1 shows a Cox proportional hazard model that predicts CEO turnover using industry and calendar year fixed effects (FEs) and the number of years remaining to the expiration of the CEO's contract. Those CEOs with more time remaining to contract expiration are significantly less likely to leave the firm. Each additional year remaining to the

[3] Instead of using cumulative industry-adjusted returns, we use cumulative raw returns and include industry fixed effects. Gormley and Matsa (2014) show that, in settings like this, the fixed-effects approach is preferable when one seeks to account for industry heterogeneity.

CEO's contract expiration decreases turnover likelihood by 20.5 percentage points. Column 2 shows—holding other factors constant—that CEOs of large firms are more likely to be dismissed and that CEOs with higher past accounting performance and higher stock returns are less likely to be dismissed.

TABLE 3 HERE

In column 3 of Panel A we add the number of CEO contract years remaining to all the variables from column 2. The sign of the remaining years variable is still negative; it is highly significant ($t = -10.98$), and its magnitude *increases* when we control for variables commonly used in the CEO turnover literature. The coefficient estimate of 0.7683 suggests that each additional contract year remaining to expiration makes it 23% less likely that the CEO leaves in a given year. The sign, significance, and magnitude of the other coefficients is similar to the estimates reported in column 2. We use the estimated hazard rates from columns 1–3 in the subsequent analysis, presented in Tables 5–11, and term this estimate "turnover probability".

To make sure that our results are not driven by tenure or more specifically, new CEOs, we repeat the analysis of column 1 for the subset of CEOs employed under a renewed contract. Figure 2 shows that the pattern of unconditional turnover likelihood for renewed CEOs is similar to the one for the whole sample: with renewal, contractual protection resets and gradually begins to fall as the renewed contract moves towards its new expiration date. The multivariate results are reported in column 4. These estimates are similar to our main results in their magnitude and statistical significance.

FIGURE 2 HERE

Columns 5–8 of Panel A report Weibull specifications, which allow for duration dependence in CEO turnover. The coefficient estimates are similar to those obtained under the Cox proportional hazard models and are highly significant statistically. In addition to the

coefficient estimate, for the estimated Weibull models we also report the shape parameter. This parameter is significantly different from 1 only in column 7 (at the 10% level), indicating that the distribution exhibits no duration dependence. We conclude that both Cox and Weibull hazard model specifications show that CEO turnover is predicted by the number of years remaining to contract expiration.

Most of the literature on CEO turnover employs models using logit regressions (Denis et al., 1997; Mikkelson and Partch, 1997; Perry, 1999; Huson et al., 2001) or probit regressions (Jenter and Lewellen, 2010).[4] To ensure that the results reported here are not driven by our empirical specification, we also estimate logit and probit models on firm-year observations; for this purpose we use a dummy variable set equal to 1 if the CEO leaves in a given firm-year (and set to 0 otherwise).[5] Panel B of Table 2 reports the values obtained from these probit and logit regression models of CEO turnover. The results are similar to those of the hazard models: CEOs with more years remaining to contract expiration are less likely to leave the firm. Overall, we conclude that our choice of empirical model does not affect the conclusion that the number of years remaining to contract expiration predicts turnover. This effect is highly statistically significant in all of our models.

2.4. *Selection into the sample*

Because our analysis links the number of years remaining on a CEO's contract to turnover probability, and in turn to risk-taking, we necessarily focus on CEOs with fixed-term contracts. However, CEOs with fixed-term contracts may differ from other CEOs. Likewise, there could be differences among the firms that offer these various contract types. To control for the selection bias that could arise from using a nonrandom sample, we follow the approach of Heckman (1979) and use the choice regression described next to compute the

[4] For a review of the literature on CEO turnover, see Brickley (2003).

[5] Nonlinear models may have the incidental parameters problem leading to incorrect estimates of fixed effects (Neyman and Scott, 1948; Heckman, 1981). Therefore, in untabulated tests, we also use linear probability models to estimate CEO turnover. These models yield qualitatively and quantitatively similar results, lending further support to our main findings.

inverse Mills ratio. We use a state law characteristic for the identifying restriction: the at-will exception rule of good faith and fair dealing (henceforth simply the "exception rule"). This statewide rule prohibits terminations made in bad faith or motivated by malice.[6] This rule protects rank-and-file employees with relatively shorter contracts (or even without contracts), which makes such forms of employment more attractive. The ensuing popularity of shorter contracts makes it difficult for executives to negotiate longer contracts for themselves. However, this rule's direct judicial consequences for CEOs are probably limited because they are already protected by individual contracts. The applicability of at-will exceptions is listed by state in Section A.1 of the Appendix (cf. Walsh and Schwarz, 1996; Muhl, 2001). In most states, these rules were adopted between 1960 and 1980 (i.e., before our sample's time frame) in response to debates driven both by that era's political sentiments and the particularities of some precedent cases. Panel B of Table 1 provides a breakdown of the sample by state (for the 15 states with the most observations). The sample composition is comparable to the overall COMPUSTAT distribution and provides a mixture of states with and without the exception.

To identify firms that do not disclose their CEO contracts, we use the following determinants of disclosure quality: firm size, number of equity issuances, and standard deviation of analyst forecasts. Lang and Lundholm (1993) and Brown and Hillegeist (2007) show that these variables affect disclosure quality as measured by (the since discontinued) AIMR scores. Because the determinants are fairly generic firm characteristics, we also include a variable that indicates whether the firm made any earnings restatements in the relevant year (as reported by Audit Dynamics).

We follow Gillan et al. (2009) in choosing other determinants of long-term contracts. These authors argue that labor market risk should be relevant for choosing contract terms;

[6] There are two other exceptions that are less relevant for our purposes. Under the *public policy* exception, dismissal is not allowed if it violates the public policy (or a statute) of the state. Under the *implied contract* exception, an employee can dispute dismissal by proving the existence of an implicit (i.e., not written) contract.

that is, firms operating in riskier industries must renegotiate contracts more often. We use their indicators of industry risk: homogeneity of stock returns, volatility of median sales, and annual rate of survival. Both CEO and board characteristics should also affect contract negotiations. In particular, there is less uncertainty about incumbent CEOs, especially when they have been in their position for a long time. A similar argument can be made for older CEOs with a lengthy track record. We control for CEO incumbency, age, and tenure, and we use the governance index of Gompers et al. (2003) to control for the board's power. To ensure that geographical effects are in fact due to at-will exceptions and not to other legal differences across states, we control—with respect to the state of incorporation—for such other geographical indices as the anti-takeover index of Bertrand and Mullainathan (1999) and the anti-competition enforceability index of Garmaise (2011). All regressions contain industry and year fixed effects to control for exogenous shocks to the labor market.

Table 4 presents the results. Column 1 reports values for a probit specification that predicts the choice of entering into a fixed-term contract in terms of all the aforementioned variables. Column 2 uses the variables that are found to be significantly associated with contract choice in column 1 to predict the choice of accepting a fixed-term contract. This regression is used to compute inverse Mills ratios for the regressions reported in Section 3.

TABLE 4 HERE

States with the exception rule are significantly less likely to issue fixed-term contracts, in line with the findings of Miles (2000). As for the two other geographical variables, the anti-takeover (resp., anti-competition enforcement) index is significantly (resp., marginally) related to fixed-term contracts. Thus we find that CEOs are more likely to enter fixed-term and longer contracts if anti-takeover laws are in force, which is consistent with the complementarity of external and internal governance (Cremers and Nair, 2005).

We find little evidence that firms with lower disclosure quality are less likely to disclose a contract. In defense of the disclosure bias hypothesis, firms with more equity issuances are more likely to be in the sample, and such firms face more disclosure requirements. That being said, smaller firms—as well as firms with more earnings restatements—are less likely to be in the sample of CEOs with a (disclosed) fixed-term contract. That these variables are related to the incidence of such contracts indicates that they measure firm characteristics unrelated to disclosure. The standard deviation of analyst forecasts is not significantly related to contract choice, which also suggests that information asymmetry is of little relevance to sample selection.

Industry homogeneity is associated with fewer contracts. In homogeneous industries, both CEO and firm have more outside options and so an employment contract is less important. Our industry risk variables are not significantly related to contract choice. Incumbent CEOs are more likely to receive a fixed-term contract. Older and longer-tenured CEOs are more likely to have no contract, perhaps because firms are less uncertain about their potential. The Gompers et al. (2003) governance index is positively associated with a firm's use of contracts. This measure is lower for firms with high shareholder orientation. The positive association suggests that a board of directors with less bargaining power is more likely to offer a fixed-term contract.

3. CEO TURNOVER PROBABILITY AND RISK TAKING

This section documents the relationship between CEO turnover probability and risk-taking. Throughout this section, we estimate the following model for firm–executive pair *i* in year *t*:

$$Risk_{it} = \alpha + \beta Turnover\_probability_{it} + \gamma Mills_{it} + \eta_i \quad (3)$$

As described in Section 2, the sample is restricted to executives on fixed-term contracts. We control for selection into this sample using the inverse Mills ratio from the regression described in the previous section. Firms and executives differ in their capacity and preference

for risk. We control for unobserved firm and executive heterogeneity by using firm–executive fixed effects. Because turnover probability is an estimated regressor (as in Murphy and Topel, 1985), we use bootstrapped standard errors—clustered at the firm level—in all our regressions (Kayhan and Titman, 2007; Petersen, 2009).[7]

We begin with our main analysis on stock return volatility. We then analyze different forms of volatility, potential sources of risk, and the heterogeneity of the relationship between job security and risk-taking.

3.1. *Stock return volatility*

In this section we explore the effect of an increase in the likelihood of turnover on stock return volatility, which is our primary measure of risk-taking. We estimate turnover probability using contract terms.

In Table 5, column 1 of Panel A reveals a strong negative correlation between predicted turnover probability and return volatility. Lower CEO turnover probability is associated with greater volatility. The values reported in column 1 indicate that an increase of one standard deviation in turnover probability corresponds to a reduction of 17 basis points (bp) in return volatility. The 17 basis points correspond to 10% of a standard deviation in return volatility.

TABLE 5 HERE

In column 2 of Panel A, we use the predicted turnover probability generated by following Jenter and Lewellen (2010) and taking performance into account. This reduces our sample from 9,030 to 6,709 observations because of missing data items. Our results are qualitatively unaffected: higher CEO turnover probability is still associated with significantly lower return volatility. The economic effect is reduced by nearly a fifth: from a 17-bp

[7] The robustness of *bootstrapped* standard errors (as used by Kayhan and Titman, 2007) is equal to or greater than that of *clustered* (but not bootstrapped) standard errors (as used by Petersen, 2009).

decrease to a 3.5-bp decrease. We obtain similar estimates in column 3, where we use both contract information and the variables suggested by the literature to predict CEO turnover.

In column 4, we address the possibility of a nonlinear relation between turnover likelihood and return volatility. In particular, the career outcome for a CEO with extremely high or extremely low turnover probability may be so certain that there is no compelling reason for any change in behavior. We regress volatility on dummy variables for CEOs with turnover probability in the lowest ("low"), highest ("high"), and third and fourth ("medium") quintile. That is, our baseline comparison group is the second quintile. We find the same pattern when using a variety of other classifications[8]. There is no evidence of gambling for resurrection. On the contrary, CEOs facing high turnover probability exhibit the least amount of risk taking; for this group, return volatility is lower (than the baseline) by 48 bp. Low turnover probability is not significantly related to volatility. Medium turnover probability corresponds to a 10-bp decrease in volatility, or one quarter of the coefficient for the high turnover probability. This finding confirms our results from columns 1 and 2: neither CEOs with medium turnover probability nor those with high turnover probability take more risk than those with low turnover probability.

In column 5 of Table 5's Panel A we regress volatility directly on a dummy for election years (i.e., years in which the CEO's employment fate is determined, with no further transformation). We find that return volatility is 8 basis points lower in election years than in other years. Speculation about CEO succession may increase stock volatility in an election year, so the actual incentive effect may be even higher.

Contract horizon is strongly correlated with tenure, and volatility may be as well. Pan et al. (2013b) argue that it takes time for the stock market to evaluate the match between the firm and a new CEO, and this can lead to additional volatility in the CEO's first years on the

[8] We discuss the issue of using different classifications further in Section 4.4.

job. Bushman et al. (2010) argue that uncertainty about the CEO's talent is associated with greater likelihood of turnover. To make sure that our results are not driven by tenure and, more specifically, by new CEOs, we repeat the analysis of column 1 for the subset of CEOs employed under a renewed contract. The results—reported in column 6—are weaker than those in column 1, with a coefficient of −0.58, but are still significant (at the 1% level). This outcome confirms that the finding of Pan et al. (2013b) applies to our sample, but it also confirms the relation between turnover risk and volatility over and above this effect.

3.2. *Composition of volatility*

In Panels B and C of Table 5, we decompose volatility to examine whether the effect of turnover likelihood is stronger for idiosyncratic or systematic risk by repeating the regressions discussed in Section 3.1 while using these dependent variables. Chevalier and Ellison (1999) argue, in the context of mutual funds, that young managers with a more recent track record have an incentive to "herd"; then, if they do not perform well, at least this occurs at a time when other candidates for their job are unlikely to perform much better. Although mutual funds differ from other firms in several ways, we are interested in whether this basic intuition applies also to CEOs. That is: Do CEOs facing a greater likelihood of turnover adjust systematic risk in order to foster their re-election? CEOs are also generally in a better position to change systematic risk—for example, by expanding or reducing hedging activities (Tufano, 1998; Perez-Gonzalez and Yun, 2013)—than idiosyncratic risk, which typically involves taking or cancelling firm-specific projects or personnel decisions. This means that CEOs who try to gamble before renewal decisions are more likely to increase systematic risk, whereas CEOs who take on risky projects because they feel unthreatened by possible dismissal are more likely to affect idiosyncratic risk.

Panel B shows that the negative relation between return volatility and turnover probability is driven by idiosyncratic risk. An increase of one standard deviation in the

likelihood of turnover corresponds to a 1.3-bp decrease in idiosyncratic risk (which is 9% of one standard deviation of idiosyncratic risk). Moreover, the magnitudes of all other coefficients are smaller than the coefficients for return volatility. The only remarkable difference is shown in column 4: CEOs who face only a low probability of turnover take significantly more idiosyncratic risk. Panel C of Table 5 shows that an increase in turnover probability is associated with no (or very minor) reductions in systematic risk.

3.3. *Sources of risk*

Managers can increase either operational or financial risk. In this section, we explore two specific channels that could drive the change in volatility: capital investment and financial leverage. Operationally risky decisions may take forms other than that of investment; examples include hiring specific managers or shifting resources between business units. However, such actions are more difficult to observe empirically. Capital investment, although it need not be risky, not only is easier to measure but also is the channel through which—according to most theoretical papers—risk-taking decisions operate. In Table 6, Panel A documents the negative association between turnover probability and with capital expenditures (normalized by the previous period's value of assets). An increase of one standard deviation in the likelihood of turnover corresponds to a 0.8-bp decrease in capital expenditures (or 8% of one standard deviation). This result is consistent with the argument that CEOs are more likely to make investments if they are protected from turnover. Much as with our findings for total and idiosyncratic volatility, this effect persists when we estimate turnover probability using only the variables suggested by the literature and also when we use those variables in addition to our variables for contract terms.

TABLE 6 HERE

Panel B of the table indicates that the relation between turnover probability and financial leverage is mixed. On the one hand, columns 1, 4, and 5 reveal no significant

correlation between these two factors. On the other hand, in columns 2 and 3 we see that a higher likelihood of turnover is associated with an increase in leverage. Yet the economic significance of this effect is rather small: an increase of one standard deviation in turnover probability corresponds to an increase of 0.0034 in leverage, which is only 0.97% of the standard deviation of leverage. Similar results are obtained when using book leverage and the level of debt (in logarithms). Overall, the effect of turnover probability on leverage is small.

3.4. *Performance*

If executives gamble for resurrection, then there may be evidence of manipulation in terms not only of risk but also of performance. After all, the firm's board of directors is likely to base its renewal decision on measures of performance. To test this hypothesis, we repeat the regressions described in Section 3.1 using ROA and stock returns as dependent variables. We cannot use turnover probability from the regressions with performance variables (columns 2 and 3 of Panel A in Table 3) because doing so would lead to circularity in our estimation strategy. The results for this test are reported in Table 7. We find no relationship between turnover probability and either stock returns or ROA.

TABLE 7 HERE

Finally, we remark that our research design does not allow for measuring the effects of turnover likelihood or contract length on performance. Because contracts are public knowledge, any significant average performance effects should be known and incorporated into stock prices at the beginning of the contract. Although each contract yields variation in the level of job protection over time, no contract provides exogenous variation in characteristics of the contract itself.

3.4. *Heterogeneity*

So far we have reported a negative effect of turnover probability on return volatility. Here we explore whether this effect varies with investment opportunities, governance, or industry. In

Table 8, Panel A reports the results on turnover probability estimated using contract terms while Panel B reports results when we use instead quintiles of turnover probability.

TABLE 8 HERE

Incentives to take more risk should be more valuable for firms that have more growth opportunities. In contrast, firms that are more stable and mature should be wary of overinvestment (Jensen, 1986). In columns 1 and 2 of Panel A, we find significant results in the lowest and the highest quintiles of market-to-book ratio. Although the effect of turnover likelihood is significant in both subsamples, it is (as expected) more pronounced—nearly twice as large—in the quintile featuring the greatest market-to-book ratio (arguably the one with the greatest investment opportunities). The *t*-statistics show that the coefficients differ significantly for firms with high versus low market-to-book ratios, but only within the highest quintile of turnover probability.

An important determinant of dismissals is corporate governance, since the decision to renew or dismiss a CEO is made by the board. Those CEOs with more power should fear dismissal less and so their career concerns should matter less for risk-taking. In columns 3 and 4 of Table 8's Panel A, we use a direct measure of CEO power to split the sample according as whether the CEO does (or does not) also hold the position of Chairman of the Board. The coefficient for the continuous measure of turnover probability is significantly more negative for CEOs who do *not* hold that position, which is consistent with the argument that these executives have less power and are therefore more sensitive to possibility of turnover. The effects of turnover probability quintiles (Panel B) on volatility are of similar sign and magnitude. Non-chairman CEOs take more risk when facing a low likelihood of turnover but take significantly less risk when facing a high turnover probability. Again, we find no evidence of gambling for resurrection.

Edmans (2009) argues that blockholders—and, more specifically, institutional owners—monitor CEOs and shield them from career risks if necessary. Such actions give CEOs a greater incentive to innovate. Aghion et al. (2013) show empirically that firms with greater institutional ownership produce more innovative output, and interpret this result as an effect of insulation from market pressure. Indeed, higher levels of institutional ownership (high quintile in column 6 versus low quintile in column 5) significantly reduce the effect of job security on risk-taking. The effect of the continuous measure of turnover probability is significant for both subsamples but is significantly more negative for the case of low institutional ownership. Splitting the sample by quintiles of turnover probability, we find that the effect on firms with low levels of institutional ownership firms is driven by the reduced risk-taking effect in medium- and high-risk firms, and the effect for firms with high levels of institutional ownership firms is concentrated in the lowest and highest quintiles.

The values reported in columns 7 and 8 enable us to analyze the relation between turnover probability and return volatility in terms of internally appointed versus externally hired CEOs. The board will have more information on an internally appointed CEO than on one hired externally, which means that it can more easily assess the former's performance. Accordingly, we find that internally appointed CEOs are less responsive to the likelihood of turnover than are externally hired CEOs (although the difference is not significant from a statistical standpoint). The sign and the magnitude of the coefficient are similar to that of the baseline analysis for both groups. Neither externally nor internally appointed CEOs gamble for resurrection.

In columns 9 and 10, we restrict the sample to firms in the financial sector or the oil and gas sector. Executives in the former industry may have more opportunities to manipulate risk—for example, by using derivatives. Yet we find no evidence to support that argument, since the coefficient for the continuous measure of turnover probability is not significant for

firms in the financial sector. The only significant association between return volatility and likelihood of turnover occurs in firm-years characterized by a medium level of turnover probability, which exhibit less volatility. In contrast, the coefficient estimated for the oil and gas industry is both significantly negative and of greater magnitude than in the baseline sample. For executives in those sectors, investment opportunities are arguably less cyclical because they can always choose between exploring fields themselves or acquiring already explored fields (Gilje and Taillard, 2012). However, these results are not significant for the quantiles considered.

Finally, young CEOs may be more concerned about job security because they have less reputation to draw upon in the event of their dismissal. Columns 11 and 12 show, respectively, our regression results for CEOs below and above the median age. The effect of job security on risk taking is more pronounced for younger CEOs, but not significantly so except within the highest quintile of turnover probability.

4. IDENTIFICATION AND ROBUSTNESS

The identification assumption central to a causal interpretation of our findings is that the cyclical variation in contract horizon-related job security is uncorrelated with unobservables that (i) affect risk and (ii) are *not* captured by firm–executive fixed effects. To explain our results, such unobservable variables must be cyclical (similarly to contract-related job protection) and must determine risk-taking. This section presents robustness tests that support our identification assumption.

4.1. *Expansion plans*

When hiring their CEO, a firm may have a specific task in mind—for example, investing in a certain plant, expanding into a new market, or cost cutting (Anderson et al., 2013). In such cases, the firm may choose a contract expiration date corresponding to the planned duration

of that task.[9] If our results were driven by such task-specific CEO hires, then the motives underlying the offered contract's length must involve up-front risk-taking and relatively little risk at the end. This description fairly characterizes most projects of an expansive nature.

Although the firm's future plans are not directly observable, we can use historical information to extrapolate its expansion cycles. Every such cycle is different ex post; however, in their strategic planning, firms rely on detailed information and experience from past cycles. If expansion cycles are the only consideration determining the contract horizon, then forecasted cycles should be equal to the contract horizon. Moreover, expansion cycles should also lead to a risk-taking pattern that is similar to the one we document—even in the absence of contracts.

We construct expansion cycles as the time elapsed between peaks in the growth of investment spending. We define such peaks as years in which capital expenditures grow more than 25% compared to the previous year. (We obtain similar results when using R&D expenses to define peaks, which is only available for a small subset of our sample.) In Table 9, Panel A gives descriptive statistics for our measures of investment cycles. The average CAPEX and R&D cycles are longer—at 3.89 and 4.18 years, respectively—than the average CEO contract (3.28 years). The length of a firm's investment cycle is fairly persistent: the standard deviation of within-firm cycle length is 0.35 for CAPEX cycles and 0.26 for R&D cycles. For each firm-year, we compute the number of years left until the end of the cycle. The average difference between this variable and the number of years remaining to the expiration of the CEO's contract is 0.92 (0.98 when using the most recent cycle; 0.97 when using R&D to compute the cycle).

TABLE 9 HERE

[9] Anecdotal evidence indicates that not all contract durations are matched to existing projects. For instance, we identify (in our sample of fixed-term contracts) five CEO turnover events that are due to sudden deaths. In each of these cases the successor was given a contract whose expiration date differed from the one of the deceased CEO.

In Panel B of Table 9, we repeat our baseline regressions while using the expansion cycle together with the turnover probability measure that was computed from the actual contract horizon. Note that we compute the expansion cycle only for firms that exhibit large changes in CAPEX. This reduces our sample to 1,960 observations. If expansion cycles were driving our results, then they—and not the measure of turnover probability—should explain risk. However, this alternative interpretation is not supported by the data. Columns 1–3 show that, when we control for investment cycles, our measure of job security remains negative and highly significant. In contrast, the timing of investment cycles is not significantly correlated with volatility in any of the specifications. The results reported in Table 9 suggest that ex ante expansion plans cannot explain the effect of turnover probability on risk-taking.

Because our expansion cycle predictions are based on historical and industry-wide data, they may not capture novel and/or firm-specific expansion plans that are reflected in the actual contract horizon. To address this concern, we predict contract expiration dates using the length of *previous* contracts, an approach used in the compensation literature to predict so-called option grant cycles (Hall, 1999; Shue and Townsend, 2013). There are several explanations for the ability of past contract length to predict future contract length; in particular, firms may re-use past contracts, repeat evaluation cycles, or attract CEOs with similar preferences. Anecdotal evidence from human resources officers suggests that the previous contract often serves as a reference point in new contract negotiations. To isolate such information, we replace contract length with the length of previous contracts offered by the same firm.

We compute historical contract length in three ways: using the most recent, the two most recent, and the three most recent fixed-term contracts prior to the current contract. We then replace the actual contract length with this historical contract length for all firms for which we observe at least one previous contract. We apply this procedure to all firms

irrespective of the actual contract length and regardless of whether the new contract actually has a fixed term. The resulting contract length, with a mean of three years (Panel A of Table 9), is comparable to that in the baseline sample. This length is sticky within firms, with a standard deviation of 0.23 (0.13 and 0.09, respectively, for the two- and three-year averages). We then use this predicted contract length to compute the number of years until expiration. The average difference between this measure and the actual number of years to contract expiration is 0.61 years.

Thereafter, instead of using the number of years remaining to the expiration of the CEO's actual contract, we use the number of years that *would remain* on the contract if the contract length were equal to this historical value. First, we repeat the initial stage of our analysis and use the modified measure of remaining years to predict CEO turnover. Panel C of Table 9 shows the estimates from a Cox hazard model estimated analogously to the model in column 1 of Table 3. Our results indicate that one additional year remaining to the CEO's estimated contract expiration is associated with a 4% decrease in the likelihood of dismissal. Although this value is considerably smaller than the estimates in Table 3, it is significant at the 10% level in the first specification and is also economically meaningful—given that the unconditional turnover probability is 15.75% in this sample of historical contract lengths. The coefficients for contract length based on either the previous two or the previous three contracts are not significant.[10]

In Panel D of Table 9, we regress volatility on turnover probability (estimated using the historical contract length) as well as the expansion cycle. In this regression, the estimation of turnover probability using previous contracts eliminates any forward-looking information from that measure. The historical contract length may well be driven by information, about

[10] There are several reasons why these estimates could be less precise. First, the size of our historical sample is smaller than the baseline sample. Second, even as replacing our measure of years left on the actual contract with one based on past contracts eliminates any forward-looking information (e.g., future expansion plans), it also eliminates all *other* information that arrives during the period of the historical contract.

the investment cycle, that is relevant to the historical contract horizon. To control for this possibility, we include the expansion cycle measure. Despite the small sample size, we find a negative and consistently significant coefficient for turnover probability when estimated based on previous contracts—even after controlling for the investment cycles. This outcome demonstrates that our results are probably not driven by firm-specific expansion plans that affect both contract terms and return volatility.

4.2. *Business cycles*

Risk-related cyclicality might also be related to business cycles or product cycles. However, industry cycles are difficult to predict accurately and so are unlikely to cause the precise pattern that we document. Morever, when adapting to the business cycle, firms are likely to set contract expiration dates in a way that would produce the opposite of our results: contracts should end when industry risk is high, not when it is low.

Nevertheless, we test for this possibility by using the industry-wide contract horizon as a forward-looking measure of the industry cycle. We compute three variants of this measure: the average length of all contracts that are valid in a given year and industry, the average number of years remaining to the expiration of such contracts, and the average length of all new contracts signed in a given year and industry. The last of these measures captures new information about business cycles that was not available to firms when the older contracts were signed. It results in an average contract length of 3.1 years, which is comparable to that in the baseline sample. Using all contracts, including old ones, yields an average industry "time-to-expiration" of 4.1 years. The variation in these measures—0.96 (for all contracts) and 0.81 (for new contracts only)—is much larger than in the previously described measures of investment cycles and contracts. The average difference between industry and actual contract time-to-expiration is 1.25 years. This average difference is

smaller (0.60 years) when we use only new contracts and is close to zero when we use the number of years remaining.

We then estimate volatility using this industry cycle measure together with either our baseline measure of turnover probability (Panel B of Table 9) or that probability as estimated via historical contracts (Panel D). Industry cycles do not change our main results: the coefficient of turnover probability remains negative and highly significant.

4.3. *Controlling for other firm and CEO characteristics*

In this section, we control for firm and CEO characteristics that are observable and have been shown in previous research to affect both contract horizon and risk-taking.

Compensation. Starting with Holmstrom (1982), the literature has argued that firms need to provide compensation packages that incentivize risk taking and thereby offset the effect of turnover probability. Several papers provide evidence that some types of compensation (e.g., options) are indeed able to induce risk-taking (e.g. Agrawal and Mandelker, 1987; DeFusco et al., 1990; Guay, 1999; Coles et al., 2006; Chava and Purnanandam, 2010; Gormley et al., 2013; Shue and Townsend, 2013). Trading restrictions imposed on options induce incentives that vary across time (Ladika and Sautner, 2013; Edmans et al., 2014; Gopalan et al., 2014). Such time-varying compensation incentives may explain our results.

To disentangle the effects of career concerns and compensation, we add to our main regression the following control variables: the level of compensation (log of TDC1, the sum of cash compensation and equity compensation granted in that year); the sensitivity of the CEO's unvested and vested portfolio of stock and options to stock returns (stock price sensitivity) in the first specification; and the sensitivity of that portfolio to stock return volatility (vega) in the second specification. These sensitivities are computed using Core and Guay's (2002) methodology. We separate sensitivity and vega into two regressions to avoid

collinearity. We obtain these variables from ExecuComp, which has data for 4,079 observations of our sample.

TABLE 10 HERE

The results are shown in columns 1 and 2 of Table 10. Controlling for compensation reduces the magnitude of the coefficient for turnover probability from −0.74 to −0.55 and −0.64, respectively, but does not alter the statistical significance. This reduction in magnitude is due in part to the restricted availability of ExecuComp data; when we repeat our baseline regression on the ExecuComp sample, that coefficient is reduced to −0.60 (column 3). Of the compensation variables, only the stock price sensitivity of vested equity grants is significantly related to volatility. Overall, we find that compensation cannot explain our baseline results.

Tenure and age. It seems unlikely that a CEO would adapt the expiration date of her contract to a personal risk-taking cycle rather than adapting personal decisions to her career concerns. Moreover, even if we did have personal data on the CEO's family, it would be impossible for an outsider to reconstruct her private plans. However, the CEO's age and tenure can give us a rough indication of her place in the life cycle and career, and these factors may affect risk-taking in their own right. For example, Li et al. (2011) and Yim (2013) show that young CEOs make more investments; also, Pan et al. (2013a) document a tenure-based investment cycle whereby CEOs increase investment as they spend more time at the firm. Because age and tenure are collinear with contract horizon for a given CEO–firm contract, we use dummy variables for age and tenure groups. Those CEOs of ages under 55, 55–59, 60–64, and over 64 are grouped together, as are CEOs with tenure of less than 3 years, 3–5 years, 6–8 years, and more than 8 years (here we follow the tenure groupings of Pan et al., 2013a).

The results are reported in columns 4 and 5 of Table 10. Controlling for age and tenure does not explain our findings, as the coefficients for turnover likelihood are significantly negative even after controlling for these variables. The coefficients for the age and tenure groups are consistent with the literature. Younger CEOs take more risk, similarly to the more acquisitive young CEOs documented by Yim (2013), and newer CEOs are associated with greater return volatility, which is consistent with the market learning about new CEOs (as documented by Pan et al., 2013b).

One might be concerned that the tenure and age groups are not perfect measures. Therefore, in column 6 we control for more specific levels of tenure and age. Because these variables are collinear with the combination of firm–CEO fixed effects and contract horizon, we remove fixed effects for this specification. Our findings continue to hold.

Firm age. The firm's history and position in its life cycle may also exhibit a predictable time trend. For example, firms may become less risky as they accumulate assets, equity, and expertise over time. We measure firm experience as its age, which in turn is measured as the (log of the) number of years since its incorporation date. We obtain this number from Capital IQ; if it is not available there, we use instead the number of years since the firm's first appearance in Compustat. The results from this regression are reported in column 7 of Table 10. Controlling for firm age does not explain our baseline results: the coefficient for turnover probability is still negative and significant. The coefficient for firm age is also significantly negative; that is, the stock returns of older firms are less volatile.

Other firm characteristics. Coles et al. (2006) link compensation incentives to risk-taking. We repeat their specification in column 8 to show that their explanatory variables do not explain our result. Controlling for their set of variables reduces the magnitude (but not the statistical significance) of turnover probability. Some of this reduction in magnitude is driven

by data availability. Column 9 shows that limiting the sample to firms for which the Coles et al. variables are available also reduces the magnitude of our main result.

In summary, the results from Table 10 indicate that controlling for compensation, CEO characteristics, firm experience, and other firm and CEO characteristics cannot explain the effect of career concerns on risk taking that is documented in our baseline regressions.

4.4. *Other robustness checks*

Actual turnover. We verify in Table 11 that our results hold when we use the actual, observed career horizon of CEOs. Toward that end, we calculate the number of years until actual turnover (column 1) and create a dummy variable for the last two years before turnover (column 2). Both measures are significantly correlated with risk in the same way as the anticipated turnover likelihood: for each additional year before turnover, volatility increases by 8 basis points. In the last two years, volatility is 34 basis points lower than in other years.

TABLE 11 HERE

First year. There are two reasons why including each CEO's first year in the sample could be problematic. First, a CEO's starting date rarely coincides with the fiscal year end. Hence the first fiscal year in which a CEO is present is likely to contain days under the former CEO. Data from that year would likely introduce noise into our estimation. Second, we have viewed all CEO transactions as being voluntary, undertaken because the CEO has private information and/or particular diversification or liquidity needs. However, firms impose a minimum level of stock ownership on CEOs (Core and Larcker, 2002). Especially when the CEO is hired from outside the firm, fulfilling these mandatory ownership requirements may lead to "mechanical" CEO share purchases during the first year of tenure.

For these reasons, as a robustness check we discard all firm-years that correspond to a CEO's first year of employment in that position (i.e., years for which tenure = 0). Doing so reduces our sample by 1,259 observations (22%). Then, for each CEO, we re-estimate the

turnover probability while excluding those years. The results, reported in column 3 of Table 11, are actually stronger than the baseline regression.

Deciles. Throughout the analysis, we have used quintiles to classify turnover probability. Our results do not change for other quantile classifications; nor do they change if we consider, for example, only the fourth quintile as the "medium" one. In column 4 we report the results obtained when using deciles of turnover probability. Here we classify the tenth decile as "high", the first as "low", and both the eighth and ninth deciles as "medium". The results are similar to those of the baseline regression: CEOs with low turnover probability have a barely significant coefficient of −0.09; those with medium turnover probability, a significant coefficient of −0.39; and those with high turnover probability, the most negative and significant coefficient of −0.56.

Firm or executive fixed effects. In columns 5 and 6 of Table 11, we replace the firm-executive fixed effects in our baseline regression with (respectively) firm or executive fixed effects. This helps control for the influence of any unobservable and time-invariant firm or CEO characteristics. Column 5 reports results for the baseline regression when using firm instead of firm–executive fixed effects; column 6 repeats this exercise using executive fixed effects. All results are qualitatively the same and of similar magnitude.

5. CONCLUSION

We estimate the likelihood of turnover for CEOs using data on contract terms. Longer contracts protect CEOs from turnover, and turnover probability indeed increases for each year that the CEO moves toward her contractual expiration date. In other words, CEOs with more time left on their contracts are less likely to be terminated.

The probability of such turnover affects risk-taking. In line with the predictions of career risk models, a higher probability of CEO turnover is associated with lower stock return

volatility—in particular, idiosyncratic volatility. We document a similar effect for capital expenditures, which suggests that much of this risk-taking is in the area of investments. However, we find no similar effects for financial leverage.

Chief executives are supervised by boards of directors, which are responsible for dismissal decisions and are likely to participate in investment or strategic decisions. Our results suggest that the board is sufficiently informed to prevent blatant and unproductive gambling for resurrection. This research uncovers no evidence for increased risk-taking when turnover probability is high. In addition, our results are more pronounced when boards are dominated by outsiders; this finding suggests that informed boards actively discourage career-related risk-taking.

Our paper is a first effort to document the effects of contract horizon on CEO turnover and risk-taking. We hope that these preliminary results give some practical orientation both to the governance literature and to contract design praxis. As new data become available, we are confident that future research will illuminate various other effects, interactions, and remedies for the phenomena described here.

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Figure 1. Turnover probability – all fixed-term contracts

Mean turnover probability for CEOs with the indicated number of years remaining under their contracts.

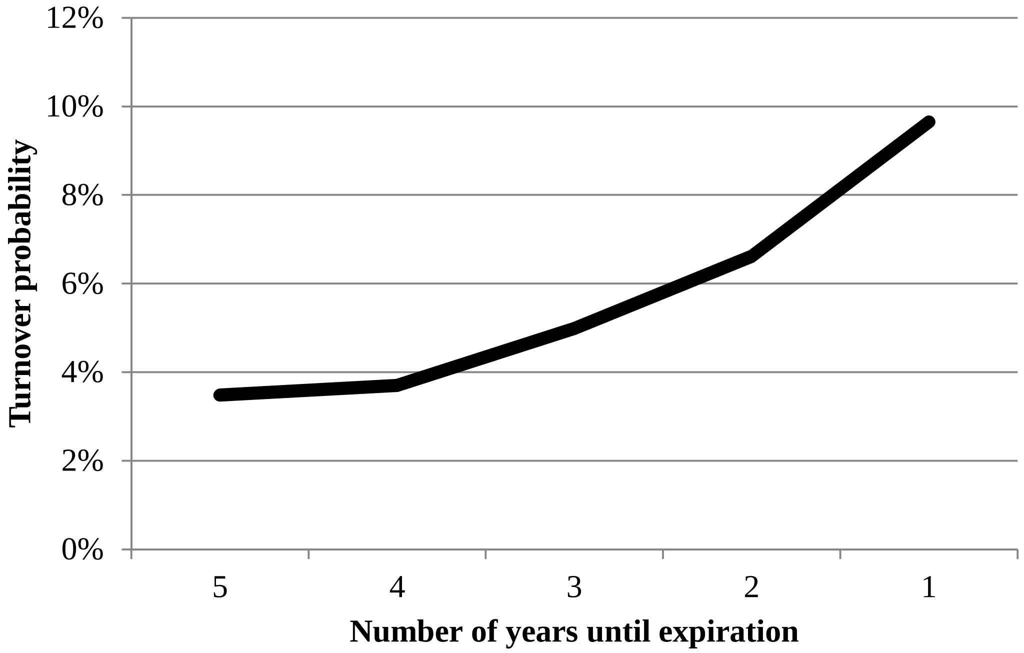

Figure 2. Turnover probability – renewed contracts

Mean turnover probability for renewed CEOs with the indicated number of years remaining under their contracts.

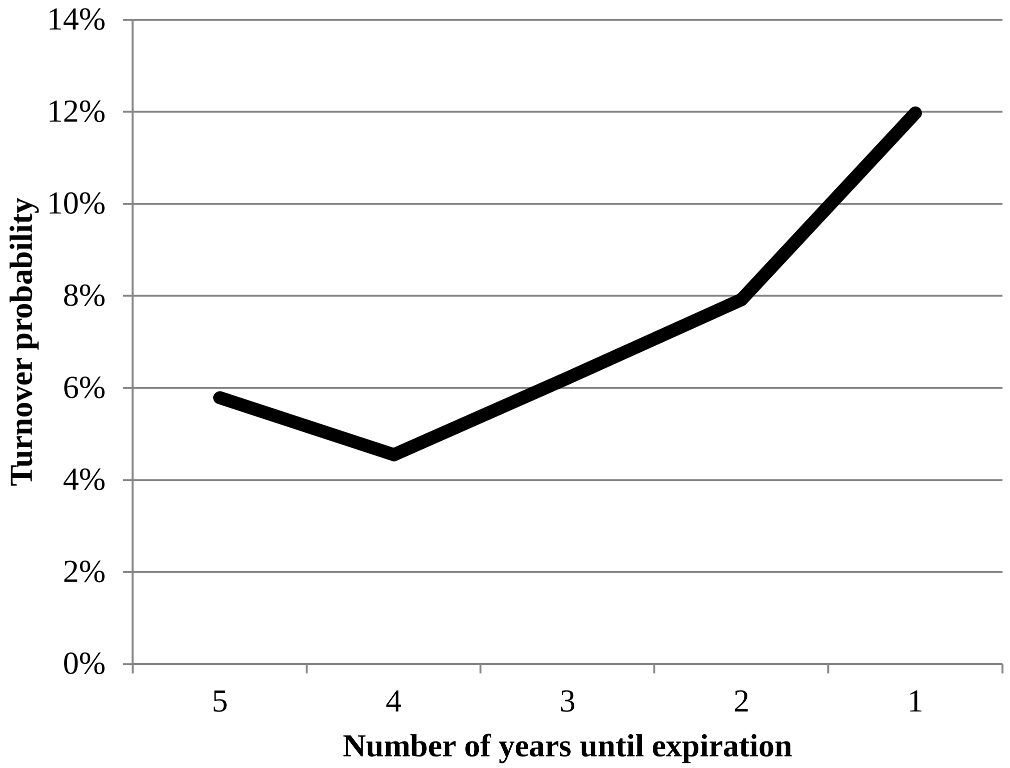

Table 1. Summary statistics (start of the contract)

This table presents descriptive statistics of our sample of contracts. Information on contracts is hand-collected from SEC filings for the period 1992-2008. Variables are defined in Appendix A.2. All non-discrete variables are winsorized at the 1% level.

Panel A: Contract length

Length (years)	<1	1	2	3	4	5	6	7	8	9	10	>10	Evergreens
All fixed-term	64	416	741	1515	410	551	92	55	22	25	23	39	73
	2%	11%	19%	38%	10%	14%	2%	1%	1%	1%	1%	1%	2%
First contract	26	282	506	1132	266	394	55	32	7	10	14	11	19
	1%	10%	19%	41%	10%	14%	2%	1%	0%	0%	1%	0%	1%
Renewals	38	134	235	383	144	157	37	23	15	15	9	28	54
	3%	11%	19%	31%	12%	13%	3%	2%	1%	1%	1%	2%	4%

Panel B: Number of contracts by state (15 states with the largest number of contracts)

State	CA	NY	TX	FL	NJ	PA	IL	MA	OH	VA	GA	MN	CT	CO	MD
Number of contracts	528	440	331	213	213	214	163	157	161	119	110	95	112	85	93
Average contract length	3.33	3.40	3.15	3.60	3.28	3.15	3.14	3.17	3.33	3.28	3.34	2.86	3.35	3.37	3.50
Sample distribution	13%	11%	8%	5%	5%	5%	4%	4%	4%	3%	3%	2%	3%	2%	2%
COMPUSTAT distribution	14%	10%	7%	5%	4%	3%	5%	4%	2%	2%	2%	2%	2%	3%	2%

Panel C: Average firm and industry characteristics by contract

		W/O Contract	Fixed-term Contract	Fixed-term 1 year	2 year	3 year	4 year	5 year
Firm	Assets ($ millions)	2,621	1,756	2,082	1,757	2,046	1,811	2,361
	ROA	7.1%	1.6%	-1.7%	-0.3%	0.8%	2.4%	2.8%
	Market-to-book	2.71	2.62	2.58	2.59	2.45	2.81	2.58
Disclosure	AIMR	100%	93%	74%	90%	86%	97%	95%
quality	Restatement	4.5%	4.7%	7.0%	4.1%	5.2%	3.8%	3.9%
Industry	Industry survival rate	96%	99%	97%	98%	98%	99%	100%
	Industry sales volatility	8%	8%	8%	8%	8%	8%	8%
	Industry homogeneity	41%	32%	32%	31%	29%	31%	37%
Number of observations		23,238	3,954	416	741	1,515	410	551

Table 2. Summary statistics (years under fixed-term contracts)

This table presents descriptive statistics by CEO-year. Variables are defined in appendix A.2. All non-discrete variables are winsorized at the 1% level. The data span 1992-2008.

		N	Mean	Median	Standard deviation	Min	Max
Firm	Assets ($ millions)	9,030	1,745	568	2,561	1	8,549
	ROA	9,030	4.60%	6.54%	18.23%	-120.29%	34.79%
	Annual stock returns	9,030	20.04%	8.55%	63.79%	-78.36%	324.34%
	Market-to-book	9,030	2.70	2.09	1.99	0.36	8.29
	Leverage	9,030	21.60%	24.42%	34.98%	-78.15%	134.28%
	Volatility	9,030	3.06%	2.58%	1.72%	0.95%	9.69%
	Beta	9,030	0.94	0.93	0.58	-0.60	2.61
	Idiosyncratic risk	9,030	0.11	0.05	0.14	0.01	0.86
	R&D/assets	9,030	0.04	0	0.14	0	1.27
	CAPEX/assets	9,030	0.07	0.04	0.10	0	0.60
	Finance industry	9,030	0.21	0	0.41	0	1
CEO/	Age	9,030	54	54	9	25	98
Governance	Renewal	9,030	0.34	0.00	0.47	0.00	1.00
	Total compensation (2000 $, tds)	6,403	5,239	2,511	10,460	0	245,017
	Governance index	5,334	9.15	9	2.66	1	18
	Chairman and CEO	9,030	52%	100%	50%	0%	100%
	Percent insiders on board	4,632	33%	30%	20%	0%	150%
	Internal CEO dummy	7,825	0.74	1	0.44	0	1
	Exception rule	9,030	25%	0%	43%	0%	100%

Table 3. Remaining years under contract and turnover probability

Panel A presents presents the results of hazard model estimations, reporting hazard ratios for CEO turnover and standard errors underneath. Columns 1-4 report results from Cox proportional hazard models, and columns 5-8 report estimates from Weibull hazard models. Panel B presents coefficients from logit (columns 1-4) and probit (columns 5-8) models of CEO turnover and standard errors underneath. The dependent variable is a dummy equal to 1 if the CEO leaves the firm in a given year. Independent variables are defined in appendix A.2. Standard errors are clustered at the firm level. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

	Panel A: Hazard models of CEO turnover							
Sample	All	All	All	Renewed	All	All	All	Renewed
Model	Cox	Cox	Cox	Cox	Weibull	Weibull	Weibull	Weibull
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remaining years	0.7946***		0.7683***	0.7188***	0.7960***		0.7698***	0.7226***
	(0.022)		(0.025)	(0.037)	(0.022)		(0.025)	(0.038)
ROA		0.4000***	0.4292***			0.3629***	0.3954***	
		(0.109)	(0.118)			(0.099)	(0.108)	
Tenure performance		0.7869***	0.7927***			0.7733***	0.7793***	
		(0.061)	(0.061)			(0.062)	(0.062)	
Ln(assets)		1.0840**	1.0965***			1.0967***	1.1102***	
		(0.037)	(0.037)			(0.038)	(0.038)	
Dividend		0.9044	0.9084			0.8958	0.8974	
		(0.102)	(0.103)			(0.102)	(0.102)	
B/M		1.0561	1.0381			1.0518	1.0331	
		(0.068)	(0.071)			(0.069)	(0.073)	
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
α					1.042	1.0541	1.0603*	
N	9,030	6,709	6,709	4,045	9,030	6,709	6,709	4,045
	Panel B: Dichotomous regressions of CEO turnover							
Sample	All	All	All	Renewed	All	All	All	Renewed
Model	Logit	Logit	Logit	Logit	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remaining years	-0.2659***		-0.3091***	-0.4359***	-0.1242***		-0.1463***	-0.2235***
	(0.031)		(0.036)	(0.071)	(0.014)		(0.017)	(0.030)
ROA		-0.4252	-0.3993			-0.2320	-0.2320	
		(0.301)	(0.304)			(0.155)	(0.156)	
Tenure performance		-0.1502**	-0.1437**			-0.0649**	-0.0614**	
		(0.069)	(0.069)			(0.031)	(0.031)	
Ln(assets)		0.0402	0.0430			0.0222	0.0244	
		(0.035)	(0.036)			(0.018)	(0.018)	
Dividend		-0.1283	-0.0982			-0.0608	-0.0517	
		(0.116)	(0.118)			(0.058)	(0.059)	
B/M		0.0906	0.0861			0.0466	0.0433	
		(0.065)	(0.065)			(0.036)	(0.036)	
Tenure	-0.0188**	-0.0236***	-0.0264***	-0.0800***	-0.0091**	-0.0111***	-0.0118***	-0.0392***
	(0.008)	(0.009)	(0.009)	(0.019)	(0.004)	(0.004)	(0.004)	(0.009)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,030	6,709	6,709	4,045	9,030	6,709	6,709	4,045

Table 4. Choice of contract type

This table presents marginal effects from probit regressions and standard errors (in parentheses) that are heteroskedasticity robust and clustered by year. The unit of observation is a firm-year. Models are estimated using 9,030 firm-years of fixed-term CEOs and 23,238 firm-years of at-will CEOs. The dependent variable is a dummy equal to 1 if the firm and the CEO have a fixed-term contract and 0 otherwise. Independent variables are defined in appendix A.2. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Dependent variable: Fixed-term contract			
		(1)	(2)
Geography	Exception rule	-0.248***	-0.240***
		(0.01)	(0.01)
	Anti-takeover	0.108***	0.102***
		(0.01)	(0.01)
	Garmaise	-0.004*	
		(0.003)	
Disclosure quality	Assets	-0.275***	-0.275***
		(0.02)	(0.02)
	Log number of SEOs	0.581***	0.574***
		(0.01)	(0.01)
	Restatement	0.175***	0.176***
		(0.05)	(0.05)
	Analyst forecast STD	-0.001	
		(0.0005)	
Risk	Industry homogeneity	-0.788**	-1.353***
		(0.34)	(0.23)
	Industry sales volatility	0.041	
		(0.14)	
	Industry survival rate	0.191	
		(0.34)	
Governance	Renewal	0.317***	0.317***
		(0.09)	(0.09)
	Age	-0.006***	-0.006***
		(0.002)	(0.002)
	Tenure	-0.040***	-0.040***
		(0.003)	(0.003)
	Governance index	0.110***	0.110***
		(0.007)	(0.007)
Fixed effects	Industry	Yes	Yes
	Year	Yes	Yes
Constant		-3.157***	-2.937***
		(0.36)	(0.18)
N		32,268	32,268

Table 5. Turnover probability and risk

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is volatility in Panel A, idiosyncratic risk in Panel B, and CAPM beta in Panel C. Variables are defined in appendix A.2. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications.. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Panel A: Volatility						
Sample	All	All	All	All	All	Renewed
Turnover estimation	Cox	Cox	Cox	Cox	None	Cox
Predictor	Contract	Performance	Contract and performance	Contract		Contract
	(1)	(1)	(3)	(4)	(5)	(6)
Turnover probability	-0.741***	-0.152***	-0.131***			-0.576***
	(0.097)	(0.028)	(0.023)			(0.125)
Low turnover probability				0.064		
				(0.054)		
Medium turnover probability				-0.106**		
				(0.043)		
High turnover probability				-0.479***		
				(0.056)		
Election year					-0.083**	
					(0.034)	
Mills	6.664***	5.525***	5.468***	6.665***	6.645***	
	(1.28)	(0.014)	(0.024)	(1.16)	(1.111)	
Constant	1.220***	1.595***	1.495***	1.060***	0.918**	2.939***
	(0.415)	(0.058)	(0.049)	(0.379)	(0.36)	(0.062)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	66%	64%	66%	65%	66%	64%
N	9,030	6,709	6,709	9,030	9,030	4,045

Panel B: Idiosyncratic risk						
Turnover probability	-0.057***	-0.007***	-0.007***			-0.033***
	(0.008)	(0.002)	(0.002)			(0.008)
Low turnover probability				0.008*		
				(0.005)		
Medium turnover probability				-0.008*		
				(0.004)		
High turnover probability				-0.031***		
				(0.005)		
Election year					-0.008**	
					(0.003)	
Mills	0.327***	0.236***	0.233***	0.331***	0.331***	
	(0.105)	(0.001)	(0.002)	(0.093)	(0.095)	
Constant	0.025	0.046***	0.041***	0.011	0.001	0.088***
	(0.034)	(0.005)	(0.003)	(0.03)	(0.031)	(0.004)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	61%	58%	61%	58%	60%	58%
N	9,030	6,709	6,709	9,030	9,030	4,030

Panel C: Beta						
Sample	All	All	All	All	All	Renewed
Turnover estimation	Cox	Cox	Cox	Cox	None	Cox
Predictor	Contract	Performance	Contract and performance	Contract		Contract
	(1)	(2)	(3)	(4)	(5)	(6)
Turnover probability	0.0005	-0.0002**	-0.0002*			0.0004
	(0.0004)	(0.0001)	(0.00009)			(0.001)
Low turnover probability				0.00000		
				(0.00023)		
Medium turnover probability				0.00000		
				(0.00018)		
High turnover probability				0.0000		
				(0.00024)		
Election year					0.00000	
					(0.00017)	
Mills	0.027	0.052***	0.052***	0.027	0.027	
	(0.031)	(0.00005)	(0.00009)	(0.029)	(0.03)	
Constant	0	-0.007***	-0.007***	0.001	0.001	0.011***
	(0.01)	(0.00021)	(0.00018)	(0.01)	(0.01)	(0.00025)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	37%	38%	39%	36%	37%	32%
N	9,030	6,709	6,709	9,030	9,030	4,030

Table 6. Turnover probability and sources of risk

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is capital expenditures divided by total assets in Panel A, and leverage in Panel B. Variables are defined in appendix A.2. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Panel A: Investment					
Sample	All	All	All	All	All
Turnover estimation	Cox	Cox	Cox	Cox	None
Predictor	Contract	Performance	Contract and performance	Contract	
	(1)	(2)	(3)	(4)	(5)
Turnover probability	-0.033***	-0.008***	-0.007***		
	(0.006)	(0.001)	(0.001)		
Low turnover probability				0.007**	
				(0.003)	
Medium turnover probability				-0.008***	
				(0.003)	
High turnover probability				-0.013***	
				(0.004)	
Election year					-0.005**
					(0.002)
Mills	0.021	-0.010***	-0.013***	0.033	0.028
	(0.223)	(0.001)	(0.001)	(0.221)	(0.227)
Constant	0.076	0.081***	0.076	0.061	0.059
	(0.073)	(0.003)	(0.073)	(0.072)	(0.074)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes
R-squared	53%	60%	62%	51%	53%
N	9,030	8,790	7,792	9,030	9,030

Panel B: Leverage					
Turnover probability	0.02	0.015***	0.010***		
	(0.012)	(0.004)	(0.003)		
Low turnover probability				-0.011	
				(0.007)	
Medium turnover probability				-0.003	
				(0.005)	
High turnover probability				0.002	
				(0.007)	
Election year					0.003
					(0.004)
Mills	0.331**	0.580***	0.331**	0.332**	0.329**
	(0.145)	(0.002)	(0.145)	(0.133)	(0.144)
Constant	0.047	-0.055***	0.047	0.056	0.142***
	(0.048)	(0.009)	(0.048)	(0.047)	(0.007)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes
R-squared	75%	76%	75%	74%	75%
N	9,030	6,709	6,709	9,030	9,030

Table 7. Turnover probability and performance

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is return on assets Panel A, and yearly stock return in Panel B. Variables are defined in appendix A.2. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Panel A: ROA			
Sample	All	All	All
Turnover estimation	Cox	Cox	None
Predictor	Contract	Contract	
	(1)	(2)	(3)
Turnover probability	0.013		
	(0.137)		
Low turnover probability		-0.004	
		(0.004)	
Medium turnover probability		-0.001	
		(0.004)	
High turnover probability		0.001	
		(0.005)	
Election year			0.001
			(0.004)
Mills	-0.323**	-0.322**	-0.324**
	(0.009)	(0.136)	(0.141)
Constant	0.145***	0.145***	0.151***
	(0.045)	(0.044)	(0.046)
Firm-executive F.E.	Yes	Yes	Yes
R-squared	74%	72%	74%
N	9,030	9,030	9,030

Panel B: Stock returns			
Turnover probability	0.015		
	(0.434)		
Low turnover probability		-0.003	
		(0.006)	
Medium turnover probability		0.004	
		(0.005)	
High turnover probability		-0.006	
		(0.007)	
Election year			0.004
			(0.005)
Mills	0.027	0.019	0.022
	(0.434)	(0.435)	(0)
Constant	0.009	0.018	0.016
	(0.141)	(0.139)	(0.141)
Firm-executive F.E.	Yes	Yes	Yes
R-squared	6%	4%	6%
N	9,030	9,030	9,030

Table 8. Heterogeneity

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is volatility, and each column presents the regression results for a subsample indicated in the heading. Variables are defined in appendix A.2. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Panel A: Turnover probability												
	Q		Chairman-CEO		Institutional ownership		CEO origin		Industry		CEO age	
	Lowest quintile	Highest quintile	Yes	No	Lowest quintile	Highest quintile	Internal CEO	External CEO	Finance	Oil	Below median	Above median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Turnover probability	-0.6707***	-1.1981***	-0.5404***	-0.8373***	-0.8938***	-0.6232***	-0.6861***	-0.8156***	-0.2284	-0.7030**	-0.6857***	-0.5659***
	(0.236)	(0.234)	(0.097)	(0.126)	(0.159)	(0.189)	(0.119)	(0.195)	(0.14)	(0.275)	(0.142)	(0.131)
t-test of difference	-1.59		-1.87		3.37		-0.57		-1.54		0.62	
Constant	3.691***	4.167***	3.177***	3.475***	3.593***	2.942***	3.331***	3.641***	2.997***	3.553***	3.5610***	3.0279***
	(0.126)	(0.133)	(0.066)	(0.077)	(0.1)	(0.099)	(0.068)	(0.127)	(0.093)	(0.074)	(0.062)	(0.058)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	68%	66%	70%	64%	66%	54%	65%	68%	79%	72%	67%	66%

Panel B: Turnover risk quantiles												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Low turnover probability	0.0079	-0.0633	-0.036	0.2284***	0.0303	0.0344	0.0829	0.1448	0.0766	0.1363	0.0942	0.0429
	(0.114)	(0.121)	(0.052)	(0.079)	(0.092)	(0.086)	(0.051)	(0.137)	(0.068)	(0.199)	(0.085)	(0.198)
t-test of difference	-0.43		2.79		0.03		0.42		0.28		-0.24	
Medium turnover probability	-0.3012***	-0.1901*	-0.1504***	-0.0646	-0.1757***	-0.0721	-0.1270***	-0.2473***	-0.1204**	-0.2021	-0.0614	-0.0924*
	(0.092)	(0.104)	(0.048)	(0.054)	(0.063)	(0.071)	(0.043)	(0.085)	(0.055)	(0.158)	(0.061)	(0.055)
t-test of difference	0.80		1.18		1.10		-1.26		-0.48		-1.38	
High turnover probability	-0.3955***	-0.8442***	-0.4708***	-0.3766***	-0.5371***	-0.4490***	-0.4177***	-0.4240***	-0.0764	-0.3137	-0.4202***	-0.3527***
	(0.126)	(0.13)	(0.059)	(0.068)	(0.08)	(0.097)	(0.061)	(0.099)	(0.071)	(0.197)	(0.076)	(0.075)
t-test of difference	-6.84		1.04		0.70		-0.05		-1.13		5.43	
Constant	3.662***	3.959***	3.172***	3.208***	3.407***	2.781***	3.208***	3.502***	2.183***	3.100***	3.4256***	2.9109***
	(0.089)	(0.095)	(0.052)	(0.054)	(0.064)	(0.067)	(0.049)	(0.084)	(0.06)	(0.186)	(0.038)	(0.038)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	68%	66%	70%	64%	66%	54%	64%	63%	55%	69%	65%	66%
N	2,007	1,969	5,495	5,117	3,974	2,149	6,558	2,278	2,240	368	4,507	4,523

Table 9. Identification

Panel A presents descriptive statistics of alternative cycle and contract horizon measures. Panel B and D present the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is volatility. In Panel D, turnover probability is estimated with the length of the previous contract. Panel C presents the results of hazard model estimations, reporting hazard ratios for CEO turnover and standard errors underneath. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

Panel A: Descriptive statistics of alternative cycle and predicted contracts

	Length (in years)	Within-firm st.dev.	Difference to actual contract (in remaining years)
Cycle length			
CAPEX, average	3.89	0.35	0.92
CAPEX, recent			0.98
R&D, average	4.18	0.26	0.97
Historic contract length			
Previous contract	2.96	0.23	0.61
Previous 2 contracts	2.97	0.13	0.57
Previous 3 contracts	3.21	0.09	0.35
Industry contract horizon			
Average contract length	4.13	0.96	1.25
Average years remaining			0.00
Average new contract length	3.10	0.81	0.60
Directorships			1.07

Panel B: Alternative cycles vs. contract based career risk. Dependent variable = volatility

	Expansion cycles			Industry contract horizon		
	CAPEX Average	CAPEX Recent	R&D Average	All contracts Length	All contracts Remaining time	New contracts
	(1)	(2)	(3)	(4)	(5)	(6)
Turnover probability	-1.148***	-1.241***	-1.577*	-0.788***	-0.854***	-0.769***
	(0.276)	(0.286)	(0.851)	0.0966047	0.0963827	0.10015
Remaining years in cycle	0.054	0.013	0.157	-0.024**	-0.063***	0.006
	(0.036)	(0.033)	(0.132)	0.0121607	0.0163756	0.0157869
Constant	3.589***	3.763***	4.126***	3.468***	3.563***	3.373***
	(0.202)	(0.193)	(0.691)	0.0679203	0.06431	0.0703085
Firm-Executive F.E.	Y	Y	Y	Y	Y	Y
R-squared	66.20%	65.70%	65.50%	65.10%	65.20%	64.70%
N	1,960	1,905	270	10,228	10,206	9,775

Panel C: Predicting CEO turnover. Cox hazard models

	Recent (1)	Recent 2 (2)	Recent 3 (3)
Remaining years (previous contract)	0.9606*	0.9680	0.9738
	(0.020)	(0.020)	(0.020)
Year F.E.	Y	Y	Y
N	2,550	2,584	2,598

Panel D: Alternative cycles vs. career risk estimated with previous contract. Dependent variable = volatility

	Expansion cycles			Industry contract horizon		
	CAPEX Average	CAPEX Recent	R&D Average	All contracts Length	All contracts Remaining time	New contracts
	(1)	(2)	(3)	(4)	(5)	(6)
Turnover probability (previous contrac	-2.473***	-2.579***	-2.963**	-1.227***	-1.217***	-1.253***
	(0.652)	(0.644)	(1.223)	(0.192)	(0.189)	(0.194)
Remaining years in cycle	0.02	-0.061	0.143	0.122	0.015	0.099**
	(0.103)	(0.092)	(0.253)	(0.083)	(0.086)	(0.043)
Constant	5.087***	5.445***	5.679***	3.533***	3.915***	3.709***
	(0.623)	(0.602)	(0.986)	(0.344)	(0.243)	(0.203)
Firm-Executive F.E.	Y	Y	Y	Y	Y	Y
R-squared	59.10%	61%	57.90%	66.30%	66.20%	66.50%
N	623	509	73	2,199	2,191	2,140

Table 10. Other firm and executive characteristics

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. The dependent variable is volatility. Independent variables are defined in appendix A.2. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

	Delta	Vega	Execucomp sample	Age	Tenure	Age/tenure (explicit)	Firm age	Coles et al.	Coles et al. sample
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Turnover probability	-0.5470***	-0.6395***	-0.6004***	-0.664***	-0.484***	-0.6546***	-0.355***	-0.3757**	-0.5937***
	(0.116)	(0.121)	(0.105)	(0.077)	(0.075)	(0.099)	(0.079)	(0.15)	(0.119)
Sensitivity of unvested equity grants	0.0024								
	(0.00223)								
Sensitivity of vested equity grants	-0.0011**								
	(0.00054)								
Vega of unvested equity grants		0.0002							
		(0.00014)							
Vega of vested equity grants		-0.0001							
		(0.00007)							
Log total compensation	-0.0279	-0.0186							
	(0.05)	(0.051)							
Group 1 (age < 55 / tenure < 3)				0.207**	0.481***				
				(0.08104)	(0.06447)				
Group 2 (age 55-60 / tenure 3-5)				0.091	0.317***				
				(0.07694)	(0.06766)				
Group 3 (age 60-64 / tenure 6-8)				-0.027	0.157**				
				(0.07662)	(0.06326)				
Age						-0.0375***			
						(0.004)			
Tenure						0.001			
						(0.004)			
Log firm age							-0.363***		
							(0.053)		
Log assets								-0.1326	
								(0.088)	
M/B								-0.0046	
								(0.005)	
CAPEX/assets								1.1053*	
								(0.601)	
R&D								1.3351**	
								(0.656)	
Leverage								0.5700**	
								(0.237)	
Cash compensation								0	
								(0)	
Total delta								-0.0008*	
								(0.0004)	
Total vega								0	
								(0)	
Constant	1.2818***	1.2636***	2.9175***			4.0337***		1.6825***	1.1188***
	(0.339)	(0.349)	(0.052)			(0.276)		(0.639)	(0.058)
Firm-executive F.E.	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Age group F.E.				Yes					
Tenure group F.E.					Yes				
R-squared	65%	64%	64%	66%	66%	6%	66%	66%	65%
N	4,079	4,079	4,079	9,030	9,030	9,030	9,030	3,907	3,907

Table 11. Robustness

This table presents the results of OLS regressions, reporting coefficients and standard errors underneath. Standard errors are robust to heteroskedasticity, clustered at the firm level, and are computed using 1999 bootstrap replications. The dependent variable is volatility. In column 3, turnover probability is estimated with a sample excluding the first year of each CEO. In column 4, low (medium, high) turnover probability denotes the first (eighth and ninths, tenth) decile of turnover risk. Asterisks indicate that the estimates are significantly different from zero at the *** 1% level, ** 5% level, * 10% level. The data span 1992-2008.

	Years to actual turnover	Last two years	No first year	Deciles	Firm F.E.	Executive F.E.
	(1)	(2)	(3)	(4)	(5)	(6)
Turnover probability			-0.967***		-0.781***	-0.667***
			(0.099)		(0.079)	(0.107)
Actual time to turnover	0.077***					
	(0.01)					
Last two years before turnover		-0.338***				
		(0.05)				
Low turnover probability				-0.090*		
				(0.052)		
Medium turnover probability				-0.387***		
				(0.031)		
High turnover probability				-0.557***		
				(0.049)		
Constant	2.871***	3.145***	2.539**	1.017***	2.539**	0.959
	(0.047)	(0.033)	(1.12)	(0.292)	(1.12)	(2.295)
Firm-executive F.E.	Yes	Yes	Yes	Yes		
Firm F.E.					Yes	
Executive F.E.						Yes
R-squared	66%	64%	63%	65%	63%	65%
N	7,153	9,030	7,771	9,030	9,030	9,030

APPENDIX

A.1. At-will exceptions

This table presents the at-will exceptions by state. The data are obtained from Walsh and Schwartz (1996) and Muhl (2001). The table shows the prevailing laws in each of the U.S. states as of 2001.

		At-will exceptions		
Code	**State**	**Public policy**	**Implied contract**	**Good faith and fair dealing**
AL	Alabama	0	1	1
AK	Alaska	1	1	1
AZ	Arizona	1	1	1
AR	Arkansas	1	1	0
CA	California	1	1	1
CO	Colorado	1	1	0
CT	Connecticut	1	1	0
DC	District of Columbia	1	1	0
DE	Delaware	1	0	1
FL	Florida	0	0	0
GA	Georgia	0	0	0
HI	Hawaii	1	1	0
ID	Idaho	1	1	1
IL	Illinois	1	1	0
IN	Indiana	1	0	0
IA	Iowa	1	1	0
KS	Kansas	1	1	0
KY	Kentucky	0	1	0
LA	Louisiana	0	0	0
ME	Maine	0	1	0
MD	Maryland	1	1	0
MA	Massachusetts	1	0	1
MI	Michigan	1	1	0
MN	Minnesota	1	1	0
MS	Mississippi	1	1	0
MO	Missouri	1	0	0
MT	Montana	1	0	1
NE	Nebraska	0	1	0
NV	Nevada	1	1	1
NH	New Hampshire	1	1	0
NJ	New Jersey	1	1	0
NM	New Mexico	1	1	0
NY	New York	0	1	0
NC	North Carolina	1	0	0
ND	North Dakota	1	1	0
OH	Ohio	1	1	0
OK	Oklahoma	1	1	0
OR	Oregon	1	1	0
PA	Pennsylvania	1	0	0
RI	Rhode Island	0	0	0
SC	South Carolina	1	1	0
SD	South Dakota	1	1	0
TN	Tennessee	1	1	0
TX	Texas	0	0	0
UT	Utah	1	1	1
VT	Vermont	1	1	0
VA	Virginia	1	0	0
WA	Washington	1	1	0
WV	West Virginia	1	1	0
WI	Wisconsin	1	1	0
WY	Wyoming	1	1	1

A.2. Variable definitions

Actual time to turnover	Year of turnover minus current year
Age	Executive's age in years
AIMR	Industry adjusted AIMR scores (see Brown and Hillegeist, 2007)
Analyst forecast STD	Standard deviation of analyst forecasts of that year's EPS
Anti-takeover	State with "business combination laws" according to Bertrand and Mullainathan (1999)
Assets	Book assets (in $ millions)
Beta	Coefficient on the market excess returns in a regression in which the dependent variable is the daily stock return, run for each firm-year
Book-to-market (B/M)	Ratio of the book value of assets to the market value of assets: the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock, cash, and deferred taxes. Market values are measured at the end of the fiscal year
CAPEX/assets	Capital expenditures divided by lagged assets
Cash compensation	Salary plus bonus (in $ thousands)
Cash flow	Earnings before extraordinary items plus depreciation, divided by lagged assets
Chairman and CEO	1 if the CEO also holds the Chairman position of the Board
Contract length	Expiration year minus start year of the contract
Dividend	1 if the fim pays dividends that year
Election year	1 if the contract is due to expire in the following year
Exception rule	1 if the contract is governed by the law of a state with a good faith & fair dealing at-will exception
Finance industry	1 if the firm operates in the Banking or Insurance industry
Firm age	Number of years since incorporation
Former CEO	1 if the CEO was in office before the current contract
Garmaise	Index of Garmaise (2006)
Governance index	The index developed by Gompers, Ishii and Metrick (2003)
Idiosyncratic risk	Standard deviation of residuals in a regression in which the dependent variable is the daily stock return, run for each firm-year
Industry homogeneity	Median (across all firms of one of the 49 Fama-French industries) of the percentage variation in monthly stock returns that is explained by an equally weighted industry index; market-adjusted returns are annual stock returns adjusted by the value-weighted CRSP index.
Industry sales volatility	49 Fama-French industry average of variance in sales over the past seven years
Industry survival rate	Industry rate of year-to-year survival within the COMPUSTAT database
Institutional ownership	Percentage of shares owned by institutional owners that file form 13f
Internal CEO	1 if CEO was employee of the firm before becoming CEO
Last two years before turnover	1 if turnover occurs in the following two years

Leverage	Net debt divided by total assets
Low analyst forecast error	1 if analyst forecast STD is below median
Market-to-book	Reciprocal of book-to-market
Number of SEOs	Number of equity issuances announced by the firm in the given year
Percent insiders on board	Percentage of insiders among board members
R&D/assets	Research and development expenditures divided by lagged assets
Remaining years	Expiration year minus current year
Renewal	Indicator variable for CEOs who were in office at the time of the contract start
Restatement	1 if the firm files an earnings restatement in that year
Return on assets (ROA)	Earnings before interest and taxes divided by assets
Sensitivity of vested equity grants	Sensitivity of vested equity grants with respect to a 1% change in the stock price calculated using the method of Core and Guay (2002), in $ thousands
Sensitivity of unvested equity grants	Sensitivity of unvested equity grants with respect to a 1% change in the stock price calculated using the method of Core and Guay (2002), in $ thousands
Stock return	Annual stock returns
Salary	CEO’s base salary in thousands of US$, adjusted to 2000 $
Tenure	Number of years the CEO has been in office
Tenure performance	The stock return measured over the preceding 5 years, or since the start of the CEO's tenure, whichever is shorter, scaled by its standard deviation
Total compensation	CEO’s total annual compensation (TDC1) in thousands of US$, adjusted to 2000 $
Total delta	Sensitivity of vested plus unvested equity grants
Total vega	Vega of vested plus unvested equity grants
Turnover	1 if the executive leaves the CEO position
Turnover probability	Fitted value of regressions reported in Table 3
Vega of vested equity grants	Sensitivity of vested equity grants with respect to a 0.01 change in return volatility calculated using the method of Core and Guay (2002), in $ thousands
Vega of unvested equity grants	Sensitivity of unvested equity grants with respect to a 0.01 change in return volatility calculated using the method of Core and Guay (2002), in $ thousands
Volatility	Standard deviation of daily stock returns