

Do CEOs Matter?

Corporate Performance and the CEO Life Cycle*

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This study suggests that the effect of CEOs on the firms they run varies over time. We document an inverted U-shaped relation between CEO tenure and firm value as well as M&A announcement returns, consistent with the net effect of posited benefits and costs arising dynamically over the CEO's time in office. We find economically meaningful variation in the point in time at which costs start to outweigh benefits depending on a firm's economic environment. Nonparametric estimations, exogenous shocks to the cost-benefit relation of tenure, and an analysis of CEO sudden deaths further support our findings.

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“It’s a familiar cycle: A CEO takes office, begins gaining knowledge and experience, and is soon launching initiatives that boost the bottom line. Fast-forward a decade, and the same executive is risk-averse and slow to adapt to change—and the company’s performance is on the decline. The pattern is so common that many refer to the “seasons” of a CEO’s tenure [...]” (“Long CEO tenure can hurt performance”, *Harvard Business Review*, March 2013)

Starting with Bertrand and Schoar (2003), a vast literature has documented that heterogeneity across CEOs, such as differences in education, work experience or personality traits, can explain differences in corporate policies and value across firms. Little is known, however, about whether and how the effect of CEOs on the firms they run varies over their time in office. How do CEOs evolve over their tenure and thereby affect the quality of corporate investments and firm performance? Do some CEOs overstay at the detriment of shareholders? This study analyzes the relation between CEO tenure, firm value, and investment decisions to address these questions. Our results provide further evidence on whether (and how) CEOs matter and adds to the ongoing debate about the usefulness of CEO term limits.¹

We build on Hambrick and Fukutomi’s (1991) theoretical work on the dynamics of CEO tenure and its empirical implications. In particular, we posit an inverted U-shaped relation between CEO tenure and firm value which reflects the net effect of the benefits and costs that arise dynamically over the CEO’s time in office (see *Figure 1a*). Among the benefits are on-the-job learning, gaining experience, and establishing valuable relations with people inside and outside the firm (e.g., Davies and Easterby-Smith, 1984; Gabarro, 1987; Luo, Kanuri, and Andrews, 2013). Benefits can be expected to increase over tenure with a declining marginal positive impact on firm value. Among the costs are the increasing likelihood of a mismatch

¹ See, e.g., “The case for CEO term limits” (*Fortune*, June 23, 2014), “How long is too long to be CEO?” (*The Washington Post*, April 16, 2014), “CEO term limits” (*The Washington Post*, May 26, 2009 and *Forbes Magazine*, November 14, 2006) and “Been a CEO for ten years? Your time’s about up?” (*Business Insider*, April 16, 2007). For the discussion about CEO term limits among legal scholars, we refer the reader to Whitehead (2011).

between the incumbent CEO and the firm (due to changes in firm environment) along with a CEO's growing aversion to risk her reputation as well as a decreasing ability and increasing reluctance to change and to consider the advice of others (e.g., Guay, Taylor, and Xiao, 2014; Miller, 1991; Prendergast and Stole, 1996). Costs can be expected to increase over tenure with an increasing marginal negative impact on firm value. Managerial entrenchment over time (e.g., Hermalin and Weisbach, 1998) is associated with additional costs and may reinforce the negative relation between CEO tenure and firm value at high tenure levels as entrenched CEOs are less likely to get fired (Coles, Daniel, and Naveen, 2014a; Taylor, 2010).²

We find empirical evidence for the existence of an inverted U-shaped relation between CEO tenure and firm value. We further examine announcement returns to acquisitions, which constitute major corporate investments associated with significant value creation, and document a similar inverted U-shaped pattern. For the average S&P 1500 firm, our evidence suggests that the costs of tenure start to outweigh the benefits after about a decade. This CEO life cycle is economically meaningful: we estimate a 4.8% increase in firm value over CEO tenure for the period during which benefits outweigh costs, while firm value decreases by 5.1% over the same number of years of tenure in the later period where costs outweigh benefits. Further, consistent with the increasing negative marginal effect of the costs of tenure on firm performance we posit, very high tenure values are associated with large declines in firm value. Nonparametric estimations confirm the aforementioned results (see *Figure 1b*).

The non-linear relation between CEO tenure and firm value is robust to various changes and extensions to our empirical setting. First, our results hold when (time-varying) industry fixed effects, firm fixed effects, CEO-firm fixed effects, or random effects are accounted for. Second, they are robust to tests sorting out several alternative explanations, including a non-

² Costs of entrenchment include, e.g., empire building (Jensen, 1986), manager-specific investments (Shleifer and Vishny, 1989), or managerial preferences for "the quiet life" (Bertrand and Mullainathan, 2003).

linear relationship between firm value and CEO (or board or firm) age, CEO ownership, CEO power, or outside director tenure which may all be potentially captured by the CEO's tenure. Our results also survive the inclusion of additional controls for firms' (dis)investment activities, managerial ability, education, work experience, compensation, and wealth-performance sensitivity. Third, when we use residuals from a regression of CEO tenure on CEO and firm characteristics to account for hard-to-disentangle variables, such as CEO and firm age, CEO power, or past performance, our results are confirmed. Fourth, our results are robust to the exclusion of observations with very short or very long tenures, observations around turnovers of CEOs younger than 60 years, or the exclusion of CEOs who leave the firm during the first years after assuming office. Fifth, our results remain qualitatively similar when we exclude firms or CEO-firm pairs with few observations from our sample. Sixth, supporting our general hypothesis, we also find an inverted U-shaped relation between firm value and two alternative measures of tenure, the CEO's overall time with the company and her time on the firm's board of directors. However, we show that it is the CEO's time at the helm of the company which (primarily) affects firm value. Finally, alternative measures of firm performance and an analysis of firms' investment rates and divestitures further confirm our hypothesis and support our results.

We also attempt to rule out alternative explanations for our findings which are related to a potential survivorship bias of either CEOs or the firms they run. For example, CEOs with good performance may get recruited to run bigger companies, while poorly performing CEOs may stay with their firms (with survival being facilitated by entrenchment). Similarly, successful CEOs may receive a larger compensation resulting in higher opportunity costs of work and thus earlier retirement. Finally, acquisition may cause at least part of the effect as the respective CEO-firm pair will disappear and the high (average) returns to target companies will result in a higher valuation. All our tests suggest that none of the explanations drive our results.

Using several measures for the dynamism of a firm's economic environment (based on industry shocks, industry classifications and age), we provide evidence that the non-linear relation between CEO tenure and firm value depends on the dynamics of the firms' environment. These analyses constitute tests of the posited cost-benefit relation of CEO tenure described above. Specifically, we would expect that the benefits of tenure, particularly the CEO's accumulation of experience and knowledge, have a shorter half-life in more dynamic settings, while the costs of tenure, particularly the potential CEO-firm mismatch together with the CEO's decreasing ability and willingness to adapt and change, are likely to increase faster. Consistently, we find that the CEO tenure at which the costs start to outweigh the benefits shifts to considerably smaller (larger) values in more (less) dynamic settings relative to our estimations for the average firm (with a range from 9 to 15 years of tenure).

As part of our identification strategy, we use different exogenous shocks to the cost-benefit relation of CEO tenure. First, we use economic recessions, including the financial crisis of the late 2000s. While CEO entrenchment is expected to become less costly due to positive effects of managerial discretion during difficult economic times (see, e.g., Li, Lu, and Phillips, 2016), we expect the CEO learning period to be extended in difficult times as CEOs gain new, valuable experience and likely have to solve more problems (see Arrow, 1962; Kempf, Manconi, and Spalt, 2014). Consequently, the number of years after which the costs of tenure start to outweigh the benefits (i.e., the turning point) is predicted to shift to larger values during recessions. We find empirical support for this prediction. Second, similar to Guo and Masulis (2015), we use the implementation of SOX as an exogenous (positive) shock to the overall level of corporate governance. Consistent with reduced costs of both CEO entrenchment and CEO-firm mismatch due to more stringent governance, we find the turning point of CEO tenure to shift to larger values post SOX. We find comparable results for firms with higher (lower) takeover susceptibility using Cain, McKeon, and Solomon's (2014) state-level takeover index.

Finally, we analyze abnormal stock returns in reaction to announcements of sudden CEO deaths as a measure of CEOs' expected future contributions to shareholder value. This analysis constitutes a test of our hypothesis about the costs and benefits arising over a CEO's tenure and provides evidence whether some CEOs stay too long at the detriment of shareholders. As sudden deaths occur randomly and are likely to be exogenous to current firm and market conditions, this approach further mitigates endogeneity concerns. Consistent with our hypothesis and panel regression results, we find significantly different abnormal stock returns upon the announcement of unexpected CEO deaths which are negative (positive) for tenure values below (above) the sample median or the threshold of 12 years of tenure. Consequently, we further find abnormal stock returns to increase in CEO tenure in multivariate regressions which account for CEO age and power and firm characteristics. This suggests that some CEOs may indeed stay at the helm for too long.

In a frictionless world, empirical tests will detect no relation between CEO tenure and firm value as firms can always maintain an optimal (i.e., value-maximizing) leadership structure. Our results suggest that some firms deviate from optimal leadership in the sense that some CEOs remain in office for too long, while others leave the firm too early. Such deviations are consistent with search and transition costs, labor market frictions, and frictions in corporate governance documented in the extant literature.³ These frictions can also explain positive valuation effects in reaction to CEO deaths (see Jenter, Matveyev, and Roth, 2016).

³ As CEOs become more powerful over their tenure, they tend to influence board composition to distort board monitoring and avoid turnover (Cohen, Frazzini, and Malloy, 2012; Coles, Daniel, and Naveen 2014a; Fracassi and Tate, 2012), which explains why some CEOs stay too long. Taylor (2010) finds that boards of large firms tend to fire CEOs more often than is optimal, likely to protect their jobs and reputation. Other reasons why CEOs leave their firms too early include health-related departures or CEOs moving to bigger companies (Fee and Hadlock, 2003; Fee, Hadlock, and Pierce, 2013). In this regard, Figure 2a shows that CEO power increases over tenure, while Figure 2b shows that the likelihood of forced turnover increases over a CEO's first years in office but declines significantly thereafter, in line with, e.g., Allgood and Farrell (2003). Voluntary CEO turnover, which is at least partly exogenous to the firm, increases over the CEO's first 10 years in office, but decreases afterwards.

Our study contributes to the recent literature on the relation between CEO learning and adaptability, investment quality, CEO power, and CEO tenure. Guay, Taylor, and Xiao (2014) provide evidence that CEOs have problems adapting to industry shocks which are found to increase the likelihood of CEO turnover. In line with the increasing power of CEOs over their time in office, the authors further find that high-tenure CEOs are less likely to leave the firm, even after industry shocks. Pan, Wang, and Weisbach (Forthcoming) find that corporate disinvestments become less likely over a CEO's time in office, while (net) investment quantity increases with tenure, and investment quality decreases. The authors provide evidence that the latter result can be explained by CEOs' growing control over the board. While the aforementioned studies indicate potential costs of increasing CEO power over tenure, our study investigates the cost-benefit relation over the CEO's time in office, taking CEO power into account, and documents that this relation depends on the firms' economic environment.⁴

On a more general level, our study extends the literature on CEOs' influence on firm policies and performance (see, e.g., Adams, Almeida, and Ferreira, 2005; Bennedsen, Pérez-González, and Wolfenzon, 2007, 2011; Bertrand and Schoar, 2003; Fee, Hadlock, and Pierce, 2013; Graham, Harvey, and Puri, 2013). Supporting extant work, our results suggest that CEOs matter for firm performance and helps to further quantify the extent to which they matter. However, while the existing literature focuses on heterogeneity across different CEOs, we attempt to explore the role of within-CEO heterogeneity. Our study suggests that the latter provides further explanation for observed differences in firm outcomes. The evidence we provide also has important policy implications. While it indicates that regular CEO turnover can be valuable for shareholders, it does not support a one-size-fits-all policy of CEO term limits.

⁴ Apart from these papers, the study closest to our work is Huang (2013). The author examines the advice and monitoring role of outside directors and provides evidence for an inverted U-shaped relation between average outside director tenure and firm value. Yet, he does neither consider CEO tenure nor industry dynamics.

1. Data and Variables

1.1 Data

Our initial sample consists of all S&P 1500 companies over the period 1998 to 2011 as covered by ISS (formerly RiskMetrics).⁵ For these firms, we collect governance data from ISS' Governance segment and director-level data from the Director segment. We complement this dataset with data from several other databases. First, we match our sample with ExecuComp to obtain information on several CEO characteristics including tenure, age, gender, and an annual description of titles (i.e., chairman and president). We obtain data on whether the CEO is the company's founder from Board Analyst's The Corporate Library database for the years 2001 to 2011. Data for earlier years is hand-collected from proxy statements. Accounting data and business segment information is retrieved from Compustat. Finally, stock price information stems from the Center for Research in Security Prices (CRSP). After excluding utilities and financial firms (SIC codes 4000-4999 and 6000-6999), because of differences in accounting and regulation, our final sample (with all available data) consists of 12,427 firm-year observations covering 1,782 firms and 3,064 unique CEO-firm pairs.

1.2 Variables

Our main variable of interest is *CEO tenure* calculated as the fiscal year minus the year the CEO became the company's CEO (ExecuComp data item "BECAMECEO"). CEOs are identified using the ExecuComp variable 'CEOANN'. Following Masulis and Mobbs (2014), we replace missing observations by the number of years the CEO has been serving on the company's board of directors (provided by ISS).⁶ To investigate a potential nonlinear relation

⁵ ISS provides data from 1996 on. However, due to problems of data availability and consistency for the years 1996 and 1997 (see, e.g., Faleye, Hoitash, and Hoitash, 2011), we choose 1998 as the starting point of our sample.

⁶ We identify the company's CEO in ISS by applying the methodology described in Mobbs (2013). A member of the board of directors is considered to be the CEO of the company if, first, the ISS variable „CLASSIFICATION“ states that the director's board affiliation is classified as employee / insider ("E") and, second, if the variable "EMPLOYMENT_CEO" equals one, indicating that her primary employment title is CEO. Using this methodology, we are able to identify a firm's CEO within ISS in 99.8% of the cases in which we could not identify

between CEO tenure and a series of output variables, we also include *CEO tenure squared*, i.e., the square of *CEO tenure*, in most of our regressions.

Our main output variable is *Tobin's Q*, defined as the sum of the market value of equity and the book value of total assets minus the book value of equity, divided by the book value of total assets. Other output variables include stock returns to acquisition announcements and to announcements of unexpected CEO deaths, and a firm's return on assets (*ROA*). *ROA* is calculated as earnings before interest, taxes, depreciation and amortization (*EBITDA*) divided by the book value of total assets at the end of the previous year and is winsorized at the 1st and 99th percentiles. Announcement returns to acquisition announcements and unexpected CEO deaths are defined below, in Sections 2.3 and 4.2 of the paper, respectively.

In our analyses, we control for several additional CEO characteristics including the age of the CEO in years (*CEO age*), a dummy variable set to one if the CEO is female (*CEO gender*), and a dummy variable set to one if the CEO is the firm's founder (*Founder CEO*).

Further, CEOs typically become more powerful as their tenure increases (see, e.g., Hermalin and Weisbach, 1998; Ryan and Wiggins, 2004). To account for effects of CEO power on firm value, and to separate CEO power from CEO tenure, we use the variable *CEO power index*. It is based on the following variables: (i) *CEO ownership*, i.e., the fraction of common shares held by the CEO, (ii) *Co-Option* which is the fraction of directors appointed after the CEO assumed office (Coles, Daniel, and Naveen, 2014a), (iii) *Duality* which is a dummy that equals one if the CEO is also the chairman of the board, (iv) *Involved CEO* which is a dummy that equals one if the board has a separate nominating committee and the CEO is a member or if such a committee does not exist (Shivdasani and Yermack, 1999), (v) *Only insider* which is a dummy that equals one if the CEO serves as the only inside (i.e., executive) director on the

a CEO in ExecuComp. CEO tenure is then calculated as the fiscal year minus the year the CEO has joined the board of directors (ISS variable "DIRSINCE").

board of directors, and (vi) *President* which is a dummy that equals one if the CEO has the title of president of the firm. Adams, Almeida, and Ferreira (2005) use the latter four variables to measure CEO power. The *CEO power index* is the sum of the following dummy variables: *CEO ownership* above median, *Co-Option* above median, *Duality*, *Involved CEO*, *President*, and *Only insider*. In robustness tests, we use the individual index components instead of the aggregated *CEO power index*.

We control for a series of additional corporate governance and firm characteristics. *Appendix A* provides an overview and detailed definitions of all variables used in the paper. Except for the variables *Business segments*, *Firm age*, and *Sales growth*, all other firm characteristics (i.e., *Book leverage*, *CapEx*, *Firm risk*, *Operating CF*, *R&D*, and *Total assets*) enter the regressions with one lag. Firm value regressions additionally include Tobin's Q with one lag as an explanatory variable to capture the relation between past performance and tenure as well as unobserved CEO and firm heterogeneity.

1.3 Summary statistics

Table 1 presents summary statistics (at the firm-year level) for the previously defined variables. In terms of CEO tenure, which takes on values between 0 and 60 years, the cross-sectional average is about 7.7 years. Based on the 3,064 CEO-firm pairs in our sample, we further define *Maximum CEO tenure* as the largest value of CEO tenure in the sample per CEO-firm pair (instead of firm-year level data). Using this definition of tenure, we find that the average CEO tenure is 8.4 years. It increases to 10.4 years when we exclude the 21% of all CEOs who leave the firm during their first three years in office, the period often referred to as “honeymoon”. Excluding turnovers during the honeymoon period, maximum CEO tenure at turnover has a mean of 11 years. 28% of all CEOs reach a maximum tenure of more than 10 years, i.e., almost a third of all S&P 1500 CEOs stay with their firm for more than a decade.

With respect to the other CEO characteristics, we find that mean CEO age is 56 years, 2% of all CEOs are female, and 12% are founders of the firm they lead. The CEO power index has a mean of 3 (relative to a minimum of 0 and a maximum of 6). As can be seen from Figure 2a, CEO power increases significantly with CEO tenure, at least over the first 15 years. Turning to the components of the CEO power index, on average CEO ownership amounts to 3% (with a median of 1%), 38% of directors on the board were appointed after the CEO assumed office (*Co-Option*), 58% of the CEOs also hold the position of the chairman of the board, 18% are involved in director selection, 57% of the CEOs are the only insiders on the board of directors, and 58% hold the title of the firm's president. 25% of CEOs hold both the chairman and the president title.

Overall, the summary statistics – also those for our governance or firm characteristics (not discussed here) – compare well to those in recent corporate governance studies (e.g., Adams, Ferreira, and Almeida, 2005; Bebchuk, Cohen, and Ferrell, 2009; Fahlenbrach, 2009; Huang, 2013; Li, Lu, and Phillips, 2016; Masulis and Mobbs, 2014).

2. CEO Tenure, Firm Value, and Investments

In this section, we investigate the relation between CEO tenure and firm value. We expect longer tenure to be associated with more experience, knowledge, and valuable personal connections of the CEO. However, eventually the CEO-firm match, and in particular the CEO's ability and willingness to adapt to changes, is expected to decrease over tenure as the firm and its industry evolve over time. Moreover, CEOs may become increasingly entrenched. Hence, we expect an inverted U-shaped relation between CEO tenure and firm value. The results of various tests of this relation are presented in Sections 2.1 and 2.2, where we rely on Tobin's Q as our measure of firm value, and in Section 2.3 where we use the stock market reaction to announcements of acquisitions to measure firm value. Section 2.3 provides additional evidence on the costs and benefits of CEO tenure from firms' (dis)investment policies.

2.1 Firm Value Analysis

We analyze the relation between CEO tenure and firm value by estimating regressions of *Tobin's Q* on *CEO tenure*, *CEO tenure squared*, and a number of controls for CEO, corporate governance, and firm characteristics (presented in Section 1.2). All regressions also include year and firm fixed effects to account for unobserved variables which are either constant across firms or constant over time. Firm fixed effects constitute our baseline estimation approach as they allow for sufficient variation in CEO tenure (as changes in tenure are not limited to one unit), while we are able to control for CEO age and other characteristics.

The functional form (of a second order polynomial of *CEO tenure*) we assume in our regressions is supported by additional tests. Most important, we perform nonparametric locally weighted regressions (*lowess*) of residuals of *Tobin's Q* on *CEO tenure*.⁷ As can be seen from Figure 1b, the nonparametric regression results suggest that the relation between firm value and CEO tenure, apparent in the data, is hump-shaped.

Our regression results are shown in *Table 2*. As a starting point, we estimate our baseline regression model without and with the squared term of CEO tenure. The results are reported in Columns 1 and 2, respectively. The coefficient on *CEO tenure* is negative and statistically insignificant in Column 1. In contrast, it is positive and significant (at the 5% level) in Column 2 and the coefficient on *CEO tenure squared* is negative and significant (at the 1% level). Hence, the results are consistent with CEO tenure capturing both benefits and costs and suggest that CEO tenure and firm value indeed exhibit an inverted U-shaped relation as motivated above. The estimated turning point, i.e., the CEO tenure at which costs start to

⁷ The residuals of *Tobin's Q* are from a regression of our baseline model, shown in Column 2 of *Table 2*, where we omit the variables *CEO Tenure* and *CEO Tenure Squared*. We also obtain the inverted U-shaped relation between firm value and CEO tenure when we analyze the residuals from the same regression model using CEO-firm fixed effects instead of firm-fixed effects. In addition, we follow Mudambi (1997) and run regressions of *Tobin's Q* on polynomials of order 1 to 4 of the variable *CEO tenure* (and control variables). The corresponding test statistics (i.e., adjusted R-squared, AIC and BIC information criteria) suggest the use of the second-order polynomial. The results of the aforementioned analyses are not reported for brevity.

outweigh benefits, is 12.5 years in Column 2. In Column 3, we include (three-digit SIC code) industry×year fixed effects in order to control for time-varying factors particular to an industry and find the results to remain statistically significant, while the turning point decreases to 10.6 years. In Column 4, we account for outliers and potential interim CEOs by excluding all observations with tenure values smaller than 1 and larger than 38 (i.e., we exclude the 1st and the 99th percentiles of *CEO tenure*). The results remain qualitatively similar and yield a turning point of 11.1 years. Finally, in Column 5 we provide estimates that address the concern that *CEO tenure* is correlated with a set of control variables used in our regression model and might therefore capture the effects that these variables can have on firm value. In particular, a CEO's time in office (technically) increases with CEO and firm age and is expected to increase in CEO power and past firm performance, and to be higher if the CEO is the company's founder. Therefore, instead of *CEO tenure*, we use *Residual CEO tenure*, which is the residual from a regression of *CEO tenure* on *CEO age*, *CEO power index*, *Firm age*, *Founder CEO*, *Tobin's Q lagged* and time fixed effects. The residual no longer captures the effects of the above variables on firm value. The results on *Residual CEO tenure* are qualitatively similar to those on *CEO Tenure*. They yield a turning point of 9.8 years.

In terms of our control variables, we find founder CEOs to be associated with a higher firm value, consistent with, e.g., Fahlenbrach (2009). Supporting previous studies, we also find both board size (e.g., Yermack, 1996) and busy boards (e.g., Fich and Shivdasani, 2006) to be negatively related to firm value. Other CEO and governance characteristics are estimated to be insignificant. Results for firm characteristics are consistent with prior studies.⁸ In sum, the

⁸ The coefficients on the firm characteristics and all fixed effects are not reported for space reasons. The coefficients of the variables *Business segments* and *Total assets* are significantly negative, while the coefficients of *Operating CF*, *R&D*, *Sales growth* and the lag of *Tobin's Q* (coefficient of 0.222) are significantly positive. When we exclude the lag of *Tobin's Q* from the regressions, the results shown in Columns 2-4 of Table 2 remain statistically significant with comparable inflection points. When we use two lags of *Tobin's Q* or substitute the lag of *Tobin's Q* for the firm's stock market performance of the previous year, results remain qualitatively similar.

results indicate that, on average, the costs of increasing CEO tenure outweigh the benefits after about a decade.

2.2 Tests on the Robustness of the Firm Value Analysis

We perform a battery of robustness tests on the results shown in Section 2.1. As a first test, we replicate our regressions in Table 2 with firm fixed effects replaced by industry fixed effects based on three-digit SIC industries or by random effects (with industry controls). The results (not reported for brevity) confirm the inverted U-shaped relation between CEO tenure and Tobin's Q. In the following, we present various other tests in more detail.

2.2.1 Interim CEOs, CEO-firm match, and outliers

We analyze whether our results are influenced by non-optimal matches between firms and CEOs, interim CEOs, or outliers in the CEO tenure variable. First, we reestimate the regression reported in Column 2 of Table 2 excluding all observations for which CEO tenure is smaller than 1 or smaller than 2 years. Alternatively, we exclude all CEOs who leave the company in their "honeymoon period" (the first three years in office). Thereby, we avoid cases of firms headed by interim CEOs and, more important, restrict our sample to CEOs that originally were considered good matches. These tests further mitigate possible concerns of endogenous CEO-firm matching. Second, we exclude 349 observations (3% of the sample) for which *CEO tenure* takes on values above 30 years. Third, we exclude founder CEOs who tend to have higher tenure values and who may differ substantially in the level of entrenchment, incentives, and the learning effect from non-founder CEOs. Fourth, we exclude CEOs who rejoin their company (*Rejoined CEOs*), identified via the ExecuComp data item "REJOIN". In another test, we also exclude CEOs with more than one CEO position (within our sample) over the sample period (*Multiple appointment CEOs*). In both cases, *CEO tenure* might not accurately reflect the costs and benefits of a CEO's time in office. The results from all these tests are reported in *Appendix B* and confirm those shown in Table 2.

2.2.2 Alternative explanations

In the next set of robustness tests, reported in *Table 3*, we attempt to rule out a number of alternative explanations. First, *CEO tenure* and *CEO tenure squared* may simply pick up the effect of a non-linear relation between CEO age or firm age and firm value. Hence, in Column 1, we add *CEO age squared* as an additional control variable to our standard specification as reported in Column 2 of *Table 2*. In Column 2, we extend our standard specification to additionally include *Firm age squared*. When we use a firm's foundation age (obtained from The Corporate Library) instead of its age since IPO in unreported regressions, the result remains qualitatively similar. Second, CEO tenure and its squared term may simply capture an inverse U-shaped relation between CEO power and firm value as power grows with longer tenure and as it may have both costs and benefits (Adams, Almeida, and Ferreira, 2005; Li, Lu, and Phillips, 2016; Sah and Stiglitz, 1986). Hence, in Column 3, we add the squared term of *CEO power index* to our standard regression. Third, Huang (2013) reports an inverse U-shaped relation between outside director tenure and firm value. As director tenure may correlate with CEO tenure, in Column 4, we extend our standard specification to include *Outside director tenure* and its squared term. Fourth, in Column 5 we additionally control for the *Board age* and its squared term which might correlate with a CEO's tenure. In Columns 6 and 7, we include all these additional explanatory variables simultaneously. Column 7 uses the variable *Residual CEO tenure* (defined in Section 2.1) instead of *CEO tenure*. We find the inverted U-shaped relation between CEO tenure and firm value to hold across all seven regressions with the coefficients on *CEO tenure* and *CEO tenure squared* being significant at the 5% level or better.

We investigate further alternative explanations and the robustness to controls for CEO ability in *Appendix C*. As shown in Pan, Wang, and Weisbach (Forthcoming), firms' investments increase significantly over CEO tenure (with decreasing investment quality), while disinvestments decrease. Given that disinvestments efficiently reshape the firm, the inverted

U-shaped relation between CEO tenure and firm value might reflect this investment pattern. Thus, in addition to firms' capital expenditures already controlled for in all of our regressions, in Column 1, we control for firms' acquisition and divestiture activities. We use the dummy variables *Acquisition* and *Divestiture* set to one if a firm undertakes an M&A transaction or a divestiture in a given year. In Column 2, we control for CEOs' general managerial abilities, which may correlate with their tenure, using the *General ability index* provided by Custódio, Ferreira, and Matos (2013). This data is only available until 2007, restricting our sample period to 1998-2007. As alternative measures of CEO ability – which might affect CEO learning, adaptability and entrenchment – we control for the *Managerial ability score* provided by Demerjian, Lev, and McVay (2012) in Column 3 and for CEO education in Column 4. Furthermore, the inverted U-shaped relation of CEO tenure and firm value might capture the effect of incentive structures changing over a CEO's time in office. In Column 5, we control for *CEO ownership* and its square to address a potential inverted U-shape of equity ownership and firm value (e.g., McConnell and Servaes, 1990). In Column 6 (7), we alternatively include the fraction of variable to total compensation (and its square). In Column 8, we control for wealth-performance sensitivity using the data from Edmans, Gabaix, and Landier (2009). Column 9 shows the regression results when we include all additional controls simultaneously. Again, we find our results to hold across all regression specifications with all coefficients on *CEO tenure* and *CEO tenure squared* being statistically significant.

2.2.3 CEO and firm survivorship

The inverted U-shaped relation between CEO tenure and firm value might not be the outcome of costs and benefits arising over a CEO's tenure, but might simply reflect that CEOs with very good performance get recruited to run bigger companies (Fee and Hadlock, 2003), while CEOs with relatively poor performance remain with their companies. The latter may still survive for longer time periods through entrenchment in poorly governed firms and, probably,

due to a lack of succession planning. A similar argument is that successful CEOs receive a larger compensation resulting in higher opportunity costs of work and earlier retirement. The acquisition of a company, which is usually associated with high returns (see, e.g., Andrade, Mitchell, and Stafford, 2001) while terminating the CEO's tenure with this company through the subsequent delisting of the target firm, may also cause part of the effect. We address these concerns in *Appendix D* where we reestimate the regression reported in Column 2 of Table 2 for different sub-samples. Specifically, in Column 1 we restrict the sample to S&P 500 companies as CEOs of these very large companies are less likely to get recruited to run even bigger firms. The focus on the 500 leading U.S. companies also reduces heterogeneity with respect to CEO talent and pay. In Columns 2 and 3, we focus on wealthier CEOs, i.e., those with a cumulative total CEO compensation (relative to their tenure) above the median or with equity ownership above the median. In Column 4, we exclude CEOs who have exceeded the general retirement age of 65 years. These CEOs are more likely to lead companies that lack CEO succession plans, while at the same time they have fewer, if any, career concerns. To further address this concern, we exclude family firms in Column 5. Family firm data for the years 2001 to 2010 is from Ron Anderson's website (www.ronandersonprofessionalpage.net). In Column 6, we exclude the last observation for each firm in our sample to eliminate a potential "last year in office" effect and the effect of potential takeovers. To further address the latter concern, in Column 7 we exclude firms that have become takeover targets over the sample period. Finally, in Column 8 we address the concern that the inverted U-shaped relation between firm value and CEO tenure is just the outcome of performance changes around forced CEO turnovers (as found, e.g., in Denis and Denis, 1995) in conjunction with the use of firm fixed effects. In this regard, Huson, Malatesta, and Parrino (2004) and Taylor (2010) show that firm profitability declines in the two years prior to forced CEO turnovers and increases in the two years after a new CEO took office. Therefore, for all turnovers of CEOs who are

younger than 60 years we exclude from our sample all firm-year observations for the five-year event window starting two years prior to and ending two years after the turnover event. The results of all aforementioned tests confirm our main finding from Section 2.1.

In a next robustness test, we address the concern that the inverted U-shaped relation between CEO tenure and firm value reflects varying managerial incentive structures as for many CEOs job security may increase over the early years of tenure, but is likely to significantly decrease afterwards. In this regard, Cziraki and Xu (2014) find that job security, estimated with the time to expiration of CEO employment contracts, affects corporate risk-taking and investments. Therefore, in *Appendix E* we first perform a survival analysis using a Cox hazard model with CEO turnover as the failure event (see Panel A). Probably most important, the analysis suggests that CEO power has a significantly negative effect on turnover probability, consistent with CEOs who stay in office for too long. In a second step, we run our baseline regression model from Column 2 of Table 2 and additionally include the resulting hazard rate, or the hazard rate and its squared term, to account for the estimated CEO turnover probability (see Panel B). Again, our results remain qualitatively similar.

In another robustness test, we attempt to mitigate concerns that our results are influenced by firms or CEO-firm pairs with only few observations in our sample. Therefore, we restrict our sample to firms with at least four (six) firm-year observations or to CEO-firm pairs with at least four (six) CEO-firm pair observations. The results from estimating the extended regression specification from Column 6 of Table 3 for these four restricted datasets are reported in *Appendix F*. The regressions in Columns 1 and 3 include firm fixed effects and the regressions in Columns 2 and 4 include CEO-firm fixed effects to account for unobserved CEO heterogeneity and endogenous CEO-firm matching. The results in all columns confirm our previous findings of an inverted U-shaped relation between CEO tenure and firm value.

2.2.4 Further robustness tests

As a test on the posited inverted U-shaped relation between firm value and CEO tenure, we reestimate our baseline regression from Column 2 of Table 2 and replace *CEO tenure* and its squared term by two alternative dummy variables. The variables *CEO tenure [11, 13]* and *CEO tenure [9, 15]*, are set to one for firm-year observations for which *CEO tenure* takes on values between 11 and 13 and between 9 and 15, respectively. The regression results are shown in *Appendix G*. Consistent with our results in Section 2.1 and the posited U-shaped pattern, we find that the both dummy variables have statistically significant, positive coefficients, with the coefficients of *CEO tenure [11, 13]* showing a larger magnitude. The results hold for both firm fixed effects (Columns 1 and 3) and CEO-firm fixed effects (Columns 2 and 4).

To analyze whether it is really tenure as a CEO that matters, versus other types of tenure, we conduct additional analyses in *Appendix H*. Specifically, we add measures of the CEO's overall tenure with the company or her tenure on the board of directors. If it is really tenure as a CEO which matters most for on-the-job learning, but is also associated with a loss of fit over time, we expect *CEO tenure* and its squared term to remain statistically significant once we add the other tenure variables to our baseline regression. To determine a CEO's tenure with the company, we use the ExecuComp data item "JOINED_CO", available for 6,521 firm-year observations, which provides the date on which a CEO first joined the company (in any position). CEO mean tenure with the company is 15.8 years in our sample. To compute the CEO's tenure on the board of directors, we use data item "DIRSINCE" in ISS. This variable is available for 12,406 firm-year observations. The CEO's mean tenure on the board of directors is 10.3 years in our sample. The results in Columns 1 and 3 of Appendix E show evidence of an inverted U-shaped relation between both alternative types of tenure and firm value, which supports our general reasoning of the cost-benefit relation of tenure. However, when we simultaneously include *CEO tenure* and its square and the CEO's tenure with the company and

its square (in Column 2), or *CEO tenure* and its square and the CEO's board tenure and its square (in Column 4), only the coefficients on *CEO tenure* and its square remain statistically significant. In Column 5, we also run our baseline regression while restricting the dataset to internal CEOs who, by definition, have joined the company before becoming the CEO. We again find an inverted U-shaped relation between CEO tenure and firm value.⁹ In Column 6, we use the ExecuComp data item "JOINED_CO" to control for the average tenure of a firm's top executives and again find our main result to hold. We conclude that the CEO's tenure at the helm of the firm is the most relevant tenure measure. Additionally, in Column 7 we standardize a CEO's tenure by her age to account for age-related differences in the costs and benefits of CEO tenure and as another way of controlling for CEO age. Similar to our previous results, we find an inverted U-shaped relation between CEO tenure and firm value when we use the variables *CEO tenure/age* and *CEO tenure/age squared*.

As a final robustness test to our main results, we replace Tobin's Q by return on assets (*ROA*) as an accounting (i.e., non-forward looking) measure of firm performance. The results are reported in *Appendix I*. We estimate similar specifications as in Column 2 of Table 2 (except for *Operating CF* which is omitted) using industry fixed effects (Column 1), firm fixed effects (Column 2), and CEO-firm fixed effects (Column 3). The results confirm the previously documented inverted U-shaped relation between CEO tenure and firm performance.

2.3 Acquisitions and other Investments as Major Channels of Firm Value Creation

In this section, we investigate a major channel through which CEOs can create and destroy firm value, acquisitions. If the inverted U-shaped relation between CEO tenure and firm value reflects a trade-off between benefits and costs, the same trade-off should also be reflected in the value of CEOs' investment decisions. In particular, we would expect the

⁹ Internal CEOs are defined as in Bebchuk, Cremers, and Peyer (2011) and account for 83% (or 10,283 observations) of our sample (Bebchuk, Cremers, and Peyer report 85%).

accumulation of experience, knowledge and valuable relations to result in better investments throughout the earlier years of a CEO's tenure. As eventually the CEO's fit with the firm deteriorates in longer tenure, and the CEO becomes increasingly entrenched and reluctant to change, we expect investment decisions to become worse. In this regard, acquisitions are an ideal setting to study the quality of a CEO's decisions as they are among the largest and most easily observable investments which tend to be directly influenced by the CEO (e.g., Custódio and Metzger, 2013). Moreover, an analysis of announcement returns allows a straightforward market-based assessment of the quality of the CEO's acquisition decision.

We compile a dataset of acquisitions announced by our sample firms during the period 1998-2011. Data on mergers and acquisitions stem from Standard & Poor's Capital IQ database. We only include takeovers with a total transaction value of at least 5 million US dollars in which a majority stake (i.e., at least 50%) of the target firm is acquired. In addition, we require a transaction's total value to represent at least 5% (10%) of the acquirer's market capitalization 20 days prior to the announcement of the deal. These filters result in 2,171 acquisitions made by 1,148 distinct firms for which the basic control variables (those typically used in the M&A literature) are available. The sample is reduced to 1,823 acquisitions made by 980 distinct firms when we use the same control variables as in Section 2.1.

We measure acquirer announcement returns over a three-day event window from one day before to one day after the event date ($CAR [-1,1]$), defined as the day of the acquisition announcement in Capital IQ (or the first trading day thereafter if the announcement was made on a non-trading day). Cumulative abnormal announcement returns are calculated using the market model with the S&P 500 market index. In addition to the acquirer characteristics used in Section 2.1, we also control for deal characteristics following previous research (e.g., Custódio and Metzger, 2013; Moeller, Schlingemann, and Stulz, 2004). They include the payment method, target ownership status, relative deal size, industry relatedness, geographic

relatedness, and whether the acquisition is hostile. We further control for the number of an acquirer's previous deals in the last five years to account for acquisition experience and the firm's acquisition set. The deal-related variables are defined in the caption of *Table 4*.¹⁰

Columns 1 and 2 of Table 4 report the results from the regressions of *CAR [-1,1]* on *CEO tenure*, *CEO tenure squared*, deal characteristics, a limited set of acquirer characteristics, and year fixed effects. Column 1 uses industry fixed effects, while Column 2 uses firm fixed effects (in order to make the results more comparable to those in Section 2.1). In Columns 3 and 4 the extended set of control variables and firm fixed effects are used. The first three columns report the results for the sample of acquisitions whose total transaction value represents at least 5% of the acquirer's market capitalization, while Column 4 reports the results for acquisitions with a relative size of at least 10%. The results across all four specifications suggest an inverted U-shaped relation between CEO tenure and M&A announcement returns. Consistent with the results on the relation between CEO tenure and firm value, we find the inflection point of CEO tenure to be located in the area of 9.5-12 years when firm fixed effects are used.¹¹ Control variables (e.g., *Founder CEO*, *Public target*) have the expected signs.

Overall, the relatively lower returns to acquisition announcements associated with very short or very long CEO tenure support the CEO life cycle we posit. For short-tenured CEOs, a lack of firm-specific knowledge may result in the selection of relatively worse acquisition targets. Also, short-tenured CEOs may lack (M&A) experience and confidence, and thus may ultimately be associated with weaker negotiation outcomes important in corporate takeovers (see Custódio and Metzger, 2013). As CEO tenure advances, CEOs learn and improve on the

¹⁰ Mean values of the control variables for deal characteristics are not reported for brevity. They are in line with previous research. For example, relative deal size is 25% and the fraction of public targets is 34%. Custódio and Metzger (2013), for example, report values of 24% and 32%, respectively.

¹¹ In unreported regressions, we use two alternative dependent variables, *CAR [-1,1]* winsorized at the 1st and 99th percentile level as well as the cumulative abnormal return for the seven-day event window from three days before to three days after the event date. Results are qualitatively similar.

aforementioned aspects. At some point, however, the CEO may have lost too much of her fit with the company, may be too entrenched, and thus selects non-optimal takeover targets (e.g., those with low synergies) or simply overpays (see Harford, Humphery-Jenner, and Powell, 2012). Empire building strategies or attempts to diversify the personal portfolio (Amihud and Lev, 1981) coupled with high CEO power may aggravate this problem.

We provide an additional analysis of corporate investments, i.e., capital expenditures and divestitures, in *Table 5*. Supporting Pan, Wang, and Weisbach (Forthcoming), our regression results suggest that investment rates increase with CEO tenure, while the likelihood of divestitures decreases. These results remain, but are weaker both economically and statistically, when we take CEO power into account. They support the benefits and costs of tenure we posit. In particular, the increase in investment rates over the CEO's tenure, found in Columns 1-4, is an indication of both on-the-job learning (and experience) and entrenchment over time. To better disentangle the two effects, in Columns 3 and 4 we distinguish between low- and high-tenured CEOs (based on the median of *CEO tenure*), respectively. Consistent with learning, Column 3 suggests that CEOs invest significantly less in the first three years of their tenure than in the subsequent three years. The positive association between tenure and capital expenditures found for high-tenured CEOs in Column 4 is consistent with entrenchment and potential overinvestment. The declining probability of divestitures over the CEO's tenure, found in Columns 5-8, is consistent with CEOs becoming more reluctant to change, more concerned to protect their reputation, and more entrenched over their time in office. Supporting the conclusion that high-tenured CEOs divest less than necessary, consistent with economic theory (Boot, 1992; Prendergast and Stole, 1996), Column 8 indicates that CEOs are more likely to divest during their first three years in office.

3. Economic Environment and the Cost-Benefit Relation of CEO Tenure

This section investigates whether the relation between CEO tenure and firm value depends on the dynamics of the firms' environment, as argued in Hambrick and Fukutomi (1991) and Henderson, Miller, and Hambrick (2006).¹² Specifically, in more dynamic settings we would expect the benefits of tenure, particularly accumulated knowledge and experience, to have a shorter half-life, while a CEO-firm mismatch is more likely to occur and the CEO is less likely able to adapt to changes (which are typically exogenous to each firm). As a consequence, relative to the inflection point of CEO tenure (of 11 years) found for the average firm in Section 2, we expect the inflection point to shift to smaller (larger) tenure values in more (less) dynamic settings, i.e., the posited costs of CEO tenure are expected to outweigh the posited benefits after fewer (more) years of a CEO's time in office. The results of the following analyses therefore present empirical tests of the cost-benefit relation of and thus of the underlying costs and benefits of CEO tenure we posit in this paper.

As a first measure for the dynamism in a firm's environment, we use the industry dynamism index proposed by Coles, Daniel, and Naveen (2014b). The index is defined as the sum of the following four indicator variables: (i) a dummy whether the average annual sales growth of all firms in the industry is above the 50th percentile, (ii) a dummy whether the average R&D expenses to total assets at the industry level are above the 75th percentile, (iii) a dummy whether the average of the fluidity scores of Hoberg, Phillips, and Prabhala (2014) is above the 50th percentile, and (iv) a dummy whether the number of mergers in the industry divided by the number of firms in the industry (e.g., Harford, 2005) is above the 50th percentile. Industries are defined based on three-digit SIC codes. The index takes on discrete values between 0 and

¹² Both studies argue that CEOs have a fixed paradigm, i.e., they have a specific worldview and specific skills with a limited elasticity. They argue that a CEO's fit with the company depends on the dynamism of the industry the company operates in. While Hambrick and Fukutomi's (1991) study is theoretical, Henderson, Miller, and Hambrick (2006) provide initial empirical evidence consistent with differences in the CEO-firm (mis)match comparing 98 CEOs in the stable food industry with 228 CEOs in the more dynamic computer industry between 1955 to 1994. Their results suggest that CEOs lose their fit much faster in a more dynamic industry.

4 (with a median value of 2) with higher values indicating higher industry dynamism. The results from reestimating our baseline regression as reported in Column 2 of Table 2 for subsamples based on whether the industry dynamism index is above or below the median value are reported in *Panel A of Table 6*. The first column reports the results for firm-years with a dynamism index below the median (i.e., for firms operating in less dynamic settings) and the second column reports the results for firm-years with a dynamism index above the median (i.e., more dynamic settings).

The results of both regressions shown in Panel A confirm the inverted U-shaped relation between CEO tenure and firm value. Most importantly, we find the inflection point to be substantially lower (higher) for firms in more (less) dynamic settings (9.5 vs. 14.8 years). This suggests that the benefits of CEO tenure have indeed a shorter half-life, while the costs occur earlier if a firm's environment is more dynamic, consistent with the cost-benefit relation we posit. In terms of economic magnitude, the variation in the inflection point of CEO tenure, i.e., the CEO's time in office after which costs start to outweigh benefits, varies dramatically between more and less dynamic settings. Compared to the inflection point of 12.5 years found in our baseline regression from Column 2 of Table 2, we find that the inflection point is 19% (or 2.3 years) higher in less dynamic settings, while it is 24% (or 3 years) lower in more dynamic settings. Overall, the difference between the two inflection points is 5.3 years.

Several alternative measures of firms' environmental dynamics support the above finding. In particular, we would expect the inflection point of CEO tenure to be lower for tech firms as accumulated knowledge and experience may more quickly become outdated and, hence, the negative value effect of a mismatch between the CEO and the firm and managerial entrenchment outweighs the positive value effect at an earlier time. A similar reasoning should apply to relatively young industries, typically characterized by higher environmental dynamics, as compared to relatively mature industries. Therefore, we reestimate our baseline regression

from Column 2 of Table 2 for sub-samples of tech and non-tech firms and for sub-samples of young and mature industries. The results are reported in *Panel B and Panel C* of Table 6. In Panel B, we define tech firms based on four-digit SIC industries as suggested by Loughran and Ritter (2004). In Panel C, we define young industries as those with below sample median industry age, where industry age is measured as the average firm age of all companies operating in a firm's (three-digit SIC) industry. Not only do the results of all four regressions confirm the inverted U-shaped relation between CEO tenure and firm value, but they are consistent with the posited cost-benefit relation of CEO tenure. Particularly, we find that the inflection point of tenure again varies considerably with firms' environmental dynamics. It is much lower (higher), i.e., costs outweigh benefits much earlier (later), for firms in more (less) dynamic settings. Relative to the inflection point of 12.5 years found in our baseline regression, the inflection point is 10.6 years for tech firms and 11.2 years for firms in young industries. For non-tech firms and firms in mature industries the inflection point is 13.7 and 14.2 years, respectively. The variation in inflection points is again economically meaningful.

In *Appendix J*, we provide additional robustness tests for the aforementioned findings. First, we use another index of environmental dynamism which is a 6-factor industry shock score based on Guay, Taylor, and Xiao (2014). The shock score (defined in the caption of Appendix J) is based on industry-wide changes, both expansions and declines, in advertising expenses, firm size, investments, R&D expenses, sales and sales concentration. Results from reestimating our baseline regression for sub-samples of firm-year observations in more shock-affected (with a shock score above the median) and less shock-affected industries are reported in Panel A. Second, Panel B reports results from regressions where we use an alternative definition of tech firms based on NAICS codes as provided by the U.S. Census. Again, we find the inflection point of CEO tenure to be much lower (higher) – 8.5 vs. 14.9 years in Panel A and 11.2 vs. 15.6 years in Panel B – in firms which are to a larger (lower) extent subject to

environmental dynamism. In terms of economic magnitude, the variation of about 4 to 6 years in the inflection point of CEO tenure is substantial.

In sum, the results across Table 6 and Appendix J confirm the inverted U-shaped CEO tenure-firm value relation, suggest that this relation is significantly affected by firms' environments, and thereby provide important tests which support the underlying costs and benefits of CEO tenure we posit. The non-linear CEO tenure-firm value relation is further supported by unreported regressions where we find that *CEO tenure* (without its squared term) is statistically insignificant in all regression models shown in Table 6 and Appendix J. Given the economically meaningful differences between the inflection points of CEO tenure found for more and less dynamic settings, the results of this section do not support a one-size-fits-all policy of CEO term limits.

4. Using Exogenous Shocks for Identification

4.1 Shocks to the Cost-Benefit Relation of CEO Tenure

As a first shock to the posited costs and benefits of CEO tenure, and hence the resulting cost-benefit relation, we use economic recessions, including the financial crisis of the late 2000s. On the one hand, we expect entrenchment to become less costly in crises and recessions due to positive effects of managerial discretion in difficult times (e.g., Li, Lu, and Phillips, 2016). On the other hand, we expect the CEO learning period to be extended in crises and recessions as CEOs gain new, valuable experience when they have to solve problems and lead their firms and employees in difficult economic times (see Arrow, 1962, and Kempf, Manconi, and Spalt, 2014, for a similar reasoning and consistent evidence). We thus expect the inflection point of CEO tenure to shift to larger values for recession years, i.e., costs start to outweigh benefits at higher CEO tenures.

To test the aforementioned prediction, we classify our sample years as recession (or non-recession) years according to the NBER Business Cycle Expansions and Contractions data (<http://www.nber.org/cycles.html>). Comparable to the procedure in Section 3, we reestimate our baseline regression from Column 2 of Table 2 for sub-samples of recession and non-recession years and compare the estimated inflection points. The results are shown in *Panel A of Table 7*. In Columns 1 and 2, we exclude year fixed effects from the regressions and compare the inflection point to the inflection point resulting from a reestimation of our baseline regression with a recession dummy instead of year fixed effects. In Columns 3 and 4, we include year fixed effects in the regressions. The results support our expectation. The inflection point indeed shifts to larger tenure values for recession years. The increase in the inflection point is economically meaningful amounting to about 2 years (or up to 18%) compared to the baseline regression results. Consistently, we find that the inflection point shifts to smaller tenure values for non-recession years.

As a second shock to the posited costs-benefit relation of CEO tenure, we make use of regulatory changes in corporate governance. First, we follow Guo and Masulis (2015) and use the implementation of SOX and the concurrent NYSE and NASDAQ listing rule changes – which significantly increased board and committee independence – as a positive shock to the overall level of corporate governance. Similar to Guo and Masulis, and given the stock exchange deadlines for compliance, we treat the fiscal year 2005 as the first year of compliance with SOX and the listing rules and denote the years after 2004 as the post-SOX period. We predict optimal CEO tenure to shift to larger values post-SOX as improved governance is expected to reduce the costs of both CEO entrenchment and CEO-firm mismatch. *Panel B of Table 7* shows the regression results from reestimating our baseline regression from Column 2 of Table 2 for sub-samples for the pre-SOX and the post-SOX periods. In Columns 1 and 2, we exclude year fixed effects from the regressions and compare the inflection point to the

inflection point resulting from a reestimation of our baseline regression with a post-SOX dummy instead of year fixed effects. In Columns 3 and 4, we include year fixed effects in the regressions. The results support our prediction. The inflection point of CEO tenure shifts to larger values after the implementation of SOX. The increase in the inflection point is again economically meaningful and amounts to at least 2 years (or 16%) compared to the baseline regression results. Consistently, we find that the inflection point shifts to smaller tenure values for pre-SOX years.

Following a similar reasoning as above, we further use the takeover index provided by Cain, McKeon, and Solomon (2014), which is based on exogenous changes in U.S. state-level laws. As higher index values correspond to higher firm-level takeover susceptibility, i.e., more external governance through the market for corporate control, we predict the inflection point of CEO tenure to shift to larger (smaller) values for firms with higher (lower) index values. The results from reestimating our baseline regression for sub-samples of firms with high (i.e., above median) and with low takeover index values are shown in *Panel C of Appendix J*. Again, the results support our prediction.

4.2 Evidence from Sudden CEO Deaths

We further aim to mitigate endogeneity concerns by employing an identification strategy based on unexpected deaths of incumbent CEOs, similar to, e.g., Johnson et al. (1985), Bennedsen, Pérez-González, and Wolfenzon (2007), and Nguyen and Nielsen (2014). Unexpected CEO deaths offer plausibly exogenous identification of how markets assess a CEO's value because deaths occur randomly and are likely to be exogenous to current firm and market conditions. In particular, the stock price reaction to sudden deaths measures the deceased CEO's expected (i.e., future) contribution to shareholder value (net of the successor). Thus, given the posited costs and benefits arising over a CEO's time in office, we expect a

positive relation between a deceased CEO's tenure and the stock price reaction to her death.¹³ Consequently, the evidence presented in this section provides an alternative test for the hypothesized U-shaped relation between tenure and firm value and important additional evidence on whether some CEOs stay in office for too long.

We hand-collected a sample of CEO deaths between 1992 and 2012 from various sources including LexisNexis, EDGAR online and Google using keyword searches of expressions "CEO", "Chief Executive Officer" and "death", "passed away", "deceased", etc. We consider CEOs of firms with available data in CRSP. To ensure that the CEO's death conveys new information, we restrict our sample to unexpected deaths using the definition of Nguyen and Nielsen (2014), i.e., we classify deaths as sudden when the cause of death is a heart attack, stroke, or an accident or when the specific cause is unreported, but the death is described as unexpected. We exclude cases of sudden deaths for which the cause of death is a murder or suicide. This procedure leaves us with a sample of 80 sudden CEO deaths.¹⁴ For these 80 events, we compute cumulative abnormal stock returns (CARs) over the 3-day period from the day before until the day after the announcement date ($CAR [-1, 1]$). We use the market model with the CRSP value-weighted index as a proxy for the market return. We winsorize the variable $CAR [-1, 1]$ at the 1st and 99th percentiles.

In *Panel A of Table 8*, we report results from univariate difference-in-means tests for whether $CAR [-1, 1]$ differs depending on the deceased CEO's tenure. Specifically, we compare

¹³ A positive stock price reaction suggests a negative contribution to firm value. Thus, a positive and linear relation between CEO tenure and the stock price reaction to sudden CEO deaths is consistent with our main finding as reported in Section 2.1. In particular, the inverted U-shaped relation between firm value and CEO tenure is consistent with a negative relation between a CEO's tenure and the growth rate of firm value (as the derivative function of an inverted U-shape is monotonically decreasing). In *Appendix K*, we provide additional supportive evidence (using our panel data) from regressions of the growth rate of Tobin's Q on CEO tenure.

¹⁴ Comparable to Nguyen and Nielsen (2014), who report a mean market capitalization of US\$ 1,260 million, a mean market-to-book ratio of 2.7, a (median) CEO age of 60 years, and a CEO tenure of 9.4 years, we find that the mean market capitalization in our sample is US\$ 1,455 million, the market-to-book ratio is 2.8, the median CEO age is 60 years and the median tenure is 8.5 years (with a minimum value of zero). The cause of death is a heart attack in 44% of all cases, a stroke or accident in 25%, and in 31% it is unknown but unexpected.

mean CARs across two sub-samples based on whether CEO tenure is above or below (or equal to) the sample median or above or below (or equal to) 12 years, the (highest) average inflection point determined in our analyses in Section 2.1. The results show that abnormal stock returns to sudden death announcements of CEOs with shorter tenure are significantly lower than announcement returns of CEOs with longer tenure. Consistent with our hypothesis and results in Section 2, we find that the sub-sample means of $CAR [-1,1]$ have the expected signs: negative for the sub-samples of CEO tenure below (or equal to) 12 years and positive for the sub-samples of tenure above 12 years.

Panel B of Table 8 reports results from regressions of $CAR [-1,1]$ on *CEO tenure* and additional controls for CEO and firm characteristics (not available for all observations) as well as time and industry fixed effects. We add the controls successively. Column 1 only includes *CEO tenure* and a constant, Column 2 adds *CEO age* and firm characteristics, Column 3 adds *Duality*, *Founder CEO*, and *President*, some of the most important CEO power measures (see Adams, Almeida, and Ferreira, 2005), Column 4 adds time fixed effects, and Column 5 adds industry fixed effects. Finally, in Column 6 we replace *CEO tenure* by two dummy variables, one for tenure values in the second tercile and one for tenure values in the third tercile of the sample's distribution of *CEO tenure*. The results of all regressions are consistent with the univariate findings and suggest a positive relation between announcement returns to CEOs' unexpected deaths and CEO tenure. Specifically, announcement returns are significantly less negative when CEOs have longer tenure suggesting that long tenure periods are more negatively perceived by the market. This result is robust to controls for several CEO power measures. Thus, the negative effect of high-tenured CEOs on shareholder value, at least to a certain part, seems to stem from costs arising with tenure, particularly CEO-firm mismatch, inability and reluctance to adapt to changes, other than the CEO's entrenchment.

In sum, the evidence found in this section supports our previous results and the hypothesized effects of the costs and benefits arising over the CEO's time in office. They indicate that some CEOs indeed stay in office for too long at the detriment of shareholders. Results suggest that a policy of frequent CEO turnover may be in the interest of shareholders.

5. Conclusion

In this study, we provide evidence that the impact of CEOs on the firms they manage varies over time. In particular, we find an inverted U-shaped relation between CEO tenure and firm value as well as M&A announcement returns, consistent with the net effect of benefits and costs that arise dynamically over the CEO's time in office. Costs of tenure outweigh benefits much earlier for firms operating in dynamic, fast changing environments, but much later in more mature and stable environments. Our results are supported by exogenous shocks to the cost-benefit relation of tenure and an analysis of CEO sudden deaths.

Our study provides important insights. First, the vast majority of the CEO literature has focused on heterogeneity across different CEOs. The evidence we present suggests that variation with respect to the same CEO over her time in office further explains variation in corporate outcomes. Second, the documented life cycle of CEOs and its variation with environmental dynamics improves our understanding of how CEOs evolve over time and thereby affect the firms they run. This result appears to be important in the context of effective corporate governance and related regulation. In this regard, the results of our study indicate that a general policy of regular CEO turnover may be valuable to corporate shareholders, but do not support a one-size-fits-all policy of CEO term limits.

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Figure 1a – The relation between firm value and CEO tenure

This figure illustrates the hypothesized relation between CEO tenure and firm value which reflects the net effect of costs and benefits that arise over a CEO’s time in office.

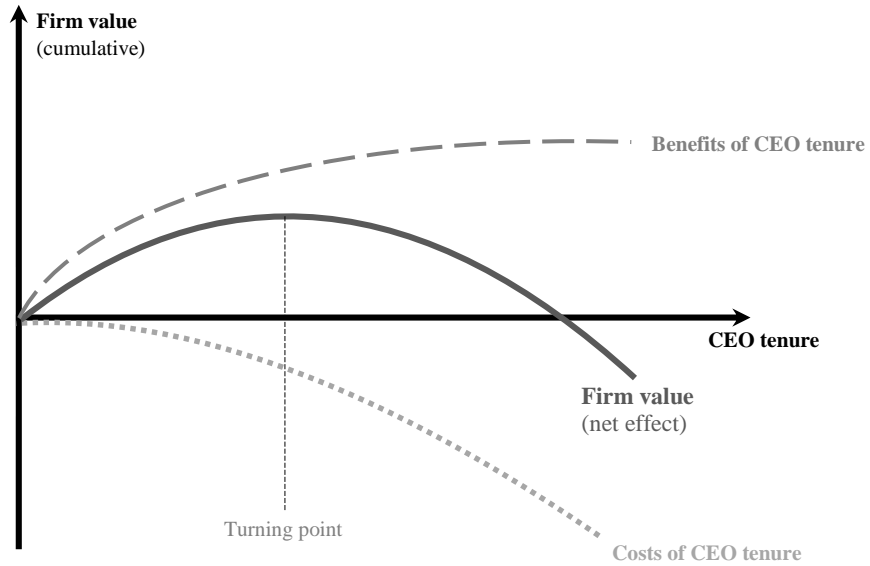


Figure 1b – Nonparametric plot of firm value against CEO tenure

This figure shows the results from locally weighted regression (lowess) of residuals of *Tobin’s Q* on CEO tenure. The residuals are from a regression of our baseline model shown in column 2 of Table 2 where we omit the variables *CEO tenure* and *CEO tenure squared*. Lowess regression provides a nonparametric way of estimating the relation between firm value and CEO tenure. The bandwidth is 0.4.

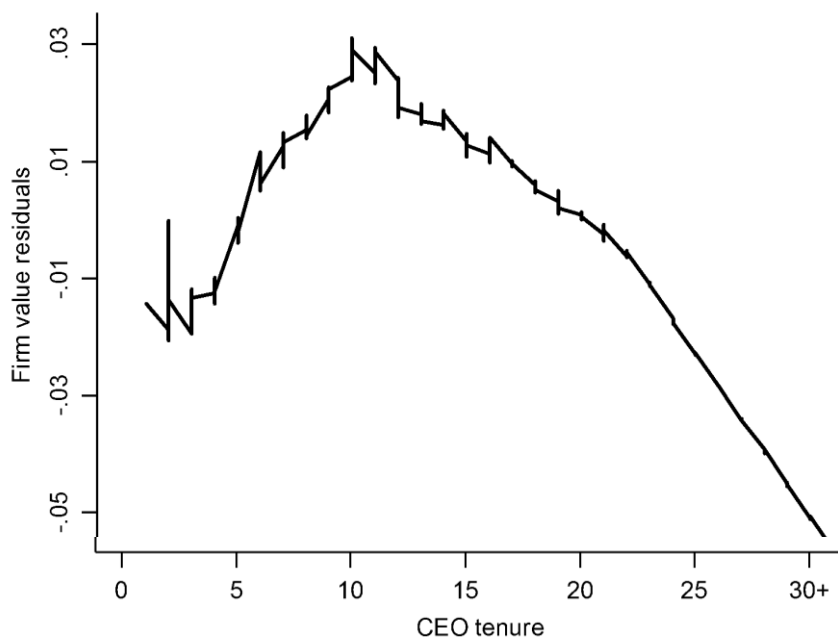


Figure 2a – CEO tenure and CEO power accumulation

This figure shows a plot of the results from a locally weighted regression (lowess) of the *CEO power index* on *CEO tenure*. The sample includes S&P 1500 firms over the period 1998-2011 excluding observations from regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). *CEO power index* is the sum of the following indicator variables: *CEO ownership* above median, *Co-Option* above median, *Duality*, *Involved CEO*, *President*, *Only insider*. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO.

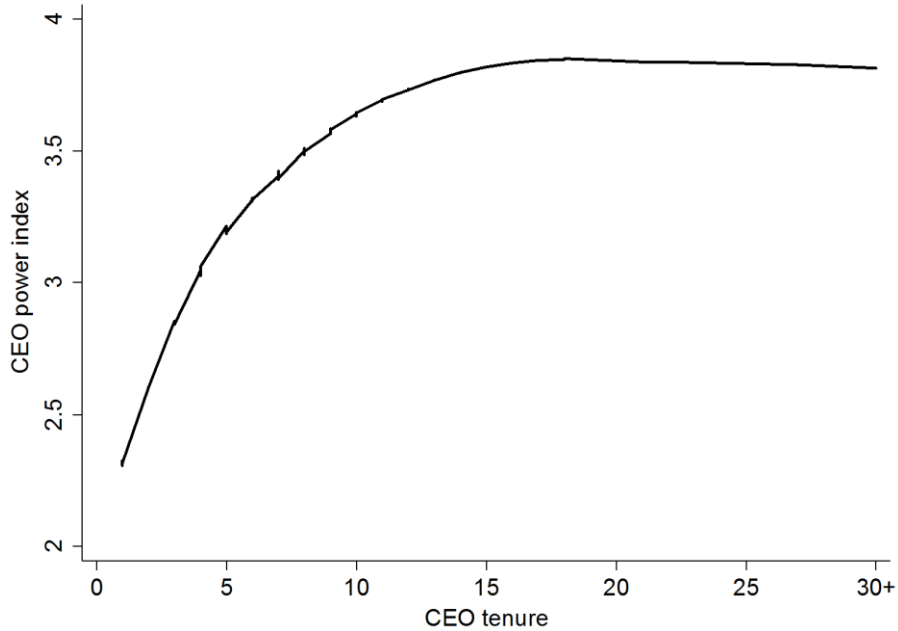


Figure 2b – CEO tenure and CEO turnover

This figure shows a plot of the results from a locally weighted regression (lowess) of CEO turnover on *CEO tenure*. The sample includes S&P 1500 firms over the period 1998-2011 excluding observations from regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). *Forced turnover* is an indicator variable that takes the value of one if the CEO departs at the end of the year, is younger than 60 years (following Coles, Daniel, Naveen, 2014a), and the firm's annual industry-adjusted stock return is below zero. *Voluntary turnover* is an indicator variable that takes the value of one if the CEO departs at the end of the year, is younger than 60 years, and the firm's annual industry-adjusted stock return is above zero. Industry adjustment is done by subtracting the median industry stock return based on 3-digit SIC cluster.



Table 1 – Summary statistics

This table provides descriptive statistics for the sample of S&P 1500 companies (excluding SIC codes 4000-4999 and 6000-6999) that consists of 12,427 firm-year observations based on 1,782 unique firms and 3,064 unique CEO-firm pairs over the period 1998-2011. *Maximum CEO tenure* is the largest value of *CEO tenure* in the sample per CEO-firm pair. A CEO is classified as a CEO who leaves the firm during her honeymoon period if *Maximum CEO tenure* is smaller than three years. All other variables are defined in Appendix A.

	Obs.	Mean	Median	1. Quartile	3. Quartile	SD
<i>CEO tenure</i>						
Maximum CEO tenure	3,064	8.41	6.00	3.00	11.00	8.06
Maximum CEO tenure w/o CEOs leaving during honeymoon	2,416	10.37	8.00	5.00	13.00	8.00
Maximum tenure > 10 yrs (dummy)	3,064	0.28				0.47
CEOs leaving during honeymoon (dummy)	3,064	0.21				0.41
CEO tenure	12,427	7.67	5.00	2.00	10.00	8.02
Maximum CEO tenure at turnover (w/o CEOs leaving during honeymoon)	887	10.88	8.00	5.00	14.00	8.26
<i>CEO characteristics</i>						
CEO age	12,427	55.66	56.00	51.00	60.00	7.38
CEO gender (dummy)	12,427	0.02				0.15
Founder CEO (dummy)	12,427	0.12				0.32
CEO power index	12,427	2.90	3.00	2.00	4.00	1.21
CEO ownership	12,427	0.03	0.010	0.003	0.026	0.06
Co-Option	12,427	0.38	0.33	0.11	0.63	0.30
Duality (dummy)	12,427	0.58				0.49
Involved CEO (dummy)	12,427	0.18				0.38
Only insider (dummy)	12,427	0.57				0.49
President (dummy)	12,427	0.58				0.49
<i>Governance characteristics</i>						
Board age	12,427	60.11	60.22	57.67	62.60	3.94
Board size	12,427	9.01	9.00	7.00	10.00	2.23
Busy board (dummy)	12,427	0.20				0.40
E-index	12,427	2.47	2.00	2.00	3.00	1.35
Independence ratio	12,427	0.71	0.75	0.63	0.83	0.16
Independent director ownership	12,427	0.002	0.0005	0.0002	0.001	0.005
Outside director tenure	12,427	8.23	7.63	5.60	10.11	3.78
<i>Firm characteristics</i>						
Book leverage	12,427	0.40	0.41	0.27	0.51	0.17
Business segments	12,427	2.81	3.00	1.00	4.00	2.29
CapEx	12,427	0.05	0.04	0.02	0.07	0.05
Firm age	12,427	25.11	19.00	11.00	35.00	19.34
Firm risk	12,427	0.46	0.41	0.31	0.55	0.21
Operating CF	12,427	0.13	0.12	0.07	0.17	0.10
R&D	12,427	0.03	0.01	0.00	0.05	0.06
ROA	12,402	0.16	0.15	0.10	0.21	0.12
Sales growth	12,427	0.10	0.08	-0.007	0.17	0.27
Tobin's Q	12,427	1.99	1.59	1.22	2.26	1.35
Total assets	12,427	6,211.67	1,355.68	556.39	3,944.00	26,765.89

Table 2 – CEO tenure and firm value

This table reports results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* or *CEO tenure* and its squared term along with CEO characteristics, CEO power measures, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Regression specification (3) additionally contains interacted year and industry (based on three-digit SIC codes) fixed effects. Specification (4) excludes all observations with *CEO tenure* below one and equal to or above 38 years (the 1st and 99th percentiles). Specification (5) uses the variable *Residual CEO tenure* and its squared term instead of *CEO tenure* and its squared term. *Residual CEO tenure* is the residual from a regression of *CEO tenure* on the variables *CEO age*, *CEO power index*, *Firm age*, *Founder CEO*, *Tobin's Q_{t-1}* and year-fixed effects. All other variables are defined in Appendix A. An intercept and year dummies are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>				
	(1)	(2)	(3)	(4)	(5)
	$1 \leq \text{CEO tenure} \leq 38$				
CEO tenure	-0.0019 (-0.499)	0.0150** (2.558)	0.0128* (1.737)	0.0244** (2.173)	
CEO tenure squared		-0.0006*** (-3.680)	-0.0006*** (-3.008)	-0.0011*** (-3.194)	
Residual CEO tenure					0.0137** (2.447)
Residual CEO tenure squared					-0.0007*** (-3.743)
<i>CEO characteristics</i>					
CEO age	0.0025 (0.852)	0.0020 (0.679)	0.0054 (1.532)	0.0044 (0.937)	0.0023 (0.825)
CEO gender	0.0208 (0.241)	0.0272 (0.319)	-0.0162 (-0.173)	-0.0264 (-0.222)	0.0283 (0.331)
CEO power index	-0.0088 (-0.462)	-0.0235 (-1.197)	-0.0309 (-1.223)	-0.0205 (-0.759)	-0.0215 (-1.144)
Founder CEO	0.3753*** (2.641)	0.4204*** (2.898)	0.4524*** (2.782)	0.7406*** (2.941)	0.4206*** (2.934)
<i>Governance characteristics</i>					
Board size	-0.2590*** (-2.689)	-0.2572*** (-2.683)	-0.2067* (-1.811)	-0.3088*** (-2.702)	-0.2573*** (-2.684)
Busy board	-0.0539* (-1.734)	-0.0518* (-1.671)	-0.0351 (-1.050)	-0.0454 (-1.217)	-0.0518* (-1.672)
E-Index	0.0174 (1.088)	0.0163 (1.025)	0.0190 (1.037)	0.0267 (1.272)	0.0163 (1.023)
Independence ratio	-0.0348 (-0.257)	-0.0454 (-0.336)	-0.0464 (-0.261)	-0.0353 (-0.214)	-0.0444 (-0.328)
Independent director ownership	-3.2313 (-1.472)	-3.3973 (-1.561)	-1.6211 (-0.655)	-5.6174** (-1.979)	-3.3998 (-1.563)
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry*year fixed effects	No	No	Yes	No	No
Observations	12,427	12,427	12,427	10,097	12,427
R-squared (within)	0.297	0.299	0.441	0.299	0.299
Turning point (yrs)		12.5	10.6	11.1	9.8

Table 3 – Alternative explanations (I): Other non-linear relations and residual CEO tenure

This table reports results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). *Residual CEO tenure* is the residual from a regression of *CEO tenure* on *CEO age*, *CEO power index*, *Firm age*, *Founder CEO*, *Tobin's Q_{t-1}* and year-fixed effects. All variables are defined in Appendix A. An intercept is included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CEO tenure	0.0131**	0.0147**	0.0151***	0.0147**	0.0152***	0.0124**	
	(2.087)	(2.537)	(2.616)	(2.521)	(2.589)	(2.044)	
CEO tenure squared	-0.0005***	-0.0006***	-0.0006***	-0.0006***	-0.0006***	-0.0005***	
	(-2.940)	(-3.663)	(-3.692)	(-3.674)	(-3.687)	(-2.884)	
Residual CEO tenure							0.0115**
							(1.981)
Residual CEO tenure squared							-0.0005***
							(-2.943)
<i>Alternative explanations</i>							
CEO age squared	-0.0003					-0.0004	-0.0004
	(-1.262)					(-1.341)	(-1.370)
Firm age squared		-0.0810				-0.0721	-0.0719
		(-1.523)				(-1.346)	(-1.343)
CEO power index squared			0.0046			0.0038	0.0033
			(0.464)			(0.391)	(0.339)
Outside director tenure				0.0158		0.0226*	0.0225*
				(1.330)		(1.770)	(1.759)
Outside director tenure squared				-0.0010*		-0.0009*	-0.0009*
				(-1.853)		(-1.716)	(-1.704)
Board age					-0.0083	-0.0450	-0.0450
					(-0.081)	(-0.424)	(-0.425)
Board age squared					-0.0000	0.0002	0.0002
					(-0.054)	(0.267)	(0.268)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,427	12,427	12,427	12,427	12,427	12,427	12,427
R-squared (within)	0.299	0.299	0.299	0.299	0.300	0.301	0.301

Table 4 – Evidence from acquisitions

This table presents results from regressions of three-day cumulative abnormal returns ($CAR [-1,1]$) around acquisition announcements on *CEO tenure* and its squared term along with CEO, acquirer (including corporate governance), and deal characteristics. To estimate abnormal returns, we use the market model with the S&P 500 index as a proxy for the market portfolio. *Cross-border* is a dummy variable whether a deal is cross-border, and zero for domestic deals. *Hostile* is a dummy variable that is set to one for deals defined by Capital IQ as hostile deals, zero otherwise. *Market-to-book* is the acquiring firm's market-to-book ratio defined as the acquirer's market capitalization 20 trading days prior to deal announcement divided by the acquirer's common equity as of the end of the fiscal year prior the announcement of the M&A deal. *Number previous deals* is the number of acquisitions made by the acquirer in the 5 years prior to deal announcement. *Payment includes stock* is a dummy variable that equals one if the consideration includes stock, and zero otherwise. *Public target* is dummy variable that equals one if the target firm is a listed company, and zero otherwise. *Relative size* is the deal's total transaction value divided by the acquirer's market capitalization 20 days prior to the announcement of the deal. *Same industry* is a dummy variable that equals one if the acquirer and the target belong to the same two-digit SIC industry, and zero otherwise. All other variables are defined in the Appendix A. Regression specification (1) includes year and industry fixed effects (based on Fama-French 48 industries), while specifications (2) to (4) include year and firm fixed effects. Robust t-statistics of the regression coefficients (in parentheses) are based on standard errors clustered by acquirer. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Relative size:	<i>CAR[-1,1]</i>			
	≥ 5% (1)	≥ 5% (2)	≥ 5% (3)	≥ 10% (4)
CEO tenure	0.0013*** (2.878)	0.0019* (1.671)	0.0023* (1.658)	0.0048** (2.199)
CEO tenure squared	-0.00004*** (-2.639)	-0.0001* (-1.939)	-0.0001* (-1.723)	-0.0002** (-2.109)
<i>CEO characteristics</i>				
CEO age	-0.0057** (-2.175)	-0.0046 (-0.952)	0.0009 (0.171)	0.0002 (0.019)
CEO age squared	0.0001** (2.355)	0.00005 (1.099)	-0.000005 (-0.099)	0.000008 (0.084)
CEO gender			0.0360* (1.759)	0.0152 (0.458)
CEO power index			0.0013 (0.472)	0.0022 (0.547)
Founder CEO			0.0411* (1.666)	0.0943*** (2.615)
<i>Acquirer characteristics</i>				
Book leverage			-0.0217 (-0.902)	0.0489 (1.296)
Business segments			-0.0019 (-0.279)	-0.0001 (-0.011)
Firm age			0.0011 (0.393)	0.0034 (0.819)
Firm risk			0.0175 (0.811)	0.0225 (0.728)
Market-to-book	0.0009* (1.940)	0.0009 (0.563)	0.0001 (0.126)	-0.0056*** (-2.788)
Operating CF			-0.0298 (-0.944)	-0.0239 (-0.541)
Total assets	-0.0022* (-1.826)	0.0045 (0.737)	0.0046 (0.662)	-0.0037 (-0.351)
Board size			-0.0375* (-1.731)	-0.0639* (-1.707)
Busy board			0.0217*** (3.206)	0.0220 (1.581)
E-index			0.0006 (0.160)	0.0013 (0.178)
Independence ratio			0.0069 (0.287)	-0.0118 (-0.332)
Independent director ownership			-1.3230* (-1.908)	-1.6630 (-1.296)
<i>Deal characteristics</i>				
Cross-border	0.0043 (1.160)	0.0042 (0.822)	0.0028 (0.508)	0.0013 (0.140)
Hostile	-0.0360 (-1.075)	-0.0078 (-0.250)	-0.0139 (-0.441)	-0.0443** (-2.049)
Number previous deals	-0.0001 (-0.354)	-0.0008 (-0.944)	-0.0006 (-0.717)	0.0012 (0.838)
Payment includes stock	-0.0067* (-1.702)	-0.0039 (-0.723)	-0.0025 (-0.411)	0.0013 (0.131)
Public target	-0.0074** (-2.017)	-0.0060 (-1.143)	-0.0070 (-1.249)	-0.0072 (-0.841)
Relative size	-0.0068 (-1.113)	-0.0023 (-0.271)	0.0045 (0.444)	0.0076 (0.634)
Same industry	-0.0034 (-0.978)	-0.0089* (-1.781)	-0.0083 (-1.588)	-0.0114 (-1.297)
Industry fixed effects	Yes	No	No	No
Firm fixed effects	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,171	2,171	1,823	1,097

Table 5 – CEO tenure and corporate (dis)investment activities

This table reports results from firm fixed effects regressions (regression specifications 1-5) and conditional logistic firm fixed effects (specifications 6-8) regressions of *Capex rate* (specifications 1-4) or *Divestiture* (specifications 5-8) on *CEO tenure* along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Following Pan, Wang, and Weisbach (Forthcoming), *Capex rate* is calculated as capital expenditures to lagged book value of total assets. *CEO tenure* [0, 2] is a dummy variable that equals one for the first three years of a CEO's tenure, zero otherwise. All other variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. For regression specifications (1)-(5), robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Capex rate</i>				<i>Prob (Divestiture)</i>			
	(1)	(2)	CEO tenure ≤ median (3)	CEO tenure > median (4)	(5)	(6)	(7)	CEO tenure ≤ median (8)
CEO tenure	0.0003** (2.538)	0.0002* (1.811)		0.0006** (2.239)	-0.0016** (-2.335)	-0.0294*** (-2.635)	-0.0211* (-1.731)	
CEO tenure [0, 2]			-0.0022** (-2.317)					0.209* (1.750)
<i>CEO characteristics</i>								
CEO age	-0.0001 (-1.229)	-0.0002 (-1.298)	-0.0002 (-1.424)	-0.0005* (-1.719)	0.0005 (0.692)	0.0099 (0.967)	0.0099 (0.964)	0.017 (1.291)
CEO gender	0.0001 (0.028)	0.0002 (0.037)	0.0056 (0.993)	-0.0314 (-1.174)	-0.0374 (-1.046)	-0.5222 (-1.205)	-0.4876 (-1.127)	-0.215 (-0.425)
CEO power index		0.0010* (1.960)	0.0007 (1.077)	-0.0001 (-0.062)			-0.0893* (-1.688)	0.006 (0.079)
Founder CEO	0.0058 (1.584)	0.0052 (1.400)	0.0001 (0.009)	0.0024 (0.385)	0.0350* (1.860)	0.7334** (2.061)	0.8134** (2.279)	-0.296 (-0.386)
<i>Firm characteristics</i>								
Book leverage	-0.0270*** (-4.833)	-0.0271*** (-4.821)	-0.0294*** (-4.697)	-0.0371*** (-3.608)	0.0706*** (2.660)	1.3012*** (2.790)	1.3242*** (2.822)	1.358** (2.096)
Business segments	-0.0018 (-1.419)	-0.0019 (-1.463)	-0.0002 (-0.105)	-0.0047** (-2.229)	-0.0000 (-0.004)	-0.0391 (-0.349)	-0.0505 (-0.449)	-0.079 (-0.510)
Firm age	-0.0059* (-1.832)	-0.0054* (-1.674)	0.0006 (0.160)	-0.0100* (-1.662)	0.0056 (0.358)	-0.0696 (-0.299)	-0.1870 (-0.790)	-0.154 (-0.503)
Firm risk	-0.0124*** (-3.612)	-0.0126*** (-3.648)	-0.0038 (-0.894)	-0.0199*** (-3.314)	0.0309 (1.607)	0.3989 (1.069)	0.4270 (1.138)	0.751 (1.429)
Operating CF	0.0681*** (7.014)	0.0679*** (7.010)	0.0488*** (4.679)	0.0787*** (5.016)	-0.0583* (-1.955)	-1.0835 (-1.603)	-1.0625 (-1.573)	-1.588* (-1.763)
R&D	0.0496** (2.167)	0.0512** (2.236)	0.0249 (1.255)	0.0782* (1.917)	0.1673 (1.606)	2.1607 (1.193)	2.0026 (1.098)	4.033 (1.279)
Sales growth	0.0227*** (6.778)	0.0228*** (6.816)	0.0198*** (4.100)	0.0246*** (7.441)	-0.0294*** (-3.070)	-0.4674** (-2.448)	-0.4794** (-2.500)	-0.550** (-2.113)
Tobin's Q _{t-1}	0.0036*** (2.707)	0.0036*** (2.695)	0.0032* (1.694)	0.0035*** (3.242)	0.0023 (1.491)	0.0459 (1.017)	0.0481 (1.052)	0.063 (0.813)
Total assets	-0.0129*** (-7.000)	-0.0128*** (-6.654)	-0.0127*** (-4.891)	-0.0119*** (-3.645)	0.0473*** (4.718)	0.7080*** (5.446)	0.6574*** (4.954)	0.819*** (4.375)
Governance charac.	No	Yes	Yes	Yes	No	No	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,427	12,427	6,536	5,591	12,427	4,740	4,740	2,203
R-squared (within)/ Log likelihood	0.187	0.187	0.177	0.181	0.008	-1529.2487	-1524.1095	-761.2831

Table 6 – Environmental dynamics and the cost-benefit relation of CEO tenure

This table presents results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics for industry sub-samples. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated financial and utility firms (SIC codes 4000-4999 and 6000-6999). Panel A reports sub-sample results for more versus less dynamic industries using the industry dynamism index proposed by Coles, Daniel, and Naveen (2014b). Industries are defined based on three-digit SIC clusters. *Dynamism index* is defined as the sum of the following four indicator variables. (i) *Growth industry* that equals one if the average annual sales growth of all firms in the industry is above the 50th percentile, zero otherwise, (ii) *R&D industry* that equals one if the average R&D expenses to total assets at the industry level is above the 75th percentile, zero otherwise, (iii) *High fluidity industry* which is set to one if the average of the fluidity scores of Hoberg, Philips, and Prabhala (2014) is above the 50th percentile, zero otherwise, and (iv) *Merger industry* that is set to one if the number of mergers in the industry divided by the number of firms in the industry (e.g., Harford, 2005) is above the 50th percentile, zero otherwise. Therefore, the index takes discrete values between 0 and 4, where higher values indicate higher industry dynamism. Panel B reports sub-sample results using the tech firm definition suggested by Loughran and Ritter (2004). According to their definition, a firm is considered a tech firm if the company is operating in one of the following four-digit SIC codes: 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3671, 3672, 3674, 3675, 3677, 3678, 3679, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7371, 7372, 7373, 7374, 7375, 7378, or 7379. Panel C reports sub-sample regression results for mature and young industries. Industries are defined based on three-digit SIC clusters. The age of an industry is defined as the average firm age (based on the CRSP inclusion year) of all companies operating in the respective industry. *Mature industries* is an indicator variable that equals one if the industry age is above the median industry age. Accordingly, *Young industries* is an indicator variable that equals one if the industry age is equal to or below the median. Control variables are identical to those used in regression specification (2) of Table 2 which yields an inflection point of 12.5 years. Absolute and relative changes presented at the end of Panel A, B, and C are calculated with respect this inflection point. All variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A – Dynamism index (based on Coles, Daniel, and Naveen, 2014b)		
	≤ Median	> Median
CEO tenure	0.0059* (1.792)	0.0397* (1.685)
CEO tenure squared	-0.0002** (-2.074)	-0.0021*** (-2.676)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	8,951	3,476
R-squared (within)	0.383	0.372
Turning point (yrs)	14.8	9.5
<i>Absolute change (yrs)</i>	+ 2.3	- 3.0
<i>Relative change (%)</i>	+ 18.5	- 24.0

Panel B – Tech vs. non-tech firms (Loughran and Ritter, 2004)		
	Tech = 0	Tech = 1
CEO tenure	0.0082* (1.861)	0.0444* (1.725)
CEO tenure squared	-0.0003* (-1.898)	-0.0021*** (-2.741)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	9,808	2,619
R-squared (within)	0.308	0.369
Turning point (yrs)	13.7	10.6
<i>Absolute change (yrs)</i>	+ 1.2	- 1.9
<i>Relative change (%)</i>	+ 9.6	- 15.2

Panel C – Industry age		
	Mature industries	Young industries
CEO tenure	0.0085* (1.745)	0.0201* (1.773)
CEO tenure squared	-0.0003* (-1.894)	-0.0009*** (-3.283)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	6,211	6,216
R-squared (within)	0.405	0.314
Turning point (yrs)	14.2	11.2
<i>Absolute change (yrs)</i>	+ 1.7	- 1.3
<i>Relative change (%)</i>	+ 13.6	- 10.4

Table 7 – Exogenous shocks to the cost-benefit relation of CEO tenure

This table presents sub-sample results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Panel A reports sub-sample results for recession and non-recession years. The variable *Recession* is an indicator variable that equals one if the observation year is classified as a recession year according to the NBER Business Cycle Expansions and Contractions data (<http://www.nber.org/cycles.html>). These are the years 2001, 2008 and 2009. All other years are defined as non-recession years. Regression specifications (1) and (2) show regression results excluding year dummies. Specifications (3) and (4) provide regression results including year dummies for the respective years. Control variables are identical to those used in regression specification (2) of Table 2 which yields an inflection point of 12.5 years. Absolute and relative changes shown below specifications (3) and (4) are calculated with respect to this inflection point. Absolute and relative changes shown below specifications (1) and (2) are calculated with respect to the inflection point of 13.7 years obtained from running of regression specification (2) of Table 2 with the indicator variable *Recession* instead of year fixed effects. Panel B reports sub-sample results for the years before and after the implementation of the Sarbanes-Oxley Act (SOX) and the concurrent NYSE and NASDAQ exchange listing rules (collectively denoted as 'SOX'). Following the methodology used in Guo and Masulis (2015), *Post-SOX (Pre-SOX)* is an indicator variable set to one for the year 2005 (2004) and later (earlier) years, zero otherwise. Specifications (1) and (2) present pre- and post-SOX sub-sample regression results excluding year dummies. Specifications (3) and (4) show pre- and post-SOX subsample regression results including year dummies. Control variables are identical to those used in regression specification (2) of Table 2 which yields an inflection point of 12.5 years. Absolute and relative changes shown below specifications (3) and (4) are calculated with respect to this inflection point. Absolute and relative changes shown below specifications (1) and (2) are calculated with respect to the inflection point of 13.9 years obtained from running of regression specification (2) of Table 2 with the indicator variable *Post-SOX* instead of year fixed effects. All other variables are defined in Appendix A. An intercept is included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A – Recession vs. non-recession years				
	No recession	Recession	No recession	Recession
	(1)	(2)	(3)	(4)
CEO tenure	0.0147* (1.906)	0.0187* (1.904)	0.0126 (1.645)	0.0178* (1.811)
CEO tenure squared	-0.0006*** (-3.476)	-0.0006** (-2.331)	-0.0006*** (-3.325)	-0.0006** (-2.211)
CEO characteristics	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Observations	9,603	2,824	9,603	2,824
R-squared (within)	0.282	0.427	0.300	0.445
Turning point (yrs)	12.3	15.6	10.5	14.8
<i>Absolute change (yrs)</i>	- 1.4	+ 1.9	- 2.0	+ 2.3
<i>Relative change (%)</i>	- 10.2	+ 13.9	- 16.0	+ 18.4

Panel B – Pre-SOX vs. Post-SOX				
	Pre-SOX	Post-SOX	Pre-SOX	Post-SOX
	(1)	(2)	(3)	(4)
CEO tenure	0.0214* (1.925)	0.0097** (2.003)	0.0191* (1.750)	0.0116** (2.481)
CEO tenure squared	-0.0009*** (-3.072)	-0.0003** (-2.166)	-0.0008*** (-2.915)	-0.0004** (-2.358)
CEO characteristics	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Observations	5,742	6,685	5,742	6,685
R-squared (within)	0.208	0.233	0.228	0.307
Turning point	11.9	16.2	11.9	14.5
<i>Absolute change (yrs)</i>	- 2.0	+ 2.3	- 0.6	+ 2.0
<i>Relative change (%)</i>	- 14.4	+ 16.5	- 4.8	+ 16.0

Table 8 – Evidence from CEO sudden deaths

This table reports three-day announcement returns for a sample of CEOs who died suddenly between 1992 and 2012. The definition of sudden deaths follows Nguyen and Nielsen (2014). $CAR [-1,1]$ is the three-day cumulative abnormal announcement return calculated using the market model with a CRSP value-weighted market index (as the market proxy), where the event day $t=0$ is the trading day on which the death of a CEO is first reported in the news (or the next trading day in case death was announced on a non-trading day). $CAR [-1,1]$ is winsorized at the 1st and 99th percentiles. Panel A shows left- and two-tailed univariate difference-in-means tests (accounting for unequal variances between both subsamples) for $CAR [-1,1]$. Panel B reports multivariate results for regressions of $CAR [-1,1]$ on CEO tenure and additional controls. Dummy variables for each decade (1990s, 2000s, and 2010s) are included specifications (4) - (6). Specifications (5) and (6) additionally include industry fixed effects based on the Fama and French 12 industries. Accounting data are winsorized at the 1st and 99th percentiles. The number of observations reported in regression specifications (2) - (6) is smaller due to data availability. All variables are defined in Appendix A. Robust t-statistics are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A – Difference-in-means tests				
Expected sign	(-)	(+)	left-tailed test (diff < 0)	two-tailed test (diff ≠ 0)
	CEO tenure ≤ median	CEO tenure > median	Difference	Difference
CAR [-1,1]	-0.0250 (N=40)	0.0104 (N=40)	-0.0354** (-1.826)	-0.0354* (-1.826)
CAR [-1,1]	CEO tenure ≤ 12 yrs	CEO tenure > 12 yrs	Difference	Difference
	-0.0231 (N=51)	0.0205 (N=29)	-0.0436** (-2.137)	-0.0436** (-2.137)

Panel B – Multivariate tests						
	$CAR [-1,1]$					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO tenure	0.002*** (2.773)	0.002*** (2.667)	0.002* (1.776)	0.002** (2.241)	0.003*** (2.855)	
CEO tenure 2 nd tercile						0.058* (1.958)
CEO tenure 3 rd tercile						0.093*** (3.053)
<i>CEO characteristics</i>						
CEO age		0.002 (1.650)	0.002 (1.650)	0.002 (1.514)	0.003** (2.110)	0.003** (2.369)
Duality			0.020 (1.142)	0.024 (1.374)	0.021 (1.131)	0.010 (0.537)
Founder CEO			0.009 (0.395)	0.004 (0.195)	0.006 (0.272)	-0.002 (-0.087)
President			0.008 (0.442)	0.010 (0.541)	0.015 (0.917)	0.022 (1.326)
<i>Firm characteristics</i>						
Total assets		0.012*** (2.819)	0.012*** (2.690)	0.015*** (3.517)	0.016*** (3.159)	0.019*** (3.281)
Market-to-book		0.001 (0.395)	0.000 (0.206)	0.000 (0.229)	0.001 (0.703)	0.002 (0.877)
ROA		-0.046 (-1.383)	-0.048 (-1.346)	-0.065* (-1.883)	-0.079** (-2.037)	-0.099** (-2.396)
Constant	-0.033*** (-2.732)	-0.235*** (-2.751)	-0.254** (-2.638)	-0.239** (-2.556)	-0.248** (-2.574)	-0.278*** (-3.059)
Decade controls	No	No	No	Yes	Yes	Yes
Industry controls	No	No	No	Yes	Yes	Yes
Observations	80	73	73	73	73	73
Adj. R-squared	0.073	0.237	0.219	0.247	0.311	0.311

APPENDICES

Appendix A – Variable definitions

Variable	Definition
Board age	The average age of the board of directors. <i>Source: ISS (formerly RiskMetrics)</i>
Board meetings	The number of meetings held by the board of directors over the fiscal year. <i>Source: ExecuComp (until 2006), The Corporate Library (2007-2011), missing values hand-collected (1998-2011)</i>
Board size	Natural logarithm of the number of directors on the firm's board of directors. <i>Source: ISS</i>
Book leverage	(Long-term debt + current liabilities)/Total assets, all at the end of the previous fiscal year. <i>Source: Compustat</i>
Business segments	Natural logarithm of the number of business segments. <i>Source: Compustat Segments</i>
Busy board	Indicator variable that equals one if a majority of the independent directors hold two or more additional outside directorships, zero otherwise. <i>Source: ISS</i>
CapEx	Capital expenditures/Total assets, all at the end of the previous fiscal year. <i>Source: Compustat</i>
CEO age	Age of the firm's CEO measured in years. <i>Source: ExecuComp</i>
CEO gender	Indicator variable that equals one if the CEO's gender is female, zero otherwise. <i>Source: ExecuComp</i>
CEO ownership	Percentage of shares outstanding held by the CEO, winzorized at the 1 st and 99 th percentiles. <i>Source: ExecuComp, ISS</i>
CEO power index	The index is the sum of the following indicator variables: CEO ownership above median, Co-Option above median, Duality, Involved CEO, President, Only insider. The index can take on values between zero and six.
CEO tenure	Number of years the CEO has been serving as the firm's CEO, calculated by using the ExecuComp "BECAMECEO" variable. Missing or incorrect data is replaced by the number of years the CEO has been serving on the board as reported in ISS. CEO tenure takes the value of zero for the CEO's first year in office. <i>Source: ExecuComp, ISS</i>
Co-Option	Fraction of directors on the board who have been appointed to the firm's board after the current CEO assumed office. <i>Source: ISS</i>
Divestiture	Indicator variable that equals one if the company is listed as the target of a deal labeled by the variable "ACQUISITION TECHNIQUE" as a "DIVESTITURE", zero otherwise. <i>Source: SDC Platinum</i>
Duality	Indicator variable that equals one if the CEO is also the chairman of the board, zero otherwise. <i>Source: ExecuComp</i>
E-Index	Entrenchment index based on six anti-takeover protection devices as proposed by Bebchuk, Cohen, and Ferrell (2009). <i>Source: ISS Governance database</i>
Firm age	Natural logarithm of the number of years the firm is listed in CRSP. <i>Source: CRSP</i>
Firm risk	Standard deviation of daily stock returns during the year, all at the end of the previous fiscal year. <i>Source: CRSP</i>

Founder CEO	Indicator variable that equals one if the CEO is the founder of the company, zero otherwise. <i>Source: The Corporate Library (2001-2011), hand-collected (1998-2000)</i>
Independence ratio	Percentage of directors on the board classified as independent directors. <i>Source: ISS</i>
Independent director ownership	Average fraction of outstanding shares held by all independent directors on the board, winzORIZED at the 1 st and 99 th percentiles. <i>Source: ISS</i>
Involved CEO	Indicator variable that equals one if (i) the board has established a nominating committee and the CEO serves as a member or (ii) if such a committee does not exist, zero otherwise. <i>Source: ISS</i>
MTB	Market-to-book ratio of equity, all at the end of the fiscal year. <i>Source: Compustat</i>
New CEO	Indicator variable that equals one if the firm's CEO took office in the current year, zero otherwise. <i>Source: ExecuComp</i>
Only insider	Indicator variable that equals one if the CEO is the only inside director on the board, zero otherwise. <i>Source: ISS</i>
Operating CF	Annual cash flow from operations/Total assets _{t-1} , all at the end of the previous fiscal year. <i>Source: Compustat</i>
Outside director tenure	Average number of years the outside directors have served on the firm's board. <i>Source: ISS</i>
President	Indicator variable that equals one if the CEO also holds the title of President of the firm, zero otherwise. <i>Source: ExecuComp</i>
R&D	R&D expense/Total assets, all at the end of the previous fiscal year. <i>Source: Compustat</i>
ROA	EBITDA/Total assets _{t-1} <i>Source: Compustat</i>
Sales growth	Annual change in net sales divided by previous year's net sales: $(Sales_t/Sales_{t-1}) - 1$ <i>Source: Compustat</i>
Tobin's Q	$(Total\ assets - Book\ equity + Market\ value\ of\ equity)/Total\ assets$ <i>Source: Compustat</i>
Total assets	Natural logarithm of total assets at the end of the previous fiscal year. <i>Source: Compustat</i>

Appendix B – Addressing interim CEOs, CEO-firm match, and different types of outliers

This table reports results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Regression specifications (1) and (2) exclude all observations with CEO tenure values equal to zero and one, respectively. Specification (3) excludes all CEO-firm observations in which the CEO left the company (for whatever reason) during the honeymoon period, i.e., during the first three years in office. A CEO is classified as a CEO who leaves the firm during her honeymoon period if *Maximum CEO tenure* does not exceed three years. Specification (4) contains only firm-year observations with CEO tenure values below 30 years. Specification (5) restricts the sample to non-founder CEO observations. Specification (6) excludes CEOs who rejoined their company (based on ExecuComp item “REJOIN”). Specification (7) excludes CEOs who hold more than one CEO position in our sample over the sample period. All variables are defined in Appendix A. Control variables are identical to those used in regression (2) of Table 2. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>CEO tenure</i> > 0 (w/o first year in office)	<i>CEO tenure</i> > 1 (w/o first two years in office)	w/o CEOs who leave in honeymoon period	<i>CEO tenure</i> < 30	w/o Founder CEOs	w/o Rejoined CEOs	w/o Multiple appointment CEOs
CEO tenure	0.0153** (2.031)	0.0163* (1.776)	0.0166** (2.415)	0.0154** (2.064)	0.0149** (2.545)	0.0141** (2.386)	0.0151** (2.497)
CEO tenure squared	-0.0007*** (-3.730)	-0.0008*** (-3.631)	-0.0007*** (-3.765)	-0.0006* (-1.949)	-0.0005*** (-2.653)	-0.0006*** (-3.555)	-0.0006*** (-3.598)
<i>CEO characteristics:</i>							
CEO age	0.0031 (0.896)	0.0044 (0.981)	0.0030 (0.754)	0.0022 (0.726)	-0.0002 (-0.071)	0.0020 (0.667)	0.0017 (0.551)
CEO gender	0.0434 (0.467)	-0.0030 (-0.024)	-0.0531 (-0.485)	0.0067 (0.078)	-0.0070 (-0.083)	0.0219 (0.252)	0.0278 (0.320)
CEO power index	-0.0173 (-0.778)	-0.0174 (-0.655)	-0.0283 (-1.297)	-0.0242 (-1.189)	-0.0385** (-2.440)	-0.0220 (-1.116)	-0.0250 (-1.255)
Founder CEO	0.5223*** (2.690)	0.6907*** (2.886)	0.5812*** (3.171)	0.4529*** (2.806)		0.4237*** (2.920)	0.4324*** (2.936)
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,567	10,229	11,407	12,078	10,978	12,351	12,150
R-squared (within)	0.304	0.297	0.298	0.295	0.309	0.298	0.291

Appendix C – Alternative explanations (II): Investments, CEO ability, ownership and compensation

This table presents results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Additional control variables are included. *Acquisition* is a dummy variable that equals one, if the firm is identified as an acquirer within our M&A sample (not restricted to M&As of a minimum relative deal size) and has announced an acquisition during the year, zero otherwise. *General ability index* is defined as in Custódio, Ferreira, and Matos (2013) and is retrieved directly from the website of the Journal of Financial Economics. The index is only available for the period ending in 2007. *Managerial ability score* is a measure of managerial ability developed by Demerjian, Lev, and McVay (2012) (<https://community.bus.emory.edu/personal/PDEMERJ/Pages/Download-Data.aspx>). *Ivy League graduate* is an indicator variable that takes the value of one if the CEO graduated from an Ivy League college, zero otherwise. *Education score* is measured on a four-point scale reflecting the highest level of education attained (0 = no college degree or missing, 1 = bachelor's degree, 2 = master's degree or MBA, 3 = Ph.D degree). *Fraction of variable compensation* is calculated as total compensation (ExecuComp item "TDC1") minus salary, all divided by the total value of total compensation ("TDC1"). Values of total annual compensation before 2006 are adjusted following the methodology in Walker (2011). *Scaled Wealth-Performance Sensitivity* is the dollar change in CEO wealth for a 100 percentage point change in firm value, divided by annual flow compensation (scaled by 1,000). The data is available on Alex Edmans's data website (<http://alexedmans.com/data/>). All other variables are defined in Appendix A. Control variables are identical to those used in regression (2) of Table 2. Year fixed effects and an intercept are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CEO tenure	0.0149** (2.547)	0.0150* (1.773)	0.0148** (2.512)	0.0152** (2.543)	0.0158*** (2.718)	0.0154*** (2.635)	0.0158*** (2.722)	0.0143** (2.422)	0.0142* (1.692)
CEO tenure squared	-0.0006*** (-3.663)	-0.0007*** (-2.863)	-0.0006*** (-3.728)	-0.0006*** (-3.648)	-0.0006*** (-3.652)	-0.0006*** (-3.694)	-0.0006*** (-3.765)	-0.0006*** (-3.467)	-0.0006** (-2.528)
<i>Further explanations</i>									
Acquisition	-0.0564*** (-2.996)								-0.0545** (-2.061)
Divestiture	0.0103 (0.468)								0.0382 (1.298)
General ability index		-0.0684** (-1.966)							-0.0761** (-2.142)
Managerial ability score			0.7634*** (3.842)						0.9935*** (3.154)
Ivy League graduate				-0.0465 (-1.021)					-0.0773 (-1.146)
Education score				0.0202 (0.804)					0.0594 (1.451)
CEO ownership					-0.6336* (-1.843)				-0.7591 (-1.411)
CEO ownership squared					-0.0874 (-0.991)				-0.2270 (-1.235)
Fraction of variable compensation						0.2996*** (5.157)	-0.4403** (-1.986)		-0.5369** (-2.166)
Fraction of variable compensation squared							0.6462*** (3.500)		0.7423*** (3.559)
Scaled wealth-performance sensitivity								0.0514 (1.554)	0.0367 (0.752)
Scaled wealth-performance sensitivity squared								-0.0004 (-1.414)	-0.0001 (-0.151)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample period	1998-2011	1998-2007	1998-2011	1998-2011	1998-2011	1998-2011	1998-2011	1998-2011	1998-2007
Observations	12,427	8,092	12,290	12,427	12,427	12,363	12,363	12,422	7,989
R-squared (within)	0.300	0.243	0.302	0.299	0.297	0.302	0.303	0.300	0.260

Appendix D – Alternative explanations (III): CEO and firm survivorship

This table reports results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Regression specification (1) restricts the sample to S&P 500 companies. Specification (2) restricts the sample to observations for which *Cumulative total CEO compensation* is above the sample median. *Cumulative total CEO compensation* is the sum of the value of total annual compensation (ExecuComp item "TDC1") the CEO has received over her tenure until the end of the fiscal year (standardized by CEO tenure). Values of total annual compensation before 2006 are adjusted following the methodology in Walker (2011). Specification (3) restricts the sample to observations for which the variable *CEO ownership* takes on values above the sample median. Specification (4) excludes all firm-year observations where the CEO's age exceeds the general retirement age of 65 years. Specification (5) excludes all family firm observations in our sample. Information on annual family firm classification for the Top-2000 largest U.S. public companies for the years 2001 to 2010 is obtained from Ron Anderson's professional website (www.ronandersonprofessionalpage.net). In specification (6), the last firm-year observation for each firm in the sample is excluded. Specification (7) excludes firms that have been identified as takeover targets. Specification (8) excludes firm-year observations in the [-2, 2]-year window around turnover of CEOs younger than 60 years (Coles, Daniel, and Naveen, 2014a). All variables are defined in Appendix A. Control variables are identical to those used in regression (2) of Table 2. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>S&P 500</i>	<i>Cumulative total CEO compensation > Median</i>	<i>CEO equity ownership > Median</i>	<i>CEO age ≤ 65 yrs</i>	<i>w/o family firms</i>	<i>w/o last sample observation for each firm</i>	<i>w/o takeover target firms</i>	<i>w/o [-2, 2]-year window around CEO turnover</i>
CEO tenure	0.0453***	0.0483***	0.0140*	0.0165**	0.0151**	0.0156**	0.0149**	0.0177***
	(3.045)	(3.310)	(1.699)	(2.094)	(2.108)	(2.329)	(2.431)	(3.092)
CEO tenure squared	-0.0015**	-0.0020***	-0.0005**	-0.0008***	-0.0006*	-0.0006***	-0.0006***	-0.0006***
	(-2.375)	(-2.791)	(-2.246)	(-2.867)	(-1.873)	(-3.527)	(-3.613)	(-3.458)
<i>CEO characteristics:</i>								
CEO age	-0.0062	0.0001	-0.0015	0.0037	0.0009	0.0017	0.0028	-0.0042*
	(-1.244)	(0.013)	(-0.235)	(0.907)	(0.364)	(0.513)	(0.898)	(-1.653)
CEO gender	-0.1895	-0.0318	0.2986	-0.0206	0.0418	0.0084	0.0110	0.0316
	(-1.084)	(-0.255)	(1.331)	(-0.235)	(0.749)	(0.085)	(0.114)	(0.299)
CEO power index	-0.1096***	-0.0598*	0.0461	-0.0249	-0.0302***	-0.0244	-0.0237	-0.0234
	(-3.463)	(-1.685)	(1.192)	(-1.160)	(-2.618)	(-1.088)	(-1.147)	(-1.527)
Founder CEO	0.5601**	0.4773	0.3341*	0.4734***	-0.1666	0.4851***	0.4189***	0.4302***
	(2.139)	(1.398)	(1.774)	(2.631)	(-1.197)	(2.872)	(2.741)	(3.363)
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample period	1998-2011	1998-2011	1998-2011	1998-2011	2001-2010	1998-2011	1998-2011	1998-2011
Observations	3,994	6,213	6,213	11,642	5,973	10,645	11,690	10,469
R-squared (within)	0.411	0.335	0.219	0.294	0.343	0.290	0.296	0.328

Appendix E – Survival analysis

Panel A presents results of a survival model analysis. The failure event is the change in the CEO position at the end of year t for any reason. Regression specification (1) reports coefficients of a Cox proportional hazard model. *CEO of retirement age* is an indicator variable that takes the value of one if the age of the CEO is between 63 and 66 years, zero otherwise. *Stock return* is the one-year buy-and-hold return calculated from monthly returns. If not stated otherwise, control variables are of the same year. Year and industry-fixed effects (based on 2-digit SIC codes) are included in specification (1) of Panel A. Panel B reports firm-fixed effects regression results of *Tobin's Q* on *CEO tenure* and its squared term. Specification (1) controls for the hazard rate obtained from specification (1) of Panel A. In specification (2), the squared term of the hazard rate is added. Control variables in Panel B are identical to those used in specification (2) of Table 2. All other variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Cox hazard model (CEO turnover)		Panel B		
	(1)	<i>Tobin's Q</i>		
		(1)	(2)	
CEO gender	0.2150 (1.023)	CEO tenure	0.0152** (2.280)	0.0147** (2.213)
CEO of retirement age	0.2589*** (3.095)	CEO tenure squared	-0.0006*** (-3.441)	-0.0006*** (-3.290)
CEO power index	-0.5807*** (-17.868)	Hazard rate	-0.0115*** (-3.140)	-0.0377*** (-7.936)
Founder CEO	-1.1849*** (-9.880)	Hazard rate squared		0.0002*** (6.019)
<i>Governance characteristics</i>		<i>CEO characteristics</i>		
Board size	0.1682 (1.039)	CEO age	0.0023 (0.702)	0.0026 (0.792)
Busy board	0.1367* (1.679)	CEO gender	0.0109 (0.106)	0.0440 (0.413)
E-index	0.0388 (1.436)	CEO power index	-0.0495** (-1.982)	-0.0970*** (-3.613)
Independence ratio	2.0102*** (7.862)	Founder CEO	0.4682*** (2.719)	0.4261** (2.472)
Independent director ownership	6.7126 (1.102)	<i>Governance</i>		
<i>Firm characteristics</i>		Board size	-0.2595** (-2.354)	-0.2547** (-2.307)
Board meetings	0.0931*** (13.290)	Busy board	-0.0421 (-1.211)	-0.0261 (-0.752)
Book leverage	0.5028** (2.540)	E-index	0.0222 (1.251)	0.0253 (1.422)
Business segments	0.0848 (1.570)	Independence ratio	-0.0336 (-0.222)	0.1128 (0.737)
Firm age	-0.1319*** (-2.795)	Independent director ownership	-2.6491 (-1.004)	-2.2694 (-0.854)
Ln(Total Assets)	-0.0642** (-2.026)	Firm characteristics	Yes	Yes
ROAEBitda	-1.4289*** (-2.859)	Firm fixed effects	Yes	Yes
ROAEBitda _{t-1}	0.4844 (1.095)	Year fixed effects	Yes	Yes
Sales growth	-0.3810** (-2.391)	Observations	10,578	10,578
Stock return	-0.3164*** (-3.841)	R-squared (within)	0.296	0.300
Stock return _{t-1}	-0.1056 (-1.474)			
Industry fixed effects	Yes			
Year fixed effects	Yes			
Observations	10,587			
Likelihood value	-8324.95			

Appendix F – Excluding firms or CEO-firm pairs with few observations

This table presents results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). In regression specifications (1) and (3), the sample is restricted to firms with more than three and more than five firm-year observations, respectively. These regressions include firm fixed effects. In specifications (2) and (4), the sample is restricted to CEO-firm pairs with more than three and more than five CEO-firm pair observations, respectively. These regressions include CEO-firm fixed effects and use the natural logarithm of *CEO age* and its squared term instead of *CEO age* and its squared term. Control variables are identical to those used in regression specification (6) of Table 3. All variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>			
	(1)	(2)	(3)	(4)
	Firm obs. ≥ 4	CEO-firm obs. ≥ 4	Firm obs. ≥ 6	CEO-firm obs. ≥ 6
CEO tenure	0.0122** (1.984)	0.0167* (1.827)	0.0123* (1.944)	0.0203* (1.929)
CEO tenure squared	-0.0005*** (-2.900)	-0.0006* (-1.951)	-0.0005*** (-3.013)	-0.0007** (-2.224)
<i>Alternative explanations</i>				
CEO age squared	-0.0004 (-1.306)	1.1703 (1.111)	-0.0004 (-1.258)	1.3425 (1.080)
CEO power index squared	0.0035 (0.340)	0.0070 (0.940)	0.0025 (0.223)	0.0035 (0.401)
Firm age squared	-0.0771 (-1.340)	-0.1517*** (-2.766)	-0.0842 (-1.295)	-0.2084** (-2.454)
Outside director tenure	0.0238* (1.841)	0.0051 (0.318)	0.0174 (1.317)	-0.0052 (-0.281)
Outside director tenure squared	-0.0009* (-1.754)	-0.0003 (-0.584)	-0.0007 (-1.291)	0.0000 (0.074)
Board age	-0.0537 (-0.486)	-0.0691 (-0.681)	-0.0295 (-0.253)	0.0123 (0.115)
Board age squared	0.0003 (0.327)	0.0005 (0.594)	0.0001 (0.119)	-0.0001 (-0.161)
<i>CEO characteristics</i>				
CEO age	0.0433 (1.358)	-9.5130 (-1.119)	0.0447 (1.325)	-10.8026 (-1.083)
CEO gender	0.0128 (0.149)		0.0598 (0.706)	
CEO power index	-0.0465 (-0.943)	-0.0756* (-1.811)	-0.0429 (-0.807)	-0.0544 (-1.072)
Founder CEO	0.4317*** (2.919)		0.4696*** (3.023)	
<i>Governance characteristics</i>				
Board size	-0.2569*** (-2.699)	-0.1639* (-1.871)	-0.2616*** (-2.636)	-0.1426 (-1.424)
Busy board	-0.0405 (-1.312)	0.0032 (0.098)	-0.0447 (-1.433)	-0.0072 (-0.197)
E-index	0.0173 (1.095)	0.0135 (0.847)	0.0187 (1.154)	0.0181 (0.985)
Independence ratio	-0.0372 (-0.266)	0.0886 (0.755)	-0.0228 (-0.157)	0.1933 (1.499)
Independent director ownership	-3.1692 (-1.425)	-1.1243 (-0.440)	-3.3359 (-1.452)	-1.7678 (-0.598)
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	No	Yes	No
CEO-firm fixed effects	No	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	11,448	9,481	10,204	6,614
R-squared (within)	0.315	0.309	0.332	0.350

Appendix G – Tenure bucket results

This table presents regression results of *Tobin's Q* on the dummy variables *CEO tenure [11, 13]* or *CEO tenure [9, 15]* along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). *CEO tenure [11, 13]* (*CEO tenure [9, 15]*) is an indicator variable that takes the value of one if CEO tenure is between 11 and 13 years (9 and 15 years), zero otherwise. Column (1) and (3) present results from firm fixed effects estimations, while results shown in Column (2) and (4) are based on CEO-firm fixed effects estimations. Control variables are identical to those used in specification (2) of Table 2. All variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>			
	(1)	(2)	(3)	(4)
CEO tenure [11, 13]	0.0802** (2.095)	0.0719** (2.053)		
CEO tenure [9, 15]			0.0557* (1.859)	0.0594* (1.908)
<i>CEO characteristics</i>				
CEO age	0.0013 (0.583)	0.0060 (0.845)	0.0011 (0.486)	0.0056 (0.790)
CEO gender	0.0192 (0.221)		0.0215 (0.249)	
CEO power index	-0.0135 (-0.873)	-0.0053 (-0.314)	-0.0153 (-0.959)	-0.0066 (-0.389)
Founder CEO	0.3606*** (2.873)		0.3606*** (2.875)	
<i>Governance characteristics</i>				
Board size	-0.2623*** (-2.703)	-0.1601 (-1.577)	-0.2638*** (-2.726)	-0.1621 (-1.599)
Busy board	-0.0535* (-1.727)	-0.0105 (-0.331)	-0.0532* (-1.718)	-0.0102 (-0.324)
E-index	0.0170 (1.067)	0.0071 (0.411)	0.0173 (1.079)	0.0077 (0.444)
Independence ratio	-0.0326 (-0.245)	-0.0030 (-0.022)	-0.0303 (-0.228)	-0.0020 (-0.015)
Independent director ownership	-3.2525 (-1.477)	-2.8807 (-1.281)	-3.2842 (-1.495)	-2.9311 (-1.350)
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	No	Yes	No
CEO-firm fixed effects	No	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	12,427	12,427	12,427	12,427
R-squared (within)	0.298	0.224	0.298	0.224

Appendix H – Alternative measures for CEO tenure

This table reports results from firm fixed regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Regression (1) uses the *Tenure with company* and its square as an alternative measure for CEO tenure, which is calculated as the fiscal year minus the year the CEO joined the company using the date the CEO has joined the company (data item "JOINED_CO") as reported in ExecuComp. Regression (2) uses both *Board tenure* and *CEO tenure* as explanatory variables. Regression (3) uses both *Tenure with company* and *CEO tenure* as explanatory variables. Regression (4) uses the CEO's tenure on the board of directors (*Board tenure*) and its square as an alternative measure. *Board tenure* is defined as the fiscal year minus the year since the director has been serving on the firm's board of directors using the ISS data item "DIRSINCE". Regression (5) excludes all observations where the CEO is not classified as an *Inside CEO*. Following Bebchuk, Cremers, and Peyer (2011), a CEO is classified as an insider (*Inside CEO*) if the CEO joined the company more than a year before becoming CEO, or if the CEO is classified as the founder of the company (*Founder CEO*), or if the data item "JOINED_CO" is missing. Regression (6) uses the variable *executives' tenure with company* and its square, calculated as the average of the firm's executives' *Tenure with company* listed in ExecuComp. For specification (6), we require the data item "JOINED_CO" to be available for at least 50% of a firm's executives and a minimum number of three executives (per firm) listed in ExecuComp. In regression (7), *CEO tenure* is standardized by *CEO age* (which is omitted from the set of controls). All other variables are defined in Appendix A. Control variables are identical to those used in regression (2) of Table 2. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Inside CEOs						
CEO tenure		0.0258*** (2.623)		0.0118** (1.988)	0.0126** (2.212)	0.0202* (1.733)	
CEO tenure squared		-0.0009*** (-2.739)		-0.0004** (-2.229)	-0.0006*** (-3.476)	-0.0007* (-1.880)	
<i>Alternative measures</i>							
Tenure with company	0.0149* (1.725)	0.0041 (0.487)					
Tenure with company squared	-0.0004** (-2.134)	-0.0002 (-0.832)					
Board tenure			0.0109* (1.961)	0.0041 (0.660)			
Board tenure squared			-0.0004*** (-3.489)	-0.0002 (-1.634)			
Executives' tenure with company						0.0028 (0.140)	
Executives' tenure with company squared						0.0004 (0.638)	
CEO tenure/age							0.8915** (2.445)
CEO tenure/age squared							-2.1857*** (-3.009)
CEO char.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governance char.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm char.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,521	6,521	12,406	12,406	10,283	3,736	12,427
R-squared (within)	0.330	0.332	0.299	0.299	0.347	0.291	0.296

Appendix I – Return on assets (ROA)

This table presents results from fixed effects regressions of return on assets (*ROA*) on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). *ROA* is calculated as earnings before interest, taxes, depreciation and amortization (EBITDA) divided by the book value of total assets at the end of the previous year and is winsorized at the 1st and 99th percentiles. Results from regression specification (1) are based on a pooled OLS regression with industry fixed effects (based on three-digit SIC codes). Results from specification (2) stem from a firm fixed effects regression. Results from specification (3) are based on a regression including CEO-firm fixed effects and use the natural logarithm of *CEO age* instead of *CEO age*. Control variables are identical to those used in regression (2) of Table 2, except for *Operation CF* which is excluded from the set of controls. All variables are defined in Appendix A. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>ROA</i>		
	Pooled (1)	Firm FE (2)	CEO-firm FE (3)
CEO tenure	0.0016*** (3.484)	0.0013*** (2.699)	0.0015** (2.255)
CEO tenure squared	-0.00004*** (-3.219)	-0.00003* (-1.778)	-0.00005** (-2.293)
<i>CEO characteristics</i>			
CEO age	0.0001 (0.661)	-0.0004* (-1.730)	0.0329 (1.646)
CEO gender	-0.0148** (-1.975)	-0.0038 (-0.455)	
CEO power index	-0.0043*** (-3.322)	-0.0007 (-0.703)	-0.0026** (-2.251)
Founder CEO	-0.0088 (-1.422)	0.0096 (1.244)	
<i>Governance characteristics</i>			
Board size	0.0071 (1.089)	0.0146** (2.046)	0.0129 (1.468)
Busy board	-0.0005 (-0.196)	-0.0025 (-1.052)	0.00005 (0.020)
E-index	-0.0028** (-2.289)	-0.0013 (-1.007)	-0.0019 (-1.272)
Independence ratio	0.0059 (0.591)	-0.0100 (-0.936)	-0.0048 (-0.397)
Independent director ownership	-0.4721* (-1.861)	-0.4337** (-2.016)	-0.4472** (-2.041)
Firm characteristics	Yes	Yes	Yes
Industry fixed effects	Yes	No	No
Firm fixed effects	No	Yes	No
CEO-firm fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Observations	12,400	12,400	12,400
R-squared (within)		0.323	0.315

Appendix J – Environmental dynamics, variation in state-level takeover laws, and the cost-benefit relation of CEO tenure

This table presents results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics for various sub-samples. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Panel A reports sub-sample results using the *6-factor industry shock score* proposed by Guay, Taylor, and Xiao (2014). An industry is defined as a three-digit SIC cluster that contains at least ten firms in year $t-1$ and year t . An industry shock is measured based on the absolute value of the percentage change in the mean of the industry characteristic from fiscal year $t-1$ to fiscal year t , regardless of the direction of the change. The 6-factor industry shock score is the sum of the following six indicator variables: (i) Industry assets shock is set to one if the absolute value of the percentage change in the total value of industry assets (Δ Industry Assets) is above the 50th percentile, zero otherwise (ii) Industry investment shock is set to one if the absolute value of the percentage change in the total value of industry capital expenditures (Δ Industry Investment) is above the 50th percentile, zero otherwise, (iii) Industry HHI shock is set to one if the absolute value of the percentage change in the Herfindahl index of the industry sales concentration (Δ Industry HHI) is above the 50th percentile, zero otherwise, (iv) Industry R&D shock is set to one if the absolute value of the percentage change in the industry R&D expenditures (Δ Industry R&D) is above the 75th percentile, zero otherwise, (v) Industry sales shock is set to one if the absolute value of the percentage change in the total value of industry sales (Δ Industry sales) is above the 50th percentile, zero otherwise, (vi) Industry advertisement shock is set to one if the absolute value of the percentage change in the industry advertising expense (Δ Industry Advertising) is above the 50th percentile, zero otherwise.). Panel B reports sub-sample results using the tech firm classification provided by the U.S. Census Bureau. A firm is considered a tech firm if the firm is operating in one of the following industry segment according to the North American Industry Classification System (NAICS): 333295, 333315, 334111, 334112, 334113, 334119, 334210, 334220, 334413, 334511, 421430, 421690, 423430, 423690, 443120, 511140, 511210, 514210, 518210, 519130, 541330, 541511, 541512, 541513, 541519, 541710, 541711, 541712. Panel C reports sub-sample results for firms with a high (i.e., above median) and for firms with a low (i.e., equal to or below median) takeover susceptibility measured via the *Takeover index* introduced by Cain, McKeon, and Solomon (2014). The index is calculated based on a broad set of takeover laws and represents a measure of a firm-level takeover susceptibility, i.e., the market for corporate control. Higher index values correspond to higher takeover susceptibility. Index data is available at <http://pages.uoregon.edu/smckeon/>. All other variables are defined in Appendix A. Control variables are identical to those used in regression (2) of Table 2 which yields an inflection point of 12.5 years. Absolute and relative changes shown at the end of Panel A, B and C are calculated with respect to this inflection point. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A – Industry shock score (based on Guay, Taylor, and Xiao, 2014)		
	≤ Median	> Median
CEO tenure	0.0179** (2.321)	0.0085 (1.077)
CEO tenure squared	-0.0006*** (-2.720)	-0.0005*** (-2.674)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	6,726	5,701
R-squared (within)	0.325	0.296
Turning point (yrs)	14.9	8.5
<i>Absolute change (yrs)</i>	+2.4	-4.0
<i>Relative change (%)</i>	+ 19.2	- 32.0

Panel B – Tech vs. non-tech firms (U.S. Census)		
	Tech = 0	Tech = 1
CEO tenure	0.00747* (1.824)	0.04931* (1.686)
CEO tenure squared	-0.00024** (-2.014)	-0.00221** (-2.535)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	10,235	2,192
R-squared (within)	0.376	0.367
Turning point (yrs)	15.6	11.2
<i>Absolute change (yrs)</i>	+ 3.1	- 1.3
<i>Relative change (%)</i>	+ 24.8	- 10.4

Panel C – Takeover susceptibility (based on Cain, McKeon, and Solomon, 2014)		
	Takeover index > median	Takeover index ≤ median
CEO tenure	0.0165*** (2.707)	0.0151 (1.256)
CEO tenure squared	-0.0005*** (-2.731)	-0.0008*** (-2.585)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	6,051	6,068
R-squared (within)	0.454	0.249
Turning point	16.5	9.4
<i>Absolute change (yrs)</i>	+ 4.0	- 3.1
<i>Relative change (%)</i>	+ 32.0	- 24.8

Appendix K – CEO tenure and growth in firm value

This table reports results from firm fixed effects regressions of the *growth rate of Tobin's Q* ($Q_t - Q_{t-1}/Q_{t-1}$) on *CEO tenure* along with CEO characteristics, CEO power measures, firm, and corporate governance characteristics. The sample includes S&P 1500 firms over the period 1998-2011 excluding regulated utility and financial firms (SIC codes 4000-4999 and 6000-6999). Regressions exclude Tobin's Q_{t-1} from the set of controls. All other control variables in regression specification (1) are identical to those used in specification (2) of Table 2, while all other control variables in specification (2) are identical to those used in specification (6) of Table 3 (excluding the squared terms of some controls). We calculate the turning point (defined as the simple zero) for equations (1) and (2) by setting the regression equation equal to zero and solving for *CEO tenure*, while holding all controls at their mean values. All variables are defined in Appendix A. An intercept and year dummies are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by firm are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	$\frac{Q_t - Q_{t-1}}{Q_{t-1}}$	
	(1)	(2)
CEO tenure	-0.0026*** (-3.224)	-0.0025*** (-3.086)
<i>Alternative explanations</i>		
Outside director tenure		-0.0027* (-1.754)
Board age		-0.0003 (-0.165)
<i>CEO characteristics</i>		
CEO age	0.0019*** (2.614)	0.0020*** (2.623)
CEO gender	-0.0180 (-0.682)	-0.0189 (-0.712)
CEO power index	0.0007 (0.177)	-0.0001 (-0.024)
Founder CEO	0.0212 (0.903)	0.0198 (0.839)
<i>Governance characteristics</i>		
Board size	-0.0763*** (-3.075)	-0.0807*** (-3.260)
Busy board	-0.0115 (-1.424)	-0.0114 (-1.417)
E-Index	0.0095*** (2.661)	0.0093*** (2.615)
Independence ratio	0.0158 (0.475)	0.0037 (0.106)
Independent director ownership	-0.3403 (-0.425)	-0.2489 (-0.312)
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	12,427	12,427
R-squared (within)	0.178	0.178
Tenure (yrs) when growth turns negative	9.6	9.7