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Abstract

Our study is the first to provide systematic evidence of a hump-shaped CEO tenure-firm value relation. This pattern is supported by announcement returns to sudden CEO deaths, which mitigate endogeneity concerns. Furthermore, the hump shape is subject to meaningful cross-sectional variation: firm value starts to decline after fewer years of CEO tenure i) in more dynamic industries, in which the optimal CEO-firm match changes more frequently, ii) if CEOs are less adaptable to changes, iii) if CEO entrenchment is higher. Lastly, financial reporting quality also follows a hump shape while earnings smoothing increases over CEO tenure, suggesting that CEOs entrench themselves by obfuscating their declining performance. While we find evidence suggesting optimal retention by boards on average, some CEOs stay past their “peak”, primarily because of a deteriorating CEO-firm match in conjunction with increasing entrenchment.

JEL classification: G30, G34, J24

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1. Introduction

Among academics and practitioners, there is a longstanding debate on whether CEOs stay in office too long.¹ Economic theories have long considered CEO entrenchment and the quality of the CEO-firm match as drivers of boards' CEO retention decisions, but they make ambiguous or no predictions with regard to the relation between CEO tenure and the value of the firm (e.g., Hermalin and Weisbach, 1998, Garrett and Pavan, 2012). Empirically, a mosaic of evidence suggests that corporate outcomes – such as earnings management (Ali and Zhang, 2015), firm-customer and firm-employee relationships (Luo et al., 2014), innovation (Wu et al., 2005), net investments (Pan et al., 2016), and profitability (Henderson et al., 2006) – vary over the CEO's time in office.² Yet, this body of evidence does not provide a clear answer to a fundamental question: How does firm value vary over a CEO's tenure? To inform the debate on whether there exists an optimal CEO tenure, we bridge this gap in the literature and provide evidence on the determinants of the CEO tenure-firm value association.

Against this background, our study provides empirical evidence on the relation between CEO tenure and firm value in S&P 1500 firms while accounting for endogeneity issues. We consider the interaction of CEO learning, entrenchment, and CEO-firm match quality and develop predictions for the tenure-firm value relation and its cross-sectional determinants, which we test empirically. The evidence we present suggests that over the CEO's later years in office the quality of the CEO-firm match deteriorates while entrenchment increases, which

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 “Been a CEO for ten years? Your time's about up?” (*Business Insider*, April 16, 2007). See Whitehead (2011) for an overview of the debate about CEO term limits among legal scholars.

² For example, Pan et al. (2016) find that a firm's net investment quantity increases, while investment quality decreases over the CEO's tenure, consistent with a negative or hump-shaped tenure-firm value relation. Luo et al. (2014) find a positive (hump-shaped) relation between CEO tenure and firm-employee (firm-customer) relationship strength, suggesting analogous tenure-value relations. In addition, the literature has little to say about the cross-sectional determinants of the relation between CEO tenure and firm value.

in combination causes a decline in firm value unless CEOs can adapt to changes in the firm's environment.

We base our empirical predictions on key assumptions and findings from the theoretical literature. Studies incorporate CEO learning as a determinant of CEO retention and performance over time (e.g., Henderson et al., 2006; Laux, 2008). If CEOs need time to acquire firm-specific knowledge, all else equal, their contribution to firm value may increase over the years. However, according to Hermalin and Weisbach (1998), boards grant successful CEOs more power over their tenure – e.g., by reducing board independence or appointing them chairman of the board – because the value of monitoring declines as uncertainty about the quality of the CEO-firm match reduces. Hence, successful CEOs become increasingly entrenched over their time in office (see Figure 1). At the same time, however, the likelihood of a shock to CEO-firm match quality (e.g., technological innovation or industry consolidation) increases, which reduces the CEO's productivity and value for her firm (Eisfeldt and Kuhnen, 2013). As a result, firms can end up with costly-to-replace CEOs who are no longer the best match for their firms' skill needs, even in the absence of agency frictions. Depending on the level of learning, entrenchment, industry dynamics, and CEOs' adaptability to changes, we expect the relation between CEO tenure and firm value to be either positive or hump-shaped.

As a baseline, for the average S&P 1500 company, we find that the relation between CEO tenure and firm value is hump-shaped and that firm value starts to decline after 10-12 years of CEO tenure.³ We use both parametric and semi-parametric estimations, which include a large set of CEO, firm, and governance characteristics, and account for concerns of extrapolation and outliers.

³ Consistently, we find that CEOs depart after an average of 11 years for the ca. 950 cases of CEO turnover in our sample, which occur after the CEO's first three years in office (the "CEO honeymoon"). This result is in line with the notion that boards and firms, on average, make optimal retention decisions.

To address identification, we follow Salas (2010) and examine the stock market reaction to announcements of sudden, unexpected CEO deaths between 1950 and 2012. Because sudden deaths occur randomly and are arguably exogenous to current firm and market conditions, this approach mitigates endogeneity concerns arising from endogenous CEO-firm matching and past performance. Furthermore, it enhances the interpretation of the results because the deceased CEO's successor, by definition, has a tenure of zero years. As the stock market reaction to sudden deaths reflects CEOs' expected future contributions to shareholder value (net of the expected successor's contribution and net of compensation), this analysis allows to test whether the relation between CEO tenure and firm value is indeed hump-shaped. If so, the CEO's contribution to shareholder value will decrease over time past a certain point. Hence, we expect abnormal stock returns to the sudden death to be negative (positive) for low-tenure (high-tenure) CEOs and generally to become more positive over the CEO's tenure. Our results are in line with this expectation and underpin that a considerable fraction of high-tenure CEOs are no longer the optimal match for their firms.

We perform a battery of additional robustness tests. For instance, we address concerns that non-linear relations between firm value and variables correlated with CEO tenure, such as CEOs' age, compensation, ownership, power, and director age and tenure, drive our results. We also use residuals of CEO tenure to account for hard-to-disentangle variables, such as CEO and firm age, CEO founder status, or past performance. To further address concerns of endogenous matching and CEO heterogeneity, we exclude the first years of tenure for each CEO and re-estimate our regressions with additional controls for CEOs' abilities, education, and work experience. Alternatively, we use CEO-firm fixed effects. We additionally measure tenure as a fraction of the CEO's maximum realized tenure to allow life cycles to differ across CEOs. To address endogenous CEO turnover, we control for hazard rates for different types of turnover. We also exclude a five-year window around forced CEO turnovers as performance

patterns around these events might explain our results. Finally, we address concerns of CEO or firm survivorship as, for instance, CEOs with good performance may be recruited to run bigger companies (Fee and Hadlock, 2003), while poorly performing entrenched CEOs stay with their firms. We find the hump-shaped tenure-firm value relation to be robust to all these tests.

In the second part of the study, we analyze cross-sectional patterns in the relation between CEO tenure and firm value. Specifically, we test how the tenure-firm value relation varies with different levels of CEO entrenchment, industry dynamism, and CEO adaptability. The analyses serve two purposes. First, they constitute specific tests of our general conceptual framework and help us to understand the channels through which the tenure-firm value relation operates. Second, they provide insights on the incremental value-relevance of CEO entrenchment, CEO-firm match, and CEO adaptability in combination with different tenure levels.

In a first step, we consider varying levels of CEO entrenchment. Because entrenchment develops endogenously with CEO tenure and performance (e.g., Hermalin and Weisbach, 1998), it is difficult to study its effect on the tenure-firm value relation. To address this issue, we use the takeover susceptibility index provided by Cain et al. (2017), which is based on exogenous changes in U.S. state-level takeover laws. CEOs at the helm of firms with lower takeover susceptibility are less exposed to pressure from the market for corporate control and, thus, are more entrenched. Comparing sub-samples based on firm-years with high and low takeover index values, we find that firm value starts to decline earlier (later) when CEOs are more (less) entrenched, consistent with entrenchment protecting poorly-performing CEOs from being fired. However, as the tenure-firm value relation is hump-shaped in both sub-samples, we conclude that CEO entrenchment cannot fully explain the hump shape, but that it significantly contributes to it.

In a second step, we examine firms' industry dynamics to study the role that the CEO-firm match plays for the relation between CEO tenure and firm value. Firms' managerial skill needs are more (less) likely to change if firms operate in more (less) dynamic industries (Henderson et al., 2006). Firms in dynamic industries may also find it harder to identify new CEO candidates with suited skill sets. Consequently, the more (less) dynamic a firm's industry, the more (less) likely will a CEO's skill set become less optimal for the firm over the CEO's tenure. Hence, we expect to find that CEO tenure is associated with declining firm value at relatively lower (higher) tenure levels if the firm's industry is more (less) dynamic. Using the industry dynamism index proposed by Coles et al. (2015), we find empirical support for our predictions. While on average firm value starts to decline after about 10-12 years of CEO tenure, we find that firm value peaks much earlier (after 8.6 years) for firms with high industry dynamism and much later (after 13.8 years) for firms with low dynamism. The large difference in the peak point of firm value (5.2 years) indicates that the quality of the CEO-firm match plays an important role for the tenure-firm value relation.

Third, we consider CEOs' adaptability to changes. For those firms that employ CEOs who find it easier to adapt to changes in firms' economic environment, the relation between CEO tenure and firm value is more likely to be positive or to peak at much higher levels of CEO tenure. Following Guay et al. (2015), we consider CEOs to be adaptable if they are either generalists – according to Custódio et al.'s (2013) general ability index – or were hired from outside the firm. We expect generalists and outside CEOs to be better able to adapt to changes in their firms' business environment as they have broader managerial work experience and, hence, are more capable of learning new concepts and solving new problems. Our empirical results show that, while the tenure-firm value relation is hump-shaped and peaks already after 10 years of CEO tenure for less adaptable CEOs, we find that the tenure-firm value relation is significantly positive for more adaptable generalist or outside CEOs. This finding points to the

value of CEO adaptability and is consistent with the generalist pay premium documented in Custódio et al. (2013).⁴

Finally, to complement the firm value-based results, we examine patterns of financial reporting during CEOs' tenure. CEOs can use reporting discretion to influence market perceptions of their ability. Theoretically, Fudenberg and Tirole (1995) model income smoothing as a function of managerial concerns for job security. That is, managers entrench themselves by opportunistically smoothing reported earnings. Empirically, Ali and Zhang (2015) find that newer CEOs overstate earnings via discretionary accruals and expenses, i.e., both accrual and real earnings management. As prior work does not consider CEO tenure or its square term, we re-examine financial reporting in the context of our hypotheses and research design. Also, while Ali and Zhang (2015) examine income-increasing earnings management during CEOs' tenure, we complement their evidence by looking at non-directional measures of earnings quality (including smoothing). We find that accrual quality (as per Dechow and Dichev, 2002) follows a similar pattern to that of firm value over the average CEO's tenure. Conversely, restatement likelihood follows a U-shape. In contrast, we find a significantly positive association between CEO tenure and earnings smoothing (as per Tucker and Zarowin, 2006). Collectively, this set of results is consistent with CEOs attempting to obfuscate their declining contribution to firm performance.

This study has important implications for the academic literature and policy considerations. Our evidence extends the literature that examines CEOs' impact on firm value and performance (e.g., Johnson et al., 1985, Bertrand and Schoar, 2003, Jenter et al., 2016, Bennedsen et al., 2017). Supporting extant work, our results suggest that CEOs constitute a

⁴ We do not directly test learning. Rather, we consider the first part of the hump shape as *prima facie* evidence of learning. Furthermore, we consider the cross-sectional evidence based on industry dynamism and CEO adaptability to be consistent with learning. That is, learning is more difficult in dynamic industries, and more adaptable CEOs have better learning skills.

value-relevant input factor in the firm’s production process. In contrast to the existing literature, which has focused on heterogeneity across CEOs, our study highlights the heterogeneity of the impact of CEOs over their tenure by providing evidence of CEOs having a different value impact on the very same firm over time.

We provide comprehensive evidence on the interplay between CEO learning, entrenchment, and CEO-firm match quality. Learning likely plays a significant role in explaining why the average CEO contributes positively to firm value during their first decade in office. Subsequently, both CEO entrenchment and a deteriorating CEO-firm match have a significantly negative bearing on the CEO tenure-firm value relationship. However, an important takeaway from our paper is that adaptable CEOs can overcome (or at least significantly delay) the hump. One practical implication for empirical studies is that CEO tenure is not necessarily a valid proxy for entrenchment, at least in a value-destroying sense.⁵ In addition, it can be optimal to allow CEOs to stay in office past their “peak” even in the absence of agency frictions (e.g., Eisfeldt and Kuhnen, 2013) – simply because the benefit of their retention exceeds the cost of their replacement by someone whose fit remains uncertain and therefore requires a pay premium (Carter et al., 2019).

We add to the ongoing debate about CEO term limits. Our results suggest that periodic CEO turnover can be valuable for shareholders because even successful CEOs, who were good initial matches for their firms, may be associated with declining firm value over the later course of their tenure, consistent with anecdotal evidence (see Appendix A). However, our findings do not support a fixed policy of CEO term limits or general voting recommendations against

⁵ Views vary on the exact meaning of CEO entrenchment. At a basic level, “passive” entrenchment can increase with the passage of time if even the best-intentioned and competent CEOs become increasingly difficult to replace. At the other end of the spectrum, self-serving CEOs may “actively” entrench themselves by adopting favorable governance features such as golden parachutes or poison pills. It is impossible to empirically ascertain that there be no entrenchment for any firm-CEO combination. Rather, our results show that (i) despite entrenchment, the CEO tenure-firm value relation is positive for several years, and (ii) the degree of entrenchment brings forward the turning point.

high-tenure CEOs by proxy advisors given that the tenure-firm value relation differs considerably across firms and CEOs. Furthermore, while we find an average turning point in the 10-12 year range, it should be noted that many CEOs end their tenure before that “peak”. Hence, it is possible that CEO tenure be too *short* in some cases.

The remainder of the paper is organized as follows. In Section 2, we provide the conceptual framework and formulate predictions for our empirical analyses. Section 3 describes our data and variables. Section 4 presents analyses of the relation between CEO tenure and firm value including various robustness tests. Section 5 provides results from cross-sectional tests of the tenure-firm value relation. Section 6 provides additional analyses based on financial reporting quality. Conclusions follow.

2. Conceptual framework and empirical predictions

In theory, the board of directors hires the best available CEO whose skill set is expected to maximize firm value given its estimated fit with the managerial skill needs of the firm, which depend on the firm’s economic environment, particularly its industry conditions and technology (e.g., Eisfeldt and Kuhnen, 2013). While uncertainty about the quality of the CEO-firm match resolves over the CEO’s tenure (e.g., Pan et al., 2015; Carter et al., 2019), the likelihood that the firm’s skill needs change – as its environment evolves – increases, rendering the CEO’s skill set no longer optimal (e.g., Miller, 1991, Garrett and Pavan, 2012, Eisfeldt and Kuhnen, 2013). Such match-quality shocks can originate from the opening of new markets, new technologies, industry consolidation, or new legislation. Those shocks may occur only rarely over short periods of time, but CEOs with longer tenures are likely to witness them. As match-quality shocks reduce managerial productivity (Garrett and Pavan, 2012, Eisfeldt and Kuhnen, 2013), they reduce the value of CEOs for the firms they manage.

Regarding its decision whether to keep or fire the incumbent CEO, each period the board fires the CEO if future firm value under the CEO is expected to be lower than under the best alternative CEO, net of adjustment costs (e.g., Eisfeldt and Kuhnen, 2013). Among other things, adjustment costs include search and transition costs, and severance pay. While managerial entrenchment may benefit shareholders *ex ante*, e.g., as it allows to pay CEOs less (Almazan and Suarez, 2003) or to incentivize them to take more risk (Manso, 2011), *ex post* it may not be in shareholders' interest because it increases the aforementioned adjustment costs (Taylor, 2010). However, even absent adjustment costs, a replacement candidate under whom the firm would be worth more (i.e., a better match for the firm's skill needs) may not always be available due to horizontal and vertical differentiation across managers. As a consequence, some CEOs may remain in office although they are associated with declining firm value.

According to this general framework and to Hermalin and Weisbach's (1998) model, CEO entrenchment and the quality of the CEO-firm match interact and can jointly influence firm value over time. As uncertainty about the CEO-firm match resolves over the early years of tenure, some CEOs fall short of expectations, others meet, and some exceed them. The better a CEO performs, the more likely she will stay in office (e.g., Dikolli et al., 2014). Accordingly, the relation between tenure and firm value can be expected to be positive.⁶ However, CEOs who perform well, and hence signal that they are good matches for their firms, also acquire the bargaining power to entrench themselves (Hermalin and Weisbach, 1998), e.g., via reducing board independence or assuming the additional role of the chairman of the board (e.g., Graham et al., 2018). CEOs also become increasingly entrenched as board co-option increases over their time in office (Coles et al., 2014). As a result, the tenure-firm value relation can turn negative for the later years of tenure when then-entrenched CEOs become more and more likely

⁶ The positive relation between tenure and firm value for the early years of tenure can be reinforced by CEO learning (e.g., Laux, 2008). Similarly, Huang and Hilary (2018) argue that outside directors learn over the early years of their tenure on the board of directors.

to lose their match-quality with the firm.⁷ Thus, whether the relation between CEO tenure and firm value is positive or rather hump-shaped is an empirical question.⁸

We further explore cross-sectional determinants of the relation between CEO tenure and firm value. We posit that CEO entrenchment is a first-order determinant of the deteriorating CEO-firm match quality. Specifically, stronger external governance curbs CEO entrenchment. Thus, it should reduce its negative performance impact at longer tenure levels, resulting in a more positive shape of the tenure-firm value relation. Empirically, most proxies for entrenchment are endogenous internal governance mechanisms, such as CEO-chair duality or board independence. We examine the role of entrenchment by looking at the effect of state-level protection against takeovers (Cain et al., 2017). We expect CEOs of firms located in states that put fewer restrictions on corporate takeovers to be positively associated with firm value for a longer time than their peers in states where antitakeover laws are stronger.

We also examine forces that are not related to managerial entrenchment per se (at least in its active sense), but rather labor and product market forces. Specifically, the more dynamic a firm's environment (i.e., its industry), the more frequently will the firm's managerial skill needs change, and hence the more likely does the CEO-firm match quality deteriorate (Henderson et al., 2006, Guay et al., 2015). Accordingly, we expect the tenure-firm value relation to be more (less) hump-shaped for firms in more (less) dynamic environments. Finally, the more capable incumbent CEOs are to adapt to changes in the firm's environment, the less likely is the quality of the CEO-firm match to deteriorate. Thus, we expect more (less)

⁷ The negative relation between tenure and firm value for the later years of tenure can be reinforced by, e.g., increased CEO perk consumption or CEOs enjoying “the quiet life” (Bertrand and Mullainathan, 2003).

⁸ The management literature also informs our predictions. According to Hambrick and Fukutomi (1991), CEOs experience “seasons” during their tenure. Their model also predicts a hump shaped association with firm value. However, Henderson et al. (2006), who focus their analysis on two industries, find that the association between CEO tenure and firm profitability depends on the dynamism of the industry – using the contrast between the relatively stable food industry and the more dynamic computer industry. We revisit this question more comprehensively by examining a much broader sample, by using market value instead of accounting profitability as the dependent variable, and by addressing endogeneity.

adaptable CEOs to be associated with a more positive (hump-shaped) tenure-firm value relation. We test the cross-sectional empirical predictions in the second part of our study.

3. Data and variables

3.1 Data

Our initial sample consists of all S&P 1500 companies over the period 1998 to 2011 as covered by ISS (formerly RiskMetrics).⁹ 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 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 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. 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 3,054 unique CEO-firm pairs.

3.2 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

⁹ 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 our sample's starting point.

company's board of directors (provided by ISS).¹⁰ *Maximum CEO tenure*, used to approximate the CEO's life cycle, equals the largest value of CEO tenure in the sample per CEO-firm pair.

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 and sudden CEO deaths. Announcement returns to acquisition announcements and sudden CEO deaths are defined in Section 4.

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 (Hermalin and Weisbach, 1998, Dikolli et al., 2014, Graham et al., 2018). 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 et al., 2014), (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 board of directors, and (vi) *President*, which is a dummy that equals one if the CEO has the

¹⁰ 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. Using this methodology, we are able to identify a firm's CEO in 99.8% of the cases in which we could not identify 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“).

title of president of the firm. Adams et al. (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*. We separately control for Bebchuk et al.'s (2009) E-index to further account for CEO and board entrenchment.

We control for a series of additional corporate governance and firm characteristics. *Appendix B* 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 value-relevant CEO and firm heterogeneity. When we exclude the lag of Tobin's Q from the regressions, all results remain qualitatively similar.

3.3 Summary statistics

Table 1 presents summary statistics for the previously defined variables. In terms of *CEO tenure* and *Maximum CEO tenure*, which take on values between 0 and 60 years, the cross-sectional average is about 7.7 and 10.5 years, respectively. Based on the 3,054 CEO-firm pairs in our sample (instead of firm-year level data) average *Maximum CEO tenure* is 8.2 years. It increases to 10.3 years when we exclude the 22% of all CEOs who leave the firm during their first three years in office. Excluding these CEOs, *Maximum CEO tenure* at CEO turnover has a mean of 11.1 years. 31% of all CEOs reach a maximum tenure of at least 10 years, i.e., about a third of all S&P 1500 CEOs stay with their firm for at least a decade. This fraction increases to 39.5% when we exclude CEOs who leave during their first three years.

Regarding 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 1*, CEO power increases significantly with CEO tenure, at least over the first 15 years. Turning to the components of the CEO power index, mean CEO ownership is 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 firm and governance characteristics (not discussed here) – are comparable to those in recent governance studies (Bebchuk et al., 2009, Fahlenbrach, 2009, Huang and Hilary, 2018, Masulis and Mobbs, 2014).

4. The relation between CEO tenure and firm value

In the following, we examine the relation between CEO tenure and firm value. Section 4.1 presents results from parametric and semi-parametric estimations of our baseline regression model. Section 4.2 provides various tests on the robustness of the firm value analysis. Section 4.3 presents complementary evidence from firms' financial reporting.

4.1 Firm value analysis

The general conceptual framework outlined in Section 2 suggests either a positive or a hump-shaped relation between CEO tenure and firm value. In this section, we set out to test this general tenure-value relationship empirically by estimating regressions of *Tobin's Q* on different functional forms of *CEO tenure* and a large number of controls for CEO, firm, and governance characteristics (presented in Section 3.2). All regressions 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, consistent with our conceptual framework in which firms employ the production factor labor, i.e., CEOs, with firms' investments in CEOs depending on their firm-specific needs for managerial skills and firm-specific hiring/firing policies. Hence, it is crucial to account for unobserved firm-specific heterogeneity. Because CEO-firm fixed effects treat each CEO-firm pair as a separate unit of observation, even though the same firm just changes its CEO, they do not accurately account for firm-specific heterogeneity. Furthermore, firm fixed effects allow for sufficient variation in CEO tenure (as changes in tenure are not limited to exactly one unit for each observation), while they allow to control for CEO characteristics such as age or ability. Still, we employ CEO-firm fixed effects in robustness tests presented in Section 4.2 below.

Table 2 reports our regression results for different functional forms of CEO tenure. In columns (1) and (2), we test whether the relation between CEO tenure and firm value is positive (or negative). In column (1), we estimate our baseline regression model and assume a logarithmic functional form by using the natural logarithm of CEO tenure, i.e., $\ln(\text{CEO tenure})$. This functional form makes the reasonable assumption that the increase in firm value decreases marginally over the CEO's tenure. In column (2), we assume a basic linear relation and accordingly use the variable *CEO tenure*. To test whether the tenure-firm value relation is hump-shaped, we use *CEO tenure* and its squared term, i.e., *CEO tenure squared*, in column (3) and a third-order polynomial of CEO tenure in column (4). Our results suggest that the relation between CEO tenure and firm value is hump-shaped. In particular, in columns (3) and (4) the coefficients on *CEO tenure* and *CEO tenure squared* are significant and their opposite signs indicate a hump shape, while all other functional forms are not statistically supported. The hump shape is also found when we additionally include (Fama French 48) industry*year fixed effects to control for time-varying factors particular to an industry as shown in column (5). In column (6), we provide estimates that address the concern that *CEO tenure* is correlated

with a set of hard-to-disentangle control variables used in our regressions and might thus 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. 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* and again support a hump-shaped relation between CEO tenure and firm value.

Overall, the regression results suggest that for the average S&P 1500 company firm value peaks (i.e., starts to decline) after 10-12 years of CEO tenure. The cross-sectional mean of 10.5 years for the variable *Max CEO tenure* and, in particular, the mean of 11.1 years for *Max CEO tenure* at CEO turnover (see Table 2) indicate that, for the average firm, CEOs depart around the time when they reach their maximum contribution to firm value. This finding is consistent with the view, articulated by Milgrom and Roberts (1992) and Ittner and Larcker (2001), that while organizations are moving toward the optimal level, there is cross-sectional variation around firms' optimal choice, which allows to study the performance consequences of firms' (leadership) choices.

In terms of our control variables, we find founders 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.¹¹

¹¹ 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 on *Operating CF*, *R&D*, *Sales growth* and the lag of *Tobin's Q* (coefficient of 0.222) are significantly positive. When

A statistical concern with the hump shape we document is that the relation between *Tobin's Q* and high values of *CEO tenure* is based only on relatively few observations, i.e., it is based on CEOs who survive until a specific year of tenure. By imposing a functional form, such as a second-order polynomial, we might extrapolate (based on slope and curvature parameters) information for CEOs who actually do not survive. We address this concern in two ways.

First, we provide results from semi-parametric estimations, which do not impose a functional form for the tenure-firm value relation. Particularly, we perform locally weighted regressions (lowess) of residuals of *Tobin's Q* on *CEO tenure*. The residuals of *Tobin's Q* are from a regression of our baseline model, shown in column (3) of Table 2, where we omit the variables *CEO tenure* and *CEO tenure squared*. The results in *Figure 2* suggest that the relation between CEO tenure and firm value apparent in the data is indeed hump-shaped. This conclusion is further supported by *Figure 2b* and *Figure 2c*, which depict the results from locally weighted regressions of residuals of *Tobin's Q* on *CEO tenure* for firm-years for which CEO tenure takes on values of 11 years or less (the average turning point from Table 2) and larger than 11 years, respectively. The figures show that residual firm value increases over the early years of tenure (*Figure 2b*), while it decreases over the later years (*Figure 2c*).

Second, in *Appendix C* we re-estimate the regression model in column (3) of Table 2 and impose different restrictions with respect to CEO tenure. In column (1), we restrict the sample to those CEOs who have been in charge of their firm for at least 9 years but no longer than 23 years (i.e., $8 \leq \text{Max CEO tenure} \leq 22$).¹² The thresholds equal the median and the 90th percentile of the variable *Max CEO tenure*, respectively. We further restrict the upper threshold

we exclude the lag of *Tobin's Q* from the regressions, the results shown in Table 2 remain statistically significant with comparable turning 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.

¹² As the smallest value of the variable *Max CEO tenure* is 0, the restriction $8 \leq \text{Max CEO tenure} \leq 22$ corresponds to CEOs who have been in office for at least 9 and no more than 23 years.

by another 5 years (i.e., $8 \leq \text{Max CEO tenure} \leq 17$) in column (2). Restricting CEO tenure to a minimum of 9 years also addresses concerns of endogenous CEO-firm matching. In columns (3) and (4), we restrict our sample to firm-years with CEO tenure smaller/equal to or larger than 11 years, respectively. To mitigate concerns of extrapolation and outliers, we additionally restrict the sample in column (4) to those CEOs with $\text{Max CEO tenure} \leq 17$. While we find a hump-shaped tenure-firm value relation in columns (1) and (2), columns (3) and (4) provide additional support for our semi-parametric results shown in *Figures 2b and 2c*. In sum, the hump-shaped tenure-value relation appears to be robust to tests for extrapolation and outliers.

4.2 Tests on the robustness of the firm value analysis

We perform a battery of robustness tests on the results shown in Section 4.1. To mitigate endogeneity concerns, in Section 4.2.1, we analyze the stock market reactions to sudden CEO deaths. In Section 4.2.2, we then briefly summarize additional robustness tests, which are detailed in the paper's online appendix.

4.2.1 Evidence from sudden CEO deaths

As our main test to identify the relation between CEO tenure and firm value, we analyze the stock market reaction to announcements of sudden and unexpected deaths of incumbent CEOs, similar to, e.g., Johnson et al. (1985), Salas (2010), Nguyen and Nielsen (2014), Jenter et al. (2016), and Quigley et al. (2017). This approach considerably mitigates endogeneity concerns, particularly the endogenous CEO-firm match and turnover, for two reasons. First, sudden deaths occur randomly and are likely to be exogenous to current firm and market conditions. Second, the deceased CEO's successor (by definition) has a tenure of zero years, which enhances the interpretation of the results. As the stock market reaction to sudden deaths reflects CEOs' expected future contributions to shareholder value (net of expected successors), this analysis constitutes an alternative test of whether the relation between CEO tenure and firm value is hump-shaped. If so, CEOs' contributions to shareholder value will decline over their

tenure and we can expect to find a positive relation between CEO tenure and abnormal stock returns.¹³ Specifically, this positive relation is likely to be the outcome of a negative average announcement return to deaths of low-tenure CEOs and a positive average announcement return to deaths of high-tenure CEOs.

We analyze a sample of up to 260 sudden CEO deaths between 1950 and 2012. Extant literature uses much smaller samples spanning over much smaller periods of time. Sudden death data for the years 1950 to 2009, including information about CEO age, founder status, and tenure, comes from Quigley et al. (2017).¹⁴ This data is complemented by sudden death and CEO data (including CEOs' chairman and president titles) for the years 1975 to 2012 provided by Jesus Salas (see Salas, 2010). We exclude sudden deaths caused by murders, overdoses, and suicides as they might be related to firm performance. We also exclude cases of deaths if confounding events were announced simultaneously or if affected firms were not included in CRSP. For all deceased CEOs we have information about their tenure. For these 260 sudden death events, we compute cumulative abnormal stock returns (CARs) over the three-day period from the day before until the day after the announcement date. We denote the respective variable $CAR [-1, 1]$. We use the market model with the CRSP value-weighted index as a proxy for the market return. We winsorize $CAR [-1, 1]$ at the 1st and 99th percentiles. We use several control variables in multivariate regressions. Regarding these controls, we have information about CEOs' age for 259 observations and about CEOs' founder status for all 260 observations. Information about CEOs' titles, i.e., chairman of the board (duality) and president, is only available for 101 observations between 1975 and 2012. Accounting data from

¹³ A positive stock price reaction suggests a negative contribution to firm value. This reaction is consistent with the hump-shaped tenure-firm value relation, which corresponds to a negative relation between a CEO's tenure and the growth rate of firm value (as the derivative function of a hump shape is monotonically decreasing).

¹⁴ We thank Tim Quigley for graciously sharing his sudden deaths data. Regarding the description of the sample selection process and data, we refer the reader to Quigley et al. (2017).

Compustat, i.e., MTB, ROA and total assets, is also not available for all death events.¹⁵ Some regressions additionally include the indicator variable *Succession plan*, which follows Nguyen and Nielsen (2014) and equals one if a firm has a succession plan in place or announces an interim CEO within one week after the announcement of a CEO's sudden death.¹⁶

Our results are reported in *Table 3*. Panel A reports results from univariate difference-in-means tests for whether $CAR [-1,1]$ differs depending on the deceased CEO's tenure. Specifically, we compare mean CARs across different sub-samples based on whether i) CEO tenure is above or below (or equal to) the sample median (= 10 years) or ii) whether tenure is in the first or in the third tercile of its distribution. The results for the sub-samples show that abnormal stock returns to announcements of sudden deaths of incumbent CEOs with shorter tenure are significantly lower than announcement returns of CEOs with longer tenure. Consistent with our economic reasoning and the hump-shaped relation between CEO tenure and firm value documented above, we find that the sub-sample means of $CAR [-1,1]$ are negative for low tenure values, whereas they are positive for high tenure values. The positive stock market reaction to sudden deaths of high-tenure CEOs indicates that a considerable fraction of these CEOs is no longer the optimal match for their firms (net of CEO pay) and that the board of directors should already have replaced them. Jenter et al. (2016) provide consistent univariate evidence for a smaller sample of sudden deaths between 1980 and 2012.

Panel B reports additional results from multivariate regressions of $CAR [-1,1]$ on *CEO tenure* and controls for CEO and firm characteristics as well as time and industry fixed effects. We add controls successively. The regression model in column (1) only includes *CEO tenure*,

¹⁵ The summary statistics for our sample of sudden CEO deaths (not tabulated) are comparable to extant literature (e.g., Johnson et al., 1985, Nguyen and Nielsen, 2014, Jenter et al., 2016). Mean CEO age and tenure amount to 61 and 13 years, respectively, while 27% of all CEOs in our sample are their companies' founders. Mean firm size is \$1,258 mn, mean MTB is 2.5, and mean ROA is 9.3%.

¹⁶ We hand-collect information about succession planning from several data sources, particularly 8-Ks, 10-Ks, DEF 14As, board and board committee charters, and obituaries for the years 1992-2012. For the years preceding 1992, we assume that firms do not engage in succession planning.

decade fixed effects, and a constant. In column (2), we add *CEO age*, *Founder*, *Total assets*, and (Fama-French 12) industry fixed effects, in column (3) we add *MTB* and *ROA*, in column (4) we add *Duality* and *President* (important CEO power measures according to Adams et al., 2005) as well as *Succession plan*. Finally, in column (5) we re-estimate the regression model shown in column (4) and replace *CEO tenure* by two dummy variables, for tenure values in the second and third tercile of the sample's distribution of CEO tenure, respectively. The results of all regressions show a positive relation between the *CAR [-1,1]* and *CEO tenure*, consistent with the univariate findings presented in Panel A and the hump-shaped relation between tenure and firm value shown in Section 4.1.

4.2.2 Alternative explanations

As a first test, we replicate our regressions in Table 2 with firm fixed effects replaced by random effects with Fama French 48 industry controls. The results (not reported for brevity) confirm the hump-shaped relation between CEO tenure and Tobin's Q. Second, we investigate alternative explanations for the hump-shaped relation between CEO tenure and firm value that are related to corporate investments and disinvestments (Pan et al., 2016), CEO ownership (McConnell and Servaes, 1990), and pay- and wealth-performance sensitivity. As all the analyses below, which are only briefly summarized in this section, these analyses are described in detail in the Internet Appendix to this paper. The results are reported in Table IA.1. Most important, we find the hump-shaped tenure-value relation to hold across all these alternative regression specifications. Third, we attempt to rule out that *CEO tenure* and *CEO tenure squared* simply pick up the effect of a non-linear relation between firm value and CEO age, firm age, CEO power, board age, and board tenure. The results from these analyses are reported in Table IA.2. In sum, we find the hump-shaped relation between CEO tenure and firm value to hold across all these alternative regression specifications.

Fourth, we attempt to further mitigate concerns of endogenous CEO-firm matching. To this end, we exclude the first two years of tenure for each CEO, during which most uncertainty about CEO quality, i.e., the CEO's match with the firm, resolves and many poor matches end (Allgood and Farrell, 2003, Dikolli et al., 2014, Pan et al., 2015). Consequently, by focusing on these good matches, we mitigate concerns of endogenous CEO-firm matching, while being able to control for time-varying CEO quality, which we proxy for by including the *Managerial ability score* of Demerjian et al. (2012) and variables related to the CEO's education. To account for early-job and firm-specific experience, we also include a *Recession graduate* (Schoar and Zuo, 2017) and an *Inside CEO* (Bebchuk et al., 2011) dummy. In additional regression specifications, we measure tenure as a fraction of the CEO's maximum realized tenure to allow life cycles to differ across CEOs, which might be a relevant source of CEO heterogeneity, or use CEO-firm fixed effects as an alternative way of addressing endogenous CEO-firm matching and unobserved (time-invariant) CEO heterogeneity. The latter includes manager-specific effects, such as disclosure, financing, investment, or tax avoidance styles (see, e.g., Bertrand and Schoar, 2003, Bamber et al., 2010, Dyreng et al., 2010, Jia et al., 2014), which might correlate with both CEO tenure and firm performance. The results from these analyses, which also support our main finding of a hump-shaped CEO tenure-firm value relation, are reported in Table IA.3.

Fifth, we further address concerns of endogenous CEO turnover. In particular, the hump-shaped relation between CEO tenure and firm value might be the outcome of performance and investment patterns around CEO turnovers (e.g., Murphy and Zimmerman, 1993, Denis and Denis, 1995), especially forced turnovers, in conjunction with the use of firm fixed effects. Hence, in a set of robustness tests, we either control for the type of CEO turnover or exclude observations around forced turnovers. We also address the concern that CEOs with very good performance might get recruited to run bigger companies (Fee and Hadlock, 2003),

while CEOs with relatively poor performance remain with their firms and survive for longer time periods through entrenchment or due to a lack of succession planning. Finally, we conduct robustness tests related to opportunity costs of work for more versus less successful CEOs and the effect of firms becoming takeover targets. Summary statistics for the CEO turnover types are provided in Table IA.4 and the results of the various tests are reported in Table IA.5.

Finally, we address the concern that the hump-shaped relation between CEO tenure and firm value might simply reflect varying managerial incentive structures as job security of many CEOs might increase over the early years of tenure but decrease afterwards. To this end, we conduct a survival analysis using a Cox hazard model with CEO turnover and different types of CEO turnover as failure events. We re-estimate our baseline regression from column (3) of Table 2 and additionally control for the estimated hazard rate (and its square). The results from these analyses are reported in Table IA.6. Again, our results remain qualitatively similar. Overall, the results of all aforementioned tests confirm our main finding from Section 4.1.

In addition to the aforementioned robustness tests, Table IA.7 provides empirical evidence on the relation between CEO tenure and stock returns to announcements of acquisitions. These large corporate investments constitute a major channel through which CEOs create and destroy firm value. Consistent with the hump-shaped tenure-firm value relation, we find that the relation between acquisition returns and CEO tenure is hump-shaped as well.

5. Cross-sectional tests: Entrenchment, CEO-firm match quality, and CEO adaptability

Our tests so far provide robust evidence in support of a hump-shaped relation between CEO tenure and firm value with a turning point after roughly 10-12 years. In this section, we address the question whether one size fits all and a general recommendation to limit CEO tenure to 12 years is warranted, or whether there are important cross-sectional differences. Specifically, we

examine how the relation between CEO tenure and firm value varies with different levels of i) CEO entrenchment, ii) industry dynamics, which alter firms' managerial skill needs and hence the quality of the CEO-firm match, and iii) CEOs' adaptability to changes. Besides showing strong cross-sectional patterns, and thus nuanced estimates of optimal tenure lengths for different types of firms, these tests also provide a better understanding of the tenure-firm value relation by identifying some of the channels through which the tenure-value relation operates.

5.1 CEO entrenchment

Stronger corporate governance may limit CEO entrenchment and, thus, may limit CEOs' ability to overstay with negative performance implications at longer tenure levels. Consequently, we would expect a better governance to be associated with a more positive shape, i.e., a later turning point. Specifically, for CEOs who are less entrenched, the tenure-firm value relation could be either positive or hump-shaped. In the latter case, one would expect firm value to decline later than for the average S&P 1500 company. In contrast, we would expect the hump-shaped tenure-firm value relation to be more pronounced (i.e., firm value starts to decline earlier) for CEOs who are or become more entrenched than the average S&P 1500 CEO because more entrenched CEOs are more costly to replace. As CEO entrenchment, particularly the composition of the board of directors, tends to develop endogenously with CEO tenure and performance (e.g., Hermalin and Weisbach, 1998), it is difficult to use exogenous variation in entrenchment to study its effect on the tenure-firm value relation. To address this issue, we use the takeover index provided by Cain et al. (2017), which is based on exogenous changes in U.S. state-level takeover laws. Higher index values correspond to higher firm-level takeover susceptibility, i.e., more external governance through the market for corporate control and, thus, less entrenchment. We divide our sample into firm-year observations with high and low takeover index values and re-estimate our baseline regression from column (3) of Table 2 for the two sub-samples. The results are shown in *Table 4*. While the relation between CEO

tenure and firm value is hump-shaped for both-subsamples, firm value starts to decline earlier (after 11.8 years) if takeover susceptibility is low (i.e., CEO entrenchment is high) and much later (after 14.3 years) if takeover susceptibility is high. The overall difference in the turning point of firm value amounts to 2.5 years. The evidence suggests that while the hump-shaped tenure-firm value relation found for the average S&P 1500 company cannot be attributed solely to CEO entrenchment, it is still considerably affected by it.

5.2 Industry dynamics

As outlined in Section 2, the documented hump-shaped tenure-firm value relation may reflect the incumbent CEO's changing fit with the firm over the course of her tenure. Therefore, we examine whether, and to what extent, the CEO-firm match quality affects the tenure-firm value relation. We do so by considering varying levels of firms' industry dynamics, i.e., how fast industries evolve. This analysis is based on the assumption that firms' managerial skill needs are more (less) likely to change if firms operate in more (less) dynamic industries. Firms in dynamic industries may also find it harder to identify new CEO candidates with better suited skill sets because predicting the optimal skill set demands is likely to be more difficult if the economic environment changes more frequently. Furthermore, learning may be more difficult in more dynamic industries. As a consequence, the more (less) dynamic a firm's industry, the more (less) likely and the faster (slower) will a CEO's skill set become less optimal for the firm. Thus, relative to the average S&P 1500 firm we expect to find that CEO tenure is associated with declining firm value at relatively lower (higher) tenure levels if the firm's industry is more (less) dynamic. Put differently, the relation between CEO tenure and firm value is less (more) likely to be hump-shaped and more (less) likely to be positive if firms are subject to low (high) dynamism.

To measure firms' industry dynamics, we use the industry dynamism index proposed by Coles et al. (2015). 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 et al. (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 is above the 50th percentile. Industries are defined based on three-digit SIC codes. The index takes on discrete values between 0 and 4 (with a median (mean) of 2 (1.8)). Higher index values indicate higher industry dynamism. The results from re-estimating our baseline regression model from column (3) of Table 2 for sub-samples based on firm-years with high (index > 2) and low industry dynamism are reported in *Panel A of Table 5*. We provide additional evidence in *Panel B of Table 5* in which we use each component of the dynamism index to compare more to less dynamic industry settings.

The results show that firm value starts to decline much earlier (later) for firms in more (less) dynamic environments. While firm value is estimated to peak after about 12.2 years of CEO tenure for the average S&P 1500 company in our baseline regression (Table 2), we find that firm value peaks already after 8.6 years (or 30% earlier) for firms in dynamic industries and is estimated to peak after 13.8 years (or 13% later) for firms in less dynamic industries. The overall difference in the turning point of firm value amounts to 5.2 years, an economically meaningful variation. When we use the components of the dynamism index in Panel B, our results are confirmed and we find firm value to peak at even higher tenure levels for some firms in low-dynamism environments suggesting that the relation between CEO tenure and firm value becomes less likely to resemble a hump shape (as expected). Yet, for all four low-dynamism sub-samples we test whether the relation can also be described by a positive logarithmic function of *CEO tenure* and find that this is only the case for firms operating in low-growth industries (column 6). Overall, our results indicate that CEOs' contribution to firm

value deteriorates much faster if they run firms in more dynamic economic environments in which firms' managerial skill needs change more frequently. This finding suggests that CEO-firm match quality is an important determinant of firm value over the CEO's time in office.

5.3 CEO's adaptability to changes

In the following, we examine CEOs' abilities to adapt to changes in firms' economic environments in greater detail. For those firms that employ adaptable CEOs, who are less likely to lose their fit with the company and more capable of learning, the relation between CEO tenure and firm value is more likely to be positive instead of hump-shaped. In such cases, more (or more drastic) changes in a firm's environment are required to render an adaptable CEO's skill set non-optimal. Consequently, firm value is expected to start declining at higher levels of CEO tenure. For less adaptable CEOs, firm value is expected to start declining at relatively lower levels of tenure. Following Guay et al. (2015), we consider two types of CEOs as adaptable: generalists and outside CEOs. To classify CEOs as generalists, we use Custódio et al.'s (2013) general ability index, which mainly encompasses managerial work experience in different firms, industries, and positions. We classify CEOs as outsiders using the indicator variable *Outside CEO*, which takes the value of one if the CEO is not classified as an inside CEO according to the definition of Bebchuk et al. (2011), and zero otherwise.¹⁷ Because of their broad managerial experience and their higher ability and potential to learn about the firm, its business, and competition, we expect generalists as well as outside CEOs to be better able to adapt to changes and to be more capable of learning new concepts and solving new problems, consistent with the evidence in Guay et al. (2015). We note that outside CEOs may be less prone to entrenchment than CEOs promoted from within the firm, who can rely on established networks. In sum, we expect the hump-shaped tenure-value relation to apply to non-generalist

¹⁷ Bebchuk et al. (2011) define a CEOs as an insider if the CEO joined the company more than a year before becoming CEO, if the CEO is classified as the founder of the company (variable *Founder CEO*), or if the Execu-Comp data item "JOINED_CO" is missing.

and inside CEOs, and a more positive tenure-firm value relation (with a later turning point, if any) for generalists and outside CEOs.

Our results, reported in *Table 6*, support our expectations. Panel A shows the results for generalist CEOs. In Column 1, we show results of a regression that uses the indicator variable *Generalist CEO*, which equals one if the general ability index is above the annual median value for the respective year, and interactions of this variable with *CEO tenure* and its squared term. We find that non-generalist CEOs are associated with a hump-shaped relation between CEO tenure and firm value, which is estimated to peak after 10.3 years, i.e., 1.9 years (or 16%) earlier than for the average S&P 1500 CEO. For generalist CEOs, however, we find a positive interaction term with *CEO tenure squared*, which suggests that firm value starts to decline much later, if at all. Consistently, columns (2) and (3) show no hump shape, but rather a positive tenure-firm value relation for generalist CEOs. The results for outside CEOs are reported in Panel B. Column (1) shows the results of a regression that uses the interactions of *CEO tenure* and its squared term with *Outside CEO*. We find that inside CEOs are associated with a hump-shaped relation between CEO tenure and firm value, which is estimated to peak after 11.3 years, i.e., 0.9 years (or 7.4%) earlier than for the average S&P 1500 CEO. In contrast, for outside CEOs, we find a positive interaction term with *CEO tenure squared*, which suggests that firm value starts to decline much later, if at all. Consistently, columns (2) and (3) show a positive tenure-firm value relation for outside CEOs, indicating that outside CEOs in fact have a higher potential to learn and adapt (and are less prone to entrenchment) resulting in a more positive tenure-value relationship.

Overall, the results provide additional evidence suggesting that the hump-shaped relation between CEO tenure and firm value reflects the quality of the CEO's match with her firm, which declines over the CEO's tenure. They also suggest that adaptability and ability to learn across firms is an important CEO attribute, which significantly impacts firm value and its

relation with CEO tenure. This interpretation provides a rationale for the increase of generalists among CEOs and the documented generalist pay premium (see, e.g., Custódio et al., 2013).

6. Complementary evidence: Financial reporting discretion

Theory and existing evidence suggest that career concerns affect CEOs' reporting choices (e.g., Fudenberg and Tirole, 1995, DeFond and Park, 1997). Insofar as CEOs attempt to manage the market's perception of their contribution to firm value through financial reporting discretion, it stands to reason that financial reporting quality would be one of the channels through which CEO tenure relates to firm value. We use three measures to infer whether CEOs "garble" earnings information during their tenure: accrual quality, restatements, and smoothing. Given that the influence of CEOs on financial reporting varies over their tenure (e.g., Ali and Zhang, 2015) and given the documented accruals quality premium (e.g., Francis et al., 2005) and the negative stock returns to announcements of restatements (e.g., Palmrose et al., 2004), these two measures are arguably plausible channels of the tenure-firm value relation. Furthermore, we triangulate the results by looking at earnings smoothing. Smooth earnings patterns can improve earnings informativeness (Tucker and Zarowin, 2006) and can signal CEOs' knowledge of the firm. However, smoothing can also be achieved through manipulation, in which case it can be a symptom of entrenchment.

Our definition of accrual quality follows the literature (e.g., Dechow and Dichev, 2002, McNichols, 2002, Huang and Hilary, 2018).¹⁸ The classification of a restatement of a firm's (quarterly, annual, or otherwise) results tracks the year(s) to which the restatement applies, not the announcement year of the restatement. Information about restatements is retrieved from the

¹⁸ We calculate the variable *Accrual quality* at year t as the standard deviation of the residuals (during the years $t-3$ to $t-1$) from the following equation: $TA_{i,t} = \alpha_0 + \alpha_1 CFO_{i,t-1} + \alpha_2 CFO_{i,t} + \alpha_3 CFO_{i,t+1} + \alpha_4 \Delta Sales_{i,t} + \alpha_5 PPE_{i,t} + \varepsilon_{i,t}$. We estimate this equation for each year and two-digit SIC industry and, alternatively, for each year and Fama-French 48 industry. *Accrual quality* is multiplied by -1 , i.e., the values increase with financial reporting quality. The variables used in the above equation are defined in the caption to Table 4.

Capital IQ database. We also follow the literature to measure earnings smoothing (Tucker and Zarowin, 2006).¹⁹ We regress our three measures of financial reporting quality on *CEO tenure*, with and without its squared term and the controls used in Table 2.²⁰

The regression results are shown in *Table 7*. Columns (1) and (2) present the results for firm fixed effects regressions explaining the variable *Accrual quality*. Columns (3) and (4) present the results for probit regressions with controls for two-digit SIC industries, which explain the indicator variable *Restatement*. Columns (5) and (6) present the results for firm fixed effects regressions with *Earnings smoothing* as the dependent variable. In odd column numbers, we omit the squared term of CEO tenure, and include it in even column numbers. Overall, the results support the hump-shaped relation between CEO tenure and firm value. Specifically, in column (2), we find a hump-shaped relation between CEO tenure and accrual quality, which has a turning point of 12.5 years. When we calculate accrual quality based on Fama-French 48 (instead of two-digit SIC) industries, we find a statistically significant hump shape with a turning point of 10 years (not reported). This finding indicates that financial reporting quality and firm value follow the same pattern, in line with the accrual quality premium and CEOs' incentives to obfuscate their performance in the early and the late years of their tenure. Consistently, we find that the likelihood of a restatement follows a U-shaped pattern with CEO tenure, as per column (4), which suggests that restatements become less

¹⁹ We calculate the variable *Earnings smoothing* by first estimating discretionary accruals using the following equation, where all variables are deflated by lagged total assets: $TA_{i,t} = \alpha_0 (1/Assets_{i,t-1}) + \alpha_1 \Delta Sales_{i,t} + \alpha_2 PPE_{i,t} + \alpha_3 ROA_{i,t} + \varepsilon_{i,t}$. The fitted values and residuals from the equation above are non-discretionary and discretionary accruals, respectively. Pre-discretionary income is defined as net income minus discretionary accruals. We then compute earnings smoothing as the correlation between the change in discretionary accruals and the change in pre-discretionary income over years t-4 to t. Finally, we use a firm's reversed fractional ranking within each industry-year to compute *Earnings smoothing* (untabulated results are equivalent using the continuous measure).

²⁰ Our results remain qualitatively similar when we additionally control for the variables *Cash* (i.e., cash to total assets), *Dividend* (i.e., an indicator variable that equals one if a firm pays a dividend in year t, and zero otherwise), *Operating cycle* (i.e., the log of 360 times the sum of receivables over sales and inventory over COGS), *Tangibility* (i.e., tangible to total assets), *Vol (CFO)* (i.e., volatility of CFO over the last 3 years), *Vol (Sales)* (i.e., volatility of sales over the last 3 years), which have been used to explain the quality of financial reporting. We also control for auditor tenure and its square term because recent empirical evidence (e.g., Davis, Soo, and Trompeter [2009], Bell, Causholli, and Knechel [2015]) suggests that audit quality exhibits a hump-shaped relation with auditor tenure. We obtain similar results (not tabulated).

likely over the earlier years of tenure and become increasingly likely over the later years of tenure. This finding provides ex post evidence of earnings management that complements the ex-ante evidence on accrual quality. Interestingly, though, the results in column (6) fail to indicate that earnings smoothing follows a hump shape over CEO tenure. Instead, the results in column (5) show a positive and statistically significant monotonic association between CEO tenure and earnings smoothing. While, in isolation, this positive association could indicate that earnings become more predictable as CEOs gain experience, the accrual quality and restatement results suggest otherwise. That is, collectively, the results are consistent with high-tenure managers entrenching themselves by obfuscating their declining contribution to firm value through more opaque financial reports.²¹

7. Conclusions

Neither theoretical models nor existing empirical evidence provides a clear picture of the relation between CEO tenure and firm value and how it relates to CEO learning, the quality of the CEO-firm match, and CEO entrenchment. Against this background, our study provides robust evidence that the value of the average S&P 1500 company exhibits a hump-shaped relation with CEO tenure. This hump shape is subject to meaningful cross-sectional variation: firm value declines after fewer/more years of tenure depending on the level of exogenous CEO entrenchment, industry dynamics, and CEOs' adaptability to changes. Furthermore, financial reporting quality exhibits a similar association with CEO tenure. This evidence is in line with a deteriorating CEO-firm match and increasing entrenchment, which in combination cause a decline in firm value over the CEO's later years in office. Consistent with the importance of the CEO-firm match, such a decline in firm value applies only to CEOs who are less adaptable to changes.

²¹ Consistent with that interpretation, we find that the results are driven by the high antitakeover protection subsample, i.e., more entrenched CEOs (not tabulated).

Our study improves the understanding of the channels through which firm value changes during the average CEO's tenure. Our study highlights CEOs' varying contribution to firm value over their tenure and the value of managerial adaptability, which provides an explanation for the growing number of generalists and outside hires among CEOs. We provide empirical evidence indicating that in today's dynamic world a major cost of entrenchment is that CEOs remain in office although they are no longer the optimal match for their company. However, the results also indicate that CEO entrenchment is not a rampant issue leading all CEOs to "enjoy the quiet life". First, the average CEO appears to leave at or before the average "peak" in the CEO-firm value association. Second, some CEOs stay past their peak even when the risk of entrenchment is low – likely because there is no readily available better option to replace them.

The results presented in this paper help explain why initially successful CEOs can be associated with declining firm value over the later course of their tenure, as suggested by anecdotal evidence. The evidence indicates that regular CEO turnover can be valuable to shareholders but does not support a fixed policy of CEO term limits. The results should be informative to boards of directors who must weigh the pros and cons of rewarding highly-performing CEOs with increasing power and consider CEO adaptability as a useful trait in the hiring and renewal process.

APPENDICES

Appendix A – CEO-firm match and firm performance

Anecdotal evidence on deteriorating CEO-firm match quality over time:²²

Microsoft

“[...] Steve Ballmer was a strong fit for Microsoft’s challenges when he was promoted to CEO in 2000. The company’s twenty years of entrepreneurial success had positioned the company to reap greater financial rewards using a more disciplined operational focus. **Ballmer effectively led this shift and saw strong revenue growth from it.** However, by the middle of the decade, Google was growing, YouTube was forming, and “operational excellence” wasn’t a differentiating strategy in technology. **Ballmer had done his job, but the strategic needs of the organization had shifted. As CEO fit decreased, Ballmer’s performance followed** and he was pressured out of the job in late 2013.”

Home Depot

“[...] In the late 1990’s, Home Depot’s rapid growth had outpaced its corporate infrastructure and was hiding serious cost management challenges. **Their board hired Robert Nardelli from GE to quickly install the organizational foundation necessary to continue the company’s growth and better manage costs.** Nardelli’s background and personality were a perfect fit for that challenge and he delivered some of the company’s most profitable years. But with the infrastructure and discipline in place, the company needed a leader who could drive innovation-based growth. **No one should have expected Nardelli to transition to fit with the new challenge and profile needed, but the board didn’t pro-actively change CEOs and Nardelli suffered through a needlessly messy exit.**”

Case study evidence on the value implications of the CEO-firm match:

Groysberg, McLean, and Nohria [2006] study a sample of 20 replacement managers, who are all former General Electric executives, and classify the managers as cost cutting, growth, or cyclical managers. The authors find that managers are only successful in their new jobs if their skill type matches the strategy required by the new job.

²² See “Assess Your CEO’s Strategic Fit Over Time”, *Harvard Business Review* Blog Network, March 2014.

Appendix B – 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 (following Masulis and Mobbs [2014]). 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>
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>

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>
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>
Max CEO tenure	The largest value of CEO tenure in the sample per CEO-firm pair. <i>Source: ExecuComp</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>

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 C – Addressing concerns of extrapolation, outliers, and sample selection

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, 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 all observations for which *Max CEO tenure* is between 8 and 22 years (the 50th and 90th percentiles of *Max CEO Tenure*, which ranges from 0 to 60 years), i.e., the respective CEOs stayed with their firm for at least 9 years, but no longer than 23 years. Specification (2) further restricts the sample to all observations for which *Max CEO tenure* is between 8 and 17 years. Specification (3) shows regression results for a subsample of CEOs who stayed with their firm for a maximum of 11 years (*Max CEO tenure* ≤ 11 yrs). Specification (4) shows regression results for a subsample of CEOs who have already been in office for more than 11 years (i.e., *CEO tenure* > 11 yrs) and who stayed with the firm for a maximum of 13 to 18 years (i.e., 12 ≤ *Max CEO tenure* ≤ 17 yrs). Control variables are identical to those used in regression (3) of Table 2. All other variables are defined in Appendix B. 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)
	$8 \leq \text{Max CEO tenure} \leq 22 \text{ yrs}$	$8 \leq \text{Max CEO tenure} \leq 17 \text{ yrs}$	$\text{Max CEO tenure} \leq 11 \text{ yrs}$	$\text{CEO tenure} > 11 \text{ yrs} \ \& \ 12 \leq \text{Max CEO tenure} \leq 17 \text{ yrs}$
CEO tenure	0.0646***	0.0675**	0.0174**	-0.1965***
	(2.952)	(2.146)	(2.029)	(-5.103)
CEO tenure squared	-0.0021**	-0.0028**		
	(-2.456)	(-1.982)		
<i>CEO characteristics</i>				
CEO age	-0.0171*	-0.0114	-0.0017	-0.0067
	(-1.732)	(-1.235)	(-0.502)	(-0.266)
CEO gender	0.0622	-0.2892	0.0692	–
	(0.196)	(-1.291)	(0.735)	
CEO power index	-0.0681**	-0.0718**	-0.0229	0.0582
	(-2.088)	(-2.073)	(-0.857)	(1.031)
Founder CEO	-0.0072	-0.2921	0.4034	–
	(-0.018)	(-1.079)	(0.873)	
Governance characteristics	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,717	4,943	8,546	817
R-squared (within)	0.295	0.280	0.283	0.271

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Figure 1 – CEO entrenchment: CEO power and forced turnover as functions of CEO tenure

This figure shows results from locally weighted regressions (lowess) of the *CEO power index* and *Forced turnover* on *CEO tenure* for the sample of S&P 1500 companies (excluding SIC codes 4000-4999 and 6000-6999) over the period 1998-2011. Lowess regressions provide a semiparametric way of estimating the relation between CEO power and CEO tenure as well as CEO forced turnover and CEO tenure. The bandwidth is 0.4. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. *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*. *Forced turnover* is an indicator variable that takes the value of one if the turnover is classified as forced according to Peters and Wagner (2014) and Jenter and Kanaan (2015) who provided the data.

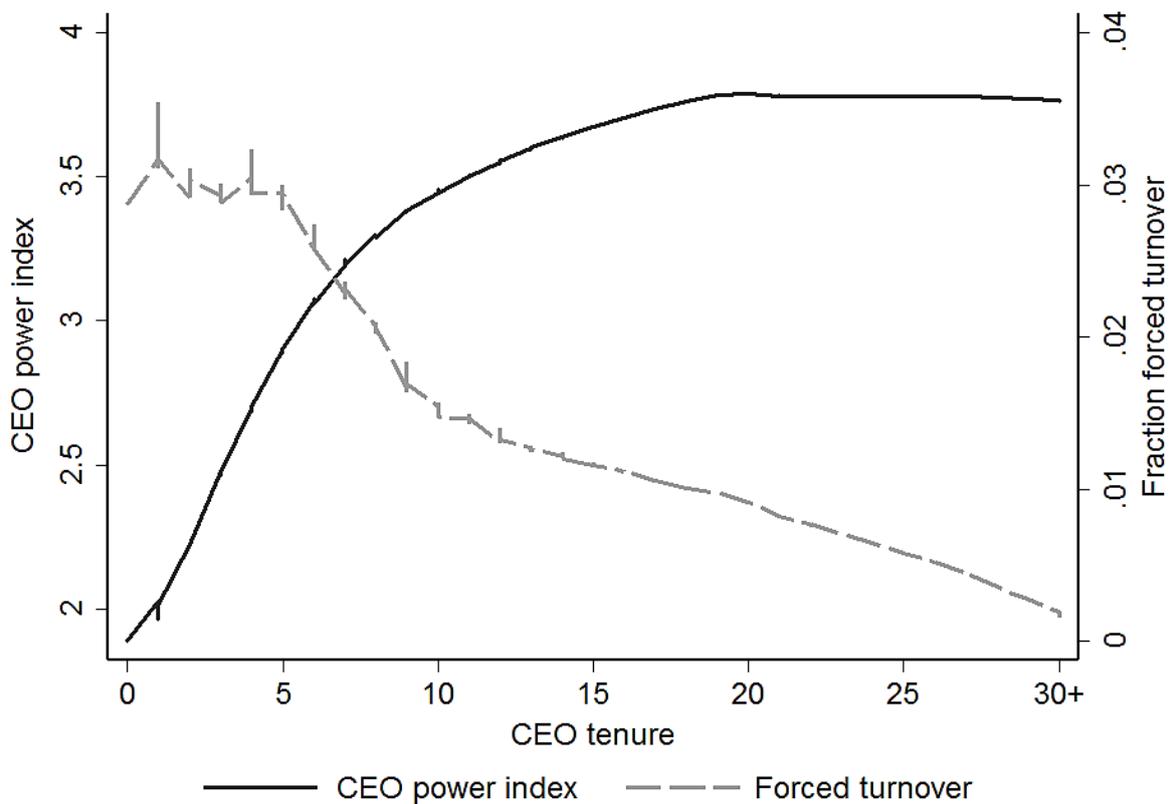


Figure 2 – Semiparametric estimation of the relation between CEO tenure and firm value

Figure 2a shows the results from a locally weighted regression (lowess) of residuals of *Tobin's Q* on *CEO tenure* for the sample of S&P 1500 companies (excluding SIC codes 4000-4999 and 6000-6999) over the period 1998-2011. *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. Lowess regressions provide a semiparametric way of estimating the relation between firm value and CEO tenure. Figure 2b shows the results from a locally weighted regression (lowess) of residuals of *Tobin's Q* on *CEO tenure* for all observations with tenure values ≤ 11 years while Figure 2c presents the results for all observations with tenure values > 11 years. The bandwidth is 0.4. The residuals of *Tobin's Q* are from a regression of our baseline model shown in column (3) of Table 2 where we omit the variables *CEO tenure* and *CEO tenure squared*.

Figure 2a – Semiparametric estimation of the relation between CEO tenure and firm value

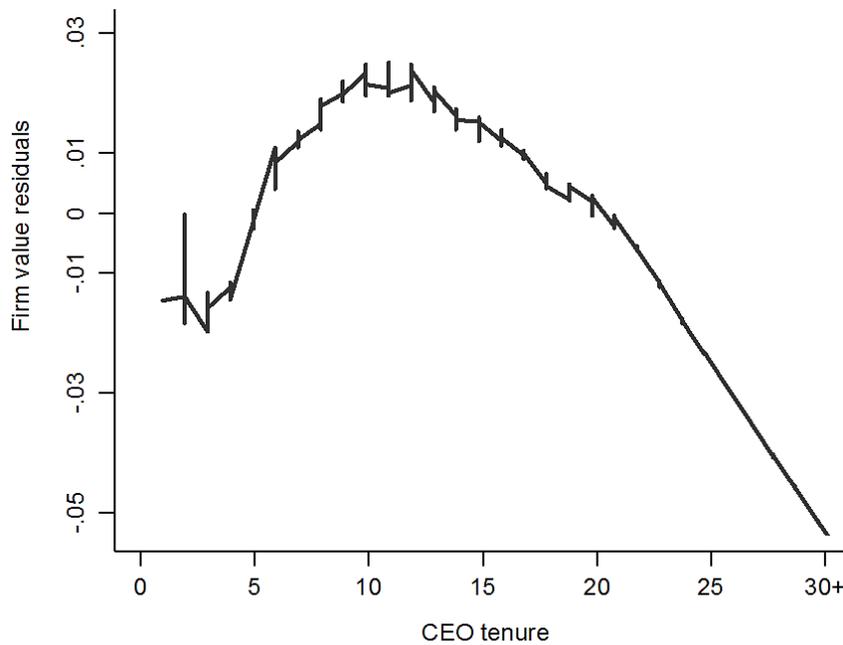


Figure 2b – Semiparametric estimation if CEO tenure ≤ 11 years

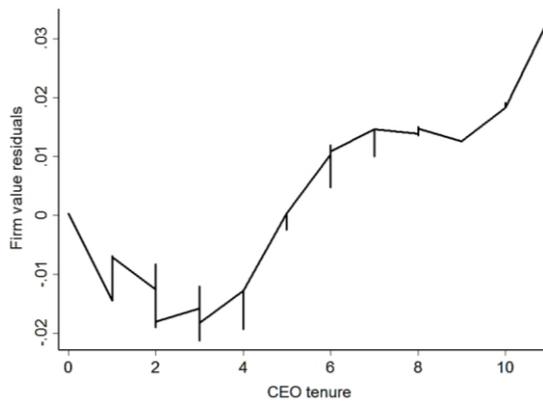


Figure 2c – Semiparametric estimation if CEO tenure > 11 years

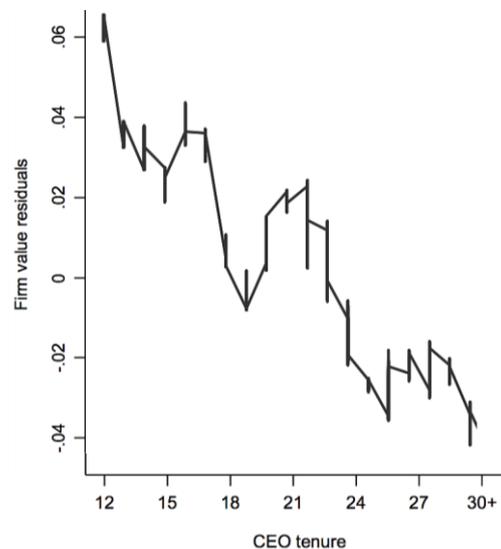


Table 1 – Summary statistics

This table presents summary statistics for the sample of S&P 1500 companies (excluding SIC codes 4000-4999 and 6000-6999) comprising 12,427 firm-year observations based on 1,782 unique firms and 3,054 unique CEO-firm pairs over the period 1998-2011. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. *Max CEO tenure* is the largest value of *CEO tenure* in the sample for each CEO-firm pair. Both *CEO tenure* and *Max CEO tenure* take on integer values between 0 and 60. CEOs leave in their honeymoon period if *Max CEO tenure* is smaller than three years. All other variables are defined in Appendix B.

	Obs.	Mean	Median	1. Quartile	3. Quartile	SD
<i>CEO tenure</i>						
CEO tenure	12,427	7.67	5.00	2.00	10.00	8.02
Max CEO tenure (cross-sectional)	12,427	10.51	8.00	5.00	13.00	8.42
Max CEO tenure (CEO-firm pair)	3,054	8.22	6.00	3.00	11.00	8.01
Max CEO tenure w/o CEOs who leave in honeymoon	2,367	10.28	8.00	5.00	13.00	7.98
CEOs who leave in honeymoon (dummy)	3,054	0.22				0.42
Max CEO tenure \geq 10 yrs (dummy)	3,054	0.31				0.44
Max CEO tenure at turnover w/o CEOs who leave in honeymoon	948	11.12	8.00	5.00	14.00	8.46
<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
Director ownership	12,427	0.002	0.0005	0.0002	0.001	0.005
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
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 – The relation between CEO tenure and firm value

This table reports results from firm fixed effects regressions of *Tobin's Q* on different functional specifications of *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). *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. Regression specification (1) uses the natural logarithm of *CEO tenure* (denoted $\ln(\text{CEO tenure})$), while specification (2) uses *CEO tenure*. Specifications (3) and (4) show regression results for a second-order and a third-order polynomial of *CEO tenure*, respectively. Specification (5) shows results of re-estimating regression specification (3) with interacted year and industry (based on Fama French 48 industries) fixed effects as additional controls. Specification (6) 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 B. 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)	(6)
ln(CEO tenure)	0.0162 (0.706)					
CEO tenure		-0.0021 (-0.483)	0.0146** (2.410)	0.0196** (2.401)	0.0130** (2.162)	
CEO tenure squared			-0.0006*** (-3.619)	-0.0010* (-1.937)	-0.0006*** (-3.701)	
CEO tenure cubic				0.0000 (0.926)		
Residual CEO tenure						0.0133** (2.252)
Residual CEO tenure squared						-0.0006*** (-3.682)
<i>CEO characteristics</i>						
CEO age	0.0006 (0.239)	0.0024 (0.828)	0.0019 (0.652)	0.0018 (0.613)	0.0040 (1.393)	0.0023 (0.801)
CEO gender	0.0362 (0.416)	0.0318 (0.365)	0.0411 (0.476)	0.0429 (0.495)	0.0131 (0.163)	0.0420 (0.485)
CEO power index	-0.0164 (-0.866)	-0.0080 (-0.425)	-0.0225 (-1.162)	-0.0241 (-1.243)	-0.0252 (-1.302)	-0.0205 (-1.112)
Founder CEO	0.3503** (2.169)	0.3802** (2.086)	0.4236** (2.283)	0.4295** (2.304)	0.3783** (2.073)	0.4231** (2.315)
<i>Governance characteristics</i>						
Board size	-0.2651*** (-2.758)	-0.2606*** (-2.731)	-0.2591*** (-2.729)	-0.2604*** (-2.739)	-0.2160** (-2.318)	-0.2592*** (-2.729)
Busy board	-0.0548* (-1.756)	-0.0547* (-1.756)	-0.0527* (-1.698)	-0.0523* (-1.686)	-0.0314 (-1.099)	-0.0527* (-1.700)
Director ownership	-3.0998 (-1.395)	-3.1192 (-1.406)	-3.2698 (-1.484)	-3.2242 (-1.466)	-2.6739 (-1.178)	-3.2753 (-1.488)
E-Index	0.0170 (1.036)	0.0174 (1.070)	0.0163 (1.006)	0.0159 (0.983)	0.0220 (1.335)	0.0163 (1.005)
Independence ratio	-0.0253 (-0.191)	-0.0324 (-0.240)	-0.0426 (-0.315)	-0.0436 (-0.322)	-0.0114 (-0.081)	-0.0415 (-0.307)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry*year fixed effects	No	No	No	No	Yes	No
Observations	12,427	12,427	12,427	12,427	12,427	12,427
R-squared (within)	0.295	0.295	0.297	0.299	0.354	0.297
Turning point (yrs)			12.2	9.8	10.8	11.1

Table 3 – CEO tenure and abnormal stock returns to announcements of sudden CEO deaths

This table reports abnormal stock returns to announcements of sudden CEO deaths between 1950 and 2012. Sudden death and CEO data for the years 1950 to 2009 is provided by Tim Quigley and is similar to that used in Quigley, Crossland, and Campbell [2017]. The data is complemented by sudden death and CEO data for the years 1975-2012 provided by Jesus Salas (see Salas [2010]). $CAR [-1,1]$ 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 either the trading day on which the sudden and unexpected death of a CEO is first reported in the news or the next trading day in case a death was announced on a non-trading day. Panel A shows results of left- and two-tailed univariate difference-in-means tests allowing for unequal variances across subsamples (based on CEO tenure). Panel B reports multivariate results for regressions of $CAR [-1,1]$ on CEO tenure and additional controls. Dummy variables for each decade (1950s, 1960s, 1970s, 1980s, 1990s, 2000s, and 2010s) are included in all regression specifications. Specifications (2) to (5) additionally include industry fixed effects based on the Fama and French 12 industries. *Succession plan* is an indicator variable that takes the value of one if the firm has a succession plan in place or announces an interim CEO within one week after the announcement of the sudden death for the years 1992 to 2012 while it equals zero for all earlier years. All other variables are defined in Appendix B. $CAR [-1,1]$ and accounting data are winsorized at the 1st and 99th percentiles. The sample size varies across regression specifications (1) to (7) due to data availability. Robust t-statistics are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Difference-in-means tests for abnormal stock returns around sudden CEO death announcements				
Expected sign	(-)	(+)	left-tailed test (diff < 0)	two-tailed test (diff ≠ 0)
	CEO tenure ≤ median	CEO tenure > median	Difference	Difference
CAR [-1,1]	-0.0134 (N=131)	0.0074 (N=129)	-0.0208*** (-2.44)	-0.0208** (-2.44)
	CEO tenure 1st tercile	CEO tenure 3rd tercile	Difference	Difference
CAR [-1,1]	-0.0157 (N=87)	0.0137 (N=84)	-0.0294*** (-2.76)	-0.0294*** (-2.76)

Panel B: Multivariate evidence from sudden deaths

	<i>CAR [-1,1]</i>				
	(1)	(2)	(3)	(4)	(5)
CEO tenure	0.0015*** (3.542)	0.0012*** (2.690)	0.0014*** (2.624)	0.0025*** (3.219)	
CEO tenure 1st tercile					-
CEO tenure 2nd tercile					0.0460** (2.233)
CEO tenure 3rd tercile					0.0688*** (3.103)
<i>CEO characteristics</i>					
CEO age		0.0017*** (2.688)	0.0019*** (2.672)	0.0005 (0.427)	0.0009 (0.850)
Duality				0.0222 (1.288)	0.0169 (0.982)
Founder CEO		-0.0043 (-0.330)	0.0021 (0.154)	0.0280 (1.398)	0.0309 (1.591)
President				-0.0016 (-0.113)	0.0022 (0.149)
<i>Firm characteristics</i>					
Market-to-book			-0.0016 (-1.300)	-0.0024 (-1.564)	-0.0025 (-1.625)
ROA			-0.0232 (-0.812)	-0.0790* (-1.711)	-0.0923* (-1.979)
Succession plan				0.0450** (2.422)	0.0457** (2.442)
Total assets		0.0087*** (3.319)	0.0110*** (3.231)	0.0153*** (3.255)	0.0161*** (3.391)
Constant	-0.0252*** (-11.851)	-0.1525*** (-3.018)	-0.1584*** (-2.874)	-0.1141 (-1.380)	-0.1282 (-1.592)
Decade controls	Yes	Yes	Yes	Yes	Yes
Industry controls	No	Yes	Yes	Yes	Yes
Observations	260	225	176	101	101
Adj. R-squared	0.053	0.229	0.271	0.332	0.339

Table 4 – Exogenous CEO entrenchment and the relation between CEO tenure and firm value

This table presents firm fixed effects sub-sample regression results of *Tobin's Q* on *CEO tenure* and its squared term along with CEO, firm, and corporate governance characteristics for firms with high and low takeover susceptibility measured via the Takeover index introduced by Cain et al. (2017). 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/>. *Low (High) takeover susceptibility* is an indicator variable that is one if the Takeover index is below or equal to (above) the sample mean, zero otherwise. Absolute and relative changes at the bottom of each panel are calculated with respect the turning point of 12.2 years obtained from regression (3) of Table 2. Control variables are identical to those used in specification (3) of Table 2. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by state of incorporation are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Takeover susceptibility index (Cain et al., 2017)	
	<i>Tobin's Q</i>	
	(1) <i>Low takeover susceptibility</i>	(2) <i>High takeover susceptibility</i>
CEO tenure	0.0142* (1.730)	0.0171*** (4.960)
CEO tenure squared	-0.0006*** (-3.284)	-0.0006*** (-4.869)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	7,502	4,615
R-squared (within)	0.264	0.503
Turning point	11.8	14.3
<i>Absolute change (yrs)</i>	- 0.4	+ 2.1
<i>Relative change (%)</i>	-3.4	+ 17.2

Table 5 – Industry dynamics, match quality, and the relation between CEO tenure and firm value

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 different industries. 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 regression results for samples of more versus less dynamic industries. Industry dynamism is measured via the industry dynamism index proposed by Coles et al. (2015). Industries are defined based on three-digit SIC clusters. *Dynamism index* is defined as the sum of the following four indicator variables: (i) *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, (ii) *Merger industry* that is set to one if the number of mergers in the industry divided by the number of firms in the industry is above the 50th percentile, zero otherwise, (iii) *Growth industry* that equals one if the average annual sales growth of all firms in the industry is above the 50th percentile, zero otherwise, and (iv) *Fluidity industry* which is set to one if the average of the fluidity scores of Hoberg et al. (2014) is above the 50th percentile, zero otherwise. The index takes on discrete values between 0 and 4, where higher values indicate higher industry dynamism. *High (Low) dynamism* is an indicator variable which equals one if the Dynamism index is above (below or equal to) the cross-sectional median. Panel B shows regression results for samples based on each of the four index components. The number of observations used for the analyses in Panel B can vary due to data availability. Absolute and relative changes at the bottom of each panel are calculated with respect the turning point of 12.2 years obtained from regression (3) of Table 2. In all regressions, control variables are identical to those used in specification (3) of Table 2. An intercept and year fixed effects are included in all regressions, but not reported. Robust t-statistics adjusted for clustering by Fama-French 48 industries are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Dynamism index (Coles et al., 2015)		
	<i>Tobin's Q</i>	
	(1)	(2)
	<i>High dynamism</i>	<i>Low dynamism</i>
CEO tenure	0.0379** (2.373)	0.0055* (1.721)
CEO tenure squared	-0.0022*** (-5.003)	-0.0002* (-1.954)
CEO characteristics	Yes	Yes
Governance characteristics	Yes	Yes
Firm characteristics	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	3,476	8,846
R-squared (within)	0.374	0.394
Turning point	8.6	13.8
<i>Absolute change (yrs)</i>	- 3.6	+ 1.6
<i>Relative change (%)</i>	- 29.5	+ 13.1

Panel B: Dynamism index components

	<i>Tobin's Q</i>							
	(1) <i>R&D industry = 1</i>	(2) <i>R&D industry = 0</i>	(3) <i>Merger industry = 1</i>	(4) <i>Merger industry = 0</i>	(5) <i>Growth industry = 1</i>	(6) <i>Growth industry = 0</i>	(7) <i>Fluidity industry = 1</i>	(8) <i>Fluidity industry = 0</i>
CEO tenure	0.0370*** (2.900)	0.0060** (2.273)	0.0184* (1.865)	0.0072* (1.912)	0.0116 (1.644)	0.0189** (2.409)	0.0287** (2.192)	0.0026 (0.707)
CEO tenure squared	-0.0018*** (-4.943)	-0.0002** (-2.255)	-0.0009*** (-3.026)	-0.0002** (-2.158)	-0.0007*** (-2.957)	-0.0005** (-2.419)	-0.0014*** (-3.754)	-0.0000 (-0.602)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governance charac.	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
Observations	3,911	8,516	6,820	5,607	6,161	6,266	5,207	7,220
R-squared (within)	0.365	0.392	0.304	0.393	0.351	0.290	0.331	0.390
Turning point	10.3	15.0	10.2	18.0	8.3	18.9	10.3	-
<i>Absolute change (yrs)</i>	- 1.9	+ 2.8	- 2.0	+ 5.8	- 3.9	+ 6.7	- 1.9	-
<i>Relative change (%)</i>	- 15.6	+ 23.0	- 16.4	+ 47.5	- 32.0	+ 54.9	- 15.6	-

Table 6 – Adaptable CEOs and the relation between CEO tenure and firm value

This table reports results from firm fixed effects regressions of *Tobin's Q* on *CEO tenure* and its squared term or the natural logarithm of *CEO tenure* (denoted $\ln(\textit{CEO tenure})$) along with CEO, firm, and corporate governance characteristics. Control variables are identical to those used in specification (3) of Table 2. 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 regression results for generalist CEOs. The indicator variable *Generalist CEO* takes the value of one if the General Ability Index (Custódio et al., 2013) is above the annual median value for the respective year, and zero otherwise. The data is retrieved directly from the website of the Journal of Financial Economics. The index is available until 2007. Missing index values for the years 2008 to 2011 are filled with the latest available index value of the respective CEO-firm pair. Specification (1) shows regression results with interaction effects for generalist CEOs. Specifications (2) and (3) show regression results for the sample of *Generalist CEOs*. Specification (2) uses *CEO tenure* and its squared term as the functional form for the relation between *CEO tenure* and *Tobin's Q*, while specification (3) uses $\ln(\textit{CEO tenure})$. Panel B reports results for outside CEOs. The indicator variable *Outside CEO* takes the value of one if the CEO is not classified as an inside CEO according to the definition of Bebchuk, Cremers, and Peyer [2011], and zero otherwise. Accordingly, a CEO is considered an insider 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 ExecuComp data item "JOINED_CO" is missing. Specification (1) shows regression results with interaction effects for Outside CEOs. Specifications (2) and (3) show regression results for the sample of *Outside CEOs*. Specification (2) uses *CEO tenure* and its squared term as the functional form for the relation between *CEO tenure* and *Tobin's Q*, while specification (3) uses $\ln(\textit{CEO tenure})$. 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: Generalist CEOs

	<i>Tobin's Q</i>		
	(1)	(2)	(3)
	<i>All CEOs</i>	<i>Generalist CEOs</i>	
ln(CEO tenure)			0.0999** (2.138)
CEO tenure	0.0186** (2.102)	0.0270* (1.812)	
CEO tenure squared	-0.0009*** (-3.174)	-0.0003 (-0.728)	
CEO tenure * Generalist CEO	-0.0088 (-0.764)		
CEO tenure squared * Generalist CEO	0.0007* (1.676)		
Generalist CEO	-0.0209 (-0.410)		
CEO characteristics	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	10,234	5,147	5,147
R-squared (within)	0.289	0.313	0.313
Test of linear hypothesis			
$(\beta_{\text{CEO tenure squared}} + \beta_{\text{CEO tenure squared} * \text{Generalist}} = 0)$			
F-statistic (Prob. > F-statistic)	0.44 (0.507)		

Panel B: Outside CEOs

	<i>Tobin's Q</i>		
	(1)	(2)	(3)
	<i>All CEOs</i>	<i>Outside CEOs</i>	
ln(CEO tenure)			0.1095* (1.867)
CEO tenure	0.0158* (1.900)	0.0128 (0.570)	
CEO tenure squared	-0.0007*** (-3.095)	0.0006 (0.664)	
CEO tenure * Outside CEO	-0.0157 (-1.114)		
CEO tenure squared * Outside CEO	0.0011** (2.246)		
Outside CEO	0.0160 (0.198)		
Generalist CEO	-0.0218 (-0.658)	0.0225 (0.258)	0.0058 (0.067)
CEO characteristics	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	10,234	1,812	1,812
R-squared (within)	0.288	0.190	0.190
Test of linear hypothesis			
$(\beta_{\text{CEO tenure squared}} + \beta_{\text{CEO tenure squared} * \text{Outside CEO}} = 0)$			
F-statistic (Prob. > F-statistic)	0.82 (0.365)		

Table 7 – CEO tenure and financial reporting discretion

This table reports results from regressions of *Accrual quality* (columns 1 and 2), *Restatement* (columns 3 and 4), and *Earnings smoothing* (columns 5 and 6), respectively, on *CEO tenure* or *CEO tenure* and *CEO tenure squared* as well as controls for CEO, firm, and governance characteristics (similar to those in Table 2). 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). The regressions shown in columns (1) and (2) and (5) and (6) additionally include firm fixed and year fixed effects. The regressions shown in columns (3) and (4) additionally include industry fixed effects based on two-digit SIC code industry classifications and year fixed effects. We calculate *Accrual quality* at year t as the standard deviation of the residuals from Equation (1) during the years $t-3$ to $t-1$. Equation (1): $TA_{i,t} = \alpha_0 + \alpha_1 CFO_{i,t} + \alpha_2 CFO_{i,t} + \alpha_3 CFO_{i,t+1} + \alpha_4 \Delta Sales_{i,t} + \alpha_5 PPE_{i,t} + \varepsilon_{i,t}$. We estimate this equation year by year for each of the two-digit SIC industries. CFO is the operating cash flow, measured as the sum of net income, depreciation and amortization, and changes in current liabilities, minus changes in current assets, scaled by average total assets. $\Delta Sales$ refers to the change in sales revenue, and PPE denotes property, plants, and equipment. The absolute value of the residuals from the above regression serves as our measure of abnormal accruals. The accrual quality measure is multiplied by -1 so that the value increases with financial reporting quality. *Restatement* is an indicator variable that equals one if a firm restates its (quarterly, annual, or otherwise) results for a given fiscal year, and zero otherwise. This classification of a restatement tracks the year (or years) to which the restatement applies, not the year during which the restatement was announced. The definition of the variable *Earnings smoothing* follows Tucker and Zarowin [2006]. Both *Accrual quality* and *Earnings smoothing* are winsorized at the 1st and 99th percentiles. 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.

	Accrual quality		Restatement		Earnings smoothing	
	(1)	(2)	(3)	(4)	(5)	(6)
CEO tenure	-0.0001 (-0.641)	0.0005** (1.984)	0.0023 (0.445)	-0.0179* (-1.695)	0.0022*** (2.736)	0.0013 (0.899)
CEO tenure squared		-0.00002** (-2.576)		0.0006** (2.010)		0.0000 (0.722)
<i>CEO characteristics</i>						
CEO age	0.0001 (0.556)	0.0000 (0.369)	-0.0054 (-1.227)	-0.0063 (-1.485)	-0.0003 (-0.427)	-0.0003 (-0.384)
CEO gender	-0.0093** (-1.987)	-0.* (-1.911)	0.1152 (0.620)	0.0986 (0.529)	0.0282 (0.743)	0.0278 (0.732)
CEO power index	0.0001 (0.168)	-0.0004 (-0.653)	-0.0236 (-0.894)	-0.0004 (-0.016)	0.0004 (0.105)	0.0011 (0.318)
Founder CEO	0.0000 (0.006)	0.0015 (0.257)	0.1294 (1.248)	0.1368 (1.293)	-0.0092 (-0.363)	-0.0116 (-0.453)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Governance charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	No	No	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,344	11,344	12,178	12,178	11,913	11,913
R2 (within) / Pseudo R2	0.085	0.087	0.126	0.128	0.035	0.035

Internet Appendix for “CEO tenure and firm value”

This internet appendix includes additional results that are mentioned and briefly described in our paper but are not reported there for space reasons. The contents are as follows:

Table IA.1: In this table, we investigate alternative explanations related to CEO incentives and corporate (dis)investments for the hump-shaped relation between CEO tenure and firm value. Pan et al. (2016) find that while firms’ disinvestments decrease over the CEO’s tenure, investments increase but with decreasing quality. Under the assumption that disinvestments efficiently reshape the firm, the hump-shaped relation between CEO tenure and firm value might simply reflect this investment pattern. Thus, in addition to firms’ capital and R&D expenditures already controlled for in all of our regressions, in specification (1) we include additional controls for firms’ acquisition and divestiture activities. Specifically, 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, respectively. In specification (2), we control for *CEO ownership* and its square to address a potential hump shape of CEO equity ownership and firm value as suggested by earlier studies such as McConnell and Servaes (1990). We alternatively include the CEOs’ fraction of variable to total compensation and its squared term in specification (3). In specification (4) we control for CEOs’ wealth-performance sensitivity using the data from Edmans et al. (2009). Specification (5) shows the regression results when we include all additional controls simultaneously. We find our results to hold across all regression specifications with all coefficients on *CEO tenure* and *CEO tenure squared* being statistically significant.

Table IA.2: In this table, we attempt to rule out further alternative explanations for the hump-shaped tenure-value relation. First, *CEO tenure* and *CEO tenure squared* might simply pick up the effect of a non-linear relation between firm value and CEO or firm age. Hence, in specifications (1) and (2), we add *CEO age squared* and *Firm age squared* as an additional control variable to our baseline regression model (as reported in column (3) of Table 2), respectively. Second, we might capture a hump-shaped relation between CEO power and firm value as power grows with longer tenure and as it may have both costs and benefits (e.g., Sah and Stiglitz, 1986, Adams et al., 2005). Hence, in specification (3), we add the squared term of *CEO power index* to our standard regression. Third, in specification (4), we additionally control for *Board age* and its squared term, which might correlate with a CEO's tenure and affect firm value. Fourth, Huang and Hilary (2018) report a hump-shaped relation between outside director tenure and firm value. As director tenure correlates with CEO tenure, in specification (5) we extend our baseline model to include *Outside director tenure* and its squared term. Finally, in specification (6) we include all additional explanatory variables simultaneously. We find the hump-shaped relation between CEO tenure and firm value to hold across all six regressions. Furthermore, in support of Huang and Hilary (2018), we find some evidence for a hump-shaped relation between outside director tenure and firm value.

Table IA.3: This table reports results from regressions that account for the endogenous (initial) CEO-firm match and heterogeneity across CEOs. Column (1) shows the results of re-estimating our baseline regression model from column (3) of Table 2 excluding the first two years of tenure for each CEO. Over the CEO's first years in office, most uncertainty about CEO quality, i.e., the CEO's match with the firm, resolves and many poor matches end (Allgood and Farrell, 2003, Dikolli et al., 2014, Pan et al., 2015). Hence, the skill set of CEOs who survive their first years in office is likely to be considered by the board of directors (and investors) to be a good match for the firm's skill needs. Consequently, by focusing on these good matches,

we mitigate concerns of endogenous CEO-firm matching, while being able to control for time-varying CEO quality, which might be important in the context of our study. In this regard, specification (1) further includes additional controls that capture important differences across CEOs. To account for CEO quality, we use the time-varying *Managerial ability score* proposed by Demerjian et al. (2012). Educational differences are captured by a dummy variable *Ivy league graduate*, which equals one if a CEO graduated from an Ivy league college, and by the variable *Education score* that takes on the values 0 (no college degree), 1 (Bachelor), 2 (Master or MBA) and 3 (Ph.D.). Data on CEO education is obtained from the BoardEx database. We further control for the two dummy variables *Recession graduate* (Schoar and Zuo, 2017) and *Inside CEO* to account for early-job and firm-specific experience. The definition of the latter variable follows Bebchuk et al. (2011). In specification (2), we use the same approach as before but replace *CEO tenure* and its squared term by the variable *CEO tenure/Max CEO tenure* and its squared term, i.e., we measure tenure as a fraction of the CEO's maximum realized tenure. This way, we allow life cycles to differ across CEOs, which might be a relevant source of CEO heterogeneity in our context. For example, CEOs might differ in their ability to learn and adapt as well as the time horizon at which they run out of new ideas. In specification (3), we re-estimate specification (2) and use CEO-firm fixed effects as an alternative way of addressing endogenous CEO-firm matching and unobserved (time-invariant) CEO heterogeneity. The latter includes manager-specific effects, such as disclosure, financing, investment, or tax avoidance styles (see, e.g., Bertrand and Schoar, 2003, Bamber et al., 2010, Dyreng et al., 2010, Jia et al., 2014), which might correlate with both CEO tenure and firm performance. Finally, in specification (4), we re-estimate specification (1) replacing firm fixed effects by CEO-firm fixed effects to simultaneously address extrapolation, outliers, endogenous matching, and CEO heterogeneity.

Table IA.4: In the next set of analyzes (Tables IA.5 and IA.6), we address concerns of endogenous CEO turnover. We use CEO turnover data as provided by Peters and Wagner (2014) and Jenter and Kanaan (2015) and apply the authors' definition of forced turnovers. All non-forced turnovers of CEOs aged 63 or older are defined as planned retirements. All remaining turnovers are defined as unclassified turnovers. Table IA.4 shows summary statistics of CEO tenure at the event of the three alternative types of CEO turnover.

Table IA.5: One concern is that the hump-shaped relation between CEO tenure and firm value might be the outcome of performance patterns around CEO turnovers, especially forced turnovers, in conjunction with the use of firm fixed effects. In this regard, Murphy and Zimmerman (1993), Denis and Denis (1995), and Taylor (2010) show that firm profitability tends to decline in the two years prior to forced CEO turnovers and increases in the two years after a new CEO took office. To address this concern, in specification (1) we use the three aforementioned turnover-related dummy variables to control for CEO turnover. In specification (2), we exclude from our sample all firm-year observations in the five-year event window starting two years prior to and ending two years after a forced turnover. Another concern is that the hump-shaped relation between CEO tenure and firm value might simply be attributed to CEO or firm survival. Specifically, it might 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 firms and survive for longer time periods through entrenchment or due to a lack of succession planning. A similar argument is that successful CEOs receive a larger compensation and accumulate more wealth resulting in higher opportunity costs of work and earlier retirement. The acquisition of a company, which is usually associated with high returns (Andrade et al., 2001) while terminating the CEO's tenure with her company, may also cause part of the effect. We consider different sub-samples to address these concerns. In specification (3), we restrict the sample to S&P 500 companies as

CEOs of very large companies are less likely to get recruited to run even bigger firms. The focus on the 500 leading U.S. companies also mitigates concerns of succession problems.²³ In specification (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. In specification (5), we focus on wealthier CEOs, i.e., those with a cumulative total CEO compensation (relative to their tenure) above the median. Finally, in specification (6) we exclude firms that have become takeover targets over the sample period. All these tests use our baseline regression model shown in column (3) of Table 2. The hump-shaped CEO tenure-firm value relation withstands all these robustness tests.

Table IA.6: In this table, we address the concern that the hump-shaped relation between CEO tenure and firm value might simply reflect varying managerial incentive structures as job security of many CEOs might increase over the early years of tenure but decrease afterwards. In this regard, Cziraki and Groen-Xu (2017) find that job security affects corporate risk-taking and investments (which could affect firm value). Therefore, in a first step we perform a survival analysis using a Cox hazard model with CEO turnover and all three types of CEO turnover as failure events. Again, all tests use our baseline regression model shown in specification (3) of Table 2. The results are shown in *Panel A*. Turnover refers to the next year ($t+1$). Results show that all types of turnover are less likely, if the CEO has more power or if she is the founder of the company, while turnover probability is higher when the board is more independent. Furthermore, higher firm value and accounting performance reduce the likelihood of forced turnover. These results are in line with the literature. In a second step, we run our baseline regression model from specification (3) of Table 2 and additionally include the resulting hazard rate (for each type of turnover), or the hazard rate and its squared term, to account for the

²³ The finding that the tenure-firm value relation remains hump-shaped even for S&P 500 firms, which are best able to attract new CEO candidates, suggests that incumbent CEOs seem to overstay likely due to entrenchment rather than because the firms cannot attract value-enhancing CEO candidates to replace them.

endogeneity of turnover and for CEO job security. The results in *Panel B* remain qualitatively similar. Overall, the results of all aforementioned tests confirm our main finding from Section 4.1.

Table IA.7: In this table, we provide complementary evidence from corporate investment decisions to provide the reader with a better understanding of the CEO tenure-firm value relation. We investigate a major channel through which CEOs create and destroy firm value, acquisitions. The hump-shaped relation between CEO tenure and firm value likely reflects CEOs' investment decisions. Specifically, over the early years of tenure those CEOs with a non-optimal skill set and fit who are likely associated with less successful acquisitions are more likely to be fired. In this regard, Lehn and Zhao (2006) provide evidence for an inverse relation between M&A bidder returns and the likelihood of CEO turnover. As CEOs' fit with their firms eventually deteriorates at long tenure levels, and CEOs become increasingly entrenched, we expect investment decisions to become worse. Thus, we expect to find a hump-shaped relation between CEO tenure and abnormal stock returns in reaction to acquisition announcements. An analysis of announcement returns allows a straightforward market-based assessment of the quality of CEOs' investment decisions. In this regard, acquisitions are an ideal setting to study the quality of CEOs' decisions as they are among the largest and most easily observable investments, which tend to be directly influenced by CEOs (Custódio and Metzger, 2013).

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. We further require a transaction's total value to represent at least 5% of the acquirer's market capitalization 20 days prior to deal announcement. 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 1,526 acquisitions made by 806 distinct firms when we use the same control variables as in Section 4.1.

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 firm characteristics used in Section 4.1, we also control for deal characteristics following previous research (e.g., Custódio and Metzger, 2013, Moeller et al., 2004). They include geographic and industry relatedness, the payment method, relative deal size, target ownership status, 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. The deal-related variables are defined in the caption of Table IA.7.²⁴

Columns (1) and (2) of Table IA.7 report the results from 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) shows results based on industry fixed effects (in order to make the results more comparable to the M&A literature), while column (2) shows results based on firm fixed effects. Columns (3) and (4) show results from regressions that are based on the extended set of control variables and firm fixed effects. 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 deal size of at least 10%. Additionally, column (5) shows regression results for

²⁴ 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 36%. Custódio and Metzger (2013), for example, report values of 24% and 32%, respectively.

CAR [-5,5] instead of *CAR [-1,1]* as the dependent variable to account for event uncertainty. The results across all five regression specifications support a hump-shaped relation between CEO tenure and acquisition announcement returns. The relatively lower returns to acquisition announcements associated with very short or very long CEO tenure support, and help to explain, our findings on the relation between CEO tenure and firm value presented in Section 4.1. Consistent with the results on the tenure-firm value relation, we find the turning point of CEO tenure to be located in the area of 8.5-14 years when firm fixed effects are used.

Table IA.1 – Addressing alternative explanations related to CEO incentives and investment patterns

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. *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. *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. *CEO ownership* is the percentage of shares outstanding held by the CEO, winzORIZED at the 1st and 99th percentiles. *Fraction of variable compensation* is the 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/>). Control variables are identical to those used in regression (3) 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)
CEO tenure	0.0145** (2.399)	0.0153** (2.555)	0.0154** (2.572)	0.0150** (2.164)	0.0167** (2.449)
CEO tenure squared	-0.0006*** (-3.604)	-0.0006*** (-3.587)	-0.0006*** (-3.704)	-0.0006*** (-3.534)	-0.0006*** (-3.586)
<i>Further explanations</i>					
Acquisition	-0.0570*** (-3.053)				-0.0581*** (-2.724)
Divestiture	0.0106 (0.480)				0.0099 (0.408)
CEO ownership		-0.5926 (-1.594)			-0.6012 (-1.263)
CEO ownership squared		0.1723 (0.779)			0.1729 (0.642)
Fraction of variable compensation			-0.4481** (-2.021)		-0.4176* (-1.897)
Fraction of variable compensation squared			0.6515*** (3.533)		0.6056*** (3.251)
Scaled wealth-performance sensitivity				0.0000 (0.905)	0.0001 (0.976)
Scaled wealth-performance sensitivity squared				-0.0000 (-0.326)	-0.0000 (-0.480)
CEO characteristics	Yes	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	12,427	12,427	12,363	10,399	10,340
R-squared (within)	0.300	0.300	0.303	0.287	0.292

Table IA.2 – Addressing alternative non-linear relations

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) to (5) each address one alternative non-linear relation with firm value. Regression specification (6) contains all control variables (to address all non-linear relations) at once. *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. *CEO age* is the age of the firm's CEO measured in years. *Firm age* is the natural logarithm of the number of years the firm is listed in CRSP. *Board age* is the average age of the board of directors. *Outside director tenure* is the average number of years the outside directors have served on the firm's board. Control variables are identical to those used in regression (3) 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)
CEO tenure	0.0127* (1.943)	0.0142** (2.385)	0.0147** (2.465)	0.0143** (2.370)	0.0148** (2.439)	0.0119* (1.893)
CEO tenure squared	-0.0005*** (-2.925)	-0.0006*** (-3.600)	-0.0006*** (-3.624)	-0.0006*** (-3.611)	-0.0006*** (-3.621)	-0.0005*** (-2.856)
<i>Alternative non-linear relations</i>						
CEO age squared	-0.0003 (-1.276)					-0.0004 (-1.354)
Firm age squared		-0.0843 (-1.603)				-0.0755 (-1.426)
CEO power index squared			0.0042 (0.429)			0.0035 (0.355)
Board age				-0.0099 (-0.096)		-0.0474 (-0.446)
Board age squared				-0.0000 (-0.031)		0.0003 (0.298)
Outside director tenure					0.0162 (1.362)	0.0224* (1.752)
Outside director tenure squared					-0.0010* (-1.875)	-0.0009* (-1.733)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	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	0.300

Table IA.3 – Unobserved CEO heterogeneity and endogenous CEO-firm matching

This table reports results from multivariate regressions of *Tobin's Q* on *CEO tenure* and its squared term or *CEO tenure/Max 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). *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. Specifications (1) and (2) show firm fixed effects regression results with additional control variables capturing differences between CEOs. These controls are: (i) *Education score*, which is measured on a four-point scale reflecting the highest level of education a CEO attained (0 = no college degree or missing, 1 = bachelor's degree, 2 = master's degree or MBA, 3 = Ph.D. degree), (ii) *Inside CEO*, which is an indicator variable that takes the value of one if a CEO is classified as an inside CEO according to the definition of Bebchuk et al. (2011), zero otherwise. A CEO is considered an insider 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, (iii) *Ivy League graduate*, which is an indicator variable that takes the value of one if the CEO graduated (at any level) from an Ivy League college, zero otherwise, (iv) *Managerial ability score*, which is a measure of managerial ability developed by Demerjian et al. (2012) (<https://community.bus.emory.edu/personal/PDEMERJ/Pages/Download-Data.aspx>), (v) *Recession graduate*, which is a dummy variable that takes the value of one if the CEO entered the labor market during a recession year, zero otherwise. The definition follows Schoar and Zuo (2017). Market entry of managers is approximated by the manager's year of birth plus 24 years. Recession years are based on the business cycle dating database of the National Bureau of Economic Research (NBER). Results shown in regression specification (1) are obtained from excluding all observations with *CEO tenure* < 2 (i.e., excluding all CEOs who are in their first two years of tenure). Specification (2) uses *CEO tenure* standardized by *Max CEO tenure* (denoted *CEO tenure/Max CEO tenure*) and its squared term as an alternative, CEO-specific measure of CEO tenure for the sample of firm-year observations for which *CEO tenure* is > 1. Specifications (3) and (4) use CEO-firm fixed effects. Regression results in specification (3) are based on all observations for which *CEO tenure* is > 1. Specification (4) shows regression results for the sample of CEOs who stayed with their firm for at least 9 but no longer than 23 years (i.e., $8 \leq \text{Max CEO tenure} \leq 22$ yrs). All other control variables are identical to specification (3) of Table 2. An intercept is included in all regressions, but not reported. Robust t-statistics reported in parentheses in specifications (1) and (2) are adjusted for clustering by firm. Robust t-statistics reported in parentheses in specifications (3) and (4) are adjusted for clustering by CEO-firm pair. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	<i>Tobin's Q</i>			
	(1)	(2)	(3)	(4)
	<i>CEO tenure > 1 (i.e., w/o first two years of tenure)</i>	<i>CEO tenure > 1</i>	<i>CEO tenure > 1</i>	<i>8 ≤ Max CEO tenure ≤ 22 yrs</i>
CEO tenure	0.0160* (1.699)			0.0531*** (2.846)
CEO tenure squared	-0.0008*** (-3.580)			-0.0019** (-2.476)
CEO tenure/Max CEO tenure		0.7144** (2.323)	0.9566*** (3.309)	
CEO tenure/Max CEO tenure squared		-0.5256** (-2.363)	-0.6719*** (-3.423)	
Max CEO tenure		-0.0107 (-1.194)		
<i>Further CEO characteristics</i>				
Education score	0.0267 (0.698)	0.0304 (0.795)		
Inside CEO	0.0067 (0.089)	0.0111 (0.150)		
Ivy league graduate	-0.0494 (-0.788)	-0.0426 (-0.678)		
Managerial ability score	0.7397*** (3.256)	0.7539*** (3.285)	0.3985* (1.950)	0.7411*** (3.761)
Recession graduate	0.0026 (0.074)	0.0054 (0.152)		
CEO characteristics	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	No	No
CEO-firm fixed effects	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	10,114	10,114	10,144	5,652
R-squared (within)	0.302	0.300	0.250	0.287

Table IA.4 – Summary statistics of CEO tenure at the event of CEO turnover

The table presents summary statistics of *CEO tenure* at the event of CEO turnover for different types of CEO turnovers. *Forced turnover* is an indicator variable that equals one if the turnover is classified as forced according to Peters and Wagner (2014) and Jenter and Kanaan (2015) who provided the data. *Planned retirement* is an indicator variable that is set to one if the turnover is not classified as forced and the CEO is 63 years or older. *Unclassified turnover* is an indicator variable that takes the value of one if the CEO turnover is not classified as a forced turnover or as a planned retirement.

Max CEO tenure at CEO turnover						
	Obs.	Mean	Median	1. Quartile	3. Quartile	SD
Forced turnover	263	4.77	4.00	1.00	6.00	4.97
Forced turnover w/o honeymoon leaver CEOs	164	6.99	5.00	4.00	8.00	5.13
Planned retirement	368	12.25	10.00	6.00	18.00	10.80
Planned retirement w/o honeymoon leaver CEOs	327	14.76	11.00	7.00	20.00	10.52
Unclassified turnover	471	8.53	7.00	4.00	12.00	6.47
Unclassified turnover w/o honeymoon leaver CEOs	402	9.82	8.00	5.00	13.00	6.14

Table IA.5 – Addressing alternative explanations related to endogenous CEO turnover

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). *Tobin's Q* is calculated as total assets minus book equity plus market value of equity all divided by total assets. *CEO tenure* is the number of years the CEO has been serving as the firm's CEO. Regression specification (1) controls for the different types of CEO turnovers and excludes the last observation for each firm. *Forced turnover* is an indicator variable that equals one if the turnover is classified as forced according to Peters and Wagner (2014) and Jenter and Kanaan (2015) who provided the data. *Planned retirement* is an indicator variable that is set to one if the turnover is not classified as forced and the CEO is 63 years or older. *Unclassified turnover* is an indicator variable that takes the value of one if the CEO turnover is not classified as a forced turnover or as a planned retirement. Specification (2) excludes firm-year observations in the [-2, 2]-year window around a forced CEO turnover. Specification (3) restricts the sample to S&P 500 companies. Specification (4) excludes all firm-year observations for which the CEO's age exceeds the general retirement age of 65 years. Specification (5) restricts the sample to relatively wealthy, better compensated CEOs 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 (6) excludes firms that have been identified as takeover targets. 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) <i>Controlling for turnover type</i>	(2) <i>w/o [-2, 2]-year window around forced CEO turnover</i>	(3) <i>S&P 500</i>	(4) <i>CEO age ≤ 65 yrs</i>	(5) <i>Cumulative total CEO compensation > Median</i>	(6) <i>w/o takeover target firms</i>
CEO tenure	0.0156** (2.032)	0.0139** (2.106)	0.0452*** (3.028)	0.0165** (2.052)	0.0597*** (3.833)	0.0145** (2.296)
CEO tenure squared	-0.0006*** (-3.513)	-0.0006*** (-3.509)	-0.0015** (-2.372)	-0.0008*** (-2.885)	-0.0027*** (-2.755)	-0.0006*** (-3.566)
<i>Turnover controls</i>						
Forced turnover	-0.2171*** (-3.794)					
Planned retirement	0.0373 (0.780)					
Unclassified turnover	0.0332 (0.455)					
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Governance characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,644	11,369	3,994	11,462	6,238	11,690
R-squared (within)	0.293	0.316	0.411	0.292	0.331	0.296

Table IA.6 – Endogenous CEO turnover: Additional robustness tests

Panel A presents results of a survival model analysis. Regression specification (1) to (4) report coefficients of a Cox proportional hazard model for different failure events as described at the top of each column. In regression specification (1) the failure event equals *CEO turnover*. *CEO turnover* is an indicator variable equal to one if there is a change in the CEO position in year t+1 for any reason. In regression specification (2), the failure event equals *Forced turnover* which is an indicator variable that equals one if the turnover is classified as forced according to Peters and Wagner (2014) and Jenter and Kanaan (2015) who provided the data. In specification (3), the failure event is *Planned retirement*. *Planned retirement* is an indicator variable that is set to one if the turnover is not classified as forced and the CEO is 63 years or older. Specification (4) shows results for the failure event of an *Unclassified turnover*. *Unclassified turnover* is an indicator variable that takes the value of one if the CEO turnover is not classified as a forced turnover or as a planned retirement. *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 for year t. Year and industry-fixed effects (based on Fama-French 48 industry classification) are included in specifications (1) to (4) of Panel A. Panel B reports results of firm fixed effects regressions of *Tobin's Q* on *CEO tenure*, its squared term, and controls for the probability of different CEO turnover types, i.e., the respective hazard rates obtained from the regressions shown in Panel A. Specifications (1), (3), (5) and (7) control for the predicted hazard rate. Specifications (2), (4), (6) and (8) additionally control for the squared term of the hazard rate from Panel A. All other control variables in Panel B are identical to those used in specification (3) of Table 2. All other variables are defined in Appendix B. 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 models				
	(1)	(2)	(3)	(4)
	<i>CEO turnover_{t+1}</i>	<i>Forced CEO turnover_{t+1}</i>	<i>Planned CEO turnover_{t+1}</i>	<i>Unclassified CEO turnover_{t+1}</i>
CEO gender	-0.0835 (-0.329)	0.1682 (0.450)	–	0.2067 (0.598)
CEO of retirement age	0.4270*** (5.596)	-1.3785*** (-4.171)	2.3260*** (19.367)	–
CEO power index	-0.6319*** (-19.504)	-0.7185*** (-11.519)	-0.6259*** (-10.403)	-0.5739*** (-11.609)
Founder CEO	-1.3609*** (-11.910)	-2.0475*** (-5.179)	-1.3340*** (-7.001)	-1.2728*** (-7.782)
<i>Governance characteristics</i>				
Board size	0.0937 (0.596)	-0.2344 (-0.717)	0.5046* (1.758)	0.0384 (0.160)
Busy board	0.1893** (2.381)	0.0793 (0.488)	0.2294* (1.659)	0.1961 (1.580)
Director ownership	6.2416 (1.008)	9.8933 (0.872)	5.7094 (0.431)	8.4524 (0.920)
E-index	0.0382 (1.443)	0.0541 (0.990)	0.0218 (0.466)	0.0605 (1.483)
Independence ratio	2.0148*** (8.221)	1.7756*** (3.617)	1.5985*** (3.656)	2.4278*** (6.327)
<i>Firm characteristics</i>				
Board meetings	0.0965*** (13.178)	0.0985*** (7.809)	0.0523*** (3.238)	0.1107*** (10.333)
Book leverage	0.5091** (2.547)	0.8812** (2.209)	0.8465** (2.392)	0.1335 (0.440)
Business segments	0.1214** (2.246)	0.1867* (1.656)	0.2243** (2.323)	0.0172 (0.206)
Firm age	-0.1836*** (-3.924)	-0.1460 (-1.601)	-0.2244*** (-2.636)	-0.1580** (-2.134)
ln(Total Assets)	-0.0706** (-2.248)	-0.1569** (-2.515)	-0.1120* (-1.941)	-0.0025 (-0.053)
ROAEBitda	-1.4325*** (-2.974)	-3.2454*** (-3.636)	0.6487 (0.761)	-1.3251* (-1.860)
ROAEBitda _{t-1}	0.5564 (1.322)	0.9797 (1.323)	-0.1791 (-0.234)	0.5901 (0.901)
Sales growth	-0.4504*** (-2.844)	-0.7227** (-2.238)	-0.2943 (-1.011)	-0.4093** (-2.027)
Stock return	-0.1713** (-2.309)	-0.9950*** (-5.321)	-0.0601 (-0.582)	-0.0011 (-0.015)
Stock return _{t-1}	-0.0229 (-0.384)	-0.5880*** (-3.350)	-0.0585 (-0.428)	0.0568 (1.264)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	10,514	10,514	10,514	10,514
Likelihood value	-8279.99	-1956.44	-2386.72	-3559.28

Panel B: Controlling for CEO turnover probability

	<i>Tobin's Q</i>							
	<i>CEO turnover_{t+1}</i>		<i>Forced CEO turnover_{t+1}</i>		<i>Planned CEO turnover_{t+1}</i>		<i>Unclassified CEO turnover_{t+1}</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO tenure	0.0149** (2.145)	0.0147** (2.115)	0.0147** (2.107)	0.0148** (2.128)	0.0154** (2.203)	0.0161** (2.293)	0.0150** (2.159)	0.0149** (2.143)
CEO tenure squared	-0.0006*** (-3.378)	-0.0006*** (-3.300)	-0.0006*** (-3.354)	-0.0006*** (-3.283)	-0.0006*** (-3.470)	-0.0006*** (-3.556)	-0.0006*** (-3.393)	-0.0006*** (-3.359)
Hazard rate	-0.0064** (-2.509)	-0.0193*** (-5.518)	-0.0000** (-2.102)	-0.0000*** (-6.489)	-0.0042 (-1.573)	-0.0138*** (-2.831)	-0.0000* (-1.938)	-0.0000** (-2.530)
Hazard rate squared		0.0001*** (3.883)		0.0000*** (6.579)		0.0002** (2.499)		0.0000** (2.279)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governance charac.	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
Observations	10,514	10,514	10,514	10,514	10,514	10,514	10,514	10,514
R-squared (within)	0.293	0.295	0.294	0.299	0.292	0.293	0.292	0.293

Table IA.7 – CEO tenure and abnormal stock returns to acquisition announcements

This table presents results from regressions of three-day cumulative abnormal returns ($CAR [-1,1]$) and eleven-day cumulative abnormal returns ($CAR [-5,5]$) 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 deal 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 Appendix B. Regression specification (1) includes year and industry fixed effects, while specifications (2) to (5) 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 deal size:	<i>CAR[-1,1]</i>				<i>CAR[-5,5]</i>
	$\geq 5\%$ (1)	$\geq 5\%$ (2)	$\geq 5\%$ (3)	$\geq 10\%$ (4)	$\geq 5\%$ (5)
CEO tenure	0.0013*** (2.895)	0.0019* (1.671)	0.0028* (1.894)	0.0049** (2.105)	0.00394* (1.796)
CEO tenure squared	-0.00004*** (-2.652)	-0.00008* (-1.939)	-0.00011* (-1.839)	-0.00022** (-2.130)	-0.00023** (-2.343)
<i>CEO characteristics</i>					
CEO age	-0.0057** (-2.185)	-0.0046 (-0.952)	-0.0004 (-0.070)	0.0004 (0.034)	0.01180 (1.484)
CEO age squared	0.00005** (2.364)	0.00005 (1.099)	0.00001 (0.124)	0.00001 (0.071)	-0.00011 (-1.531)
CEO gender			0.0091 (0.424)	-0.0164 (-0.565)	0.06840 (1.534)
CEO power index			0.0016 (0.522)	0.0010 (0.201)	0.00647 (1.498)
Founder CEO			0.0321 (1.175)	0.0996** (2.369)	0.07726** (2.246)
<i>Acquirer characteristics</i>					
Book leverage			-0.01338 (-0.529)	0.04114 (1.009)	-0.01396 (-0.305)
Business segments			-0.00465 (-0.608)	0.00008 (0.006)	-0.01524 (-1.450)
Firm age			-0.01249 (-0.821)	0.00539 (0.185)	-0.01161 (-0.571)
Firm risk			0.02363 (0.924)	0.01697 (0.459)	0.06852* (1.856)
Market-to-book	0.0009* (1.941)	0.0009 (0.563)	-0.0003 (-0.311)	-0.0054** (-2.348)	-0.00272* (-1.665)
Operating CF			-0.0522 (-1.527)	-0.0332 (-0.708)	-0.10395* (-1.951)
Total assets	-0.0022* (-1.797)	0.0045 (0.737)	0.0077 (0.988)	-0.0023 (-0.192)	-0.00132 (-0.124)
<i>Governance characteristics</i>					
Board size			-0.0366 (-1.550)	-0.0728* (-1.785)	-0.01200 (-0.402)
Busy board			0.0200*** (2.734)	0.0217 (1.418)	0.03125*** (2.781)
Director ownership			-1.3644* (-1.721)	-1.6921 (-1.320)	-1.78950 (-1.427)
E-index			0.0006 (0.132)	0.0039 (0.469)	0.00577 (1.072)
Independence ratio			0.0069 (0.253)	0.0026 (0.065)	0.01053 (0.266)
<i>Deal characteristics</i>					
Cross-border	0.0042 (1.144)	0.0042 (0.822)	0.0018 (0.320)	0.0008 (0.075)	0.00476 (0.616)
Hostile	-0.0360 (-1.075)	-0.0078 (-0.250)	-0.0149 (-0.468)	-0.0471* (-1.869)	-0.01679 (-0.667)
Number previous deals	-0.0001 (-0.356)	-0.0008 (-0.944)	-0.0006 (-0.596)	0.0011 (0.723)	-0.00135 (-0.921)
Payment includes stock	-0.0067* (-1.704)	-0.0039 (-0.723)	-0.0043 (-0.616)	0.0042 (0.373)	0.00318 (0.336)
Public target	-0.0074** (-2.032)	-0.0060 (-1.143)	-0.0057 (-0.921)	-0.0068 (-0.680)	-0.00641 (-0.746)
Relative deal size	-0.0068 (-1.111)	-0.0023 (-0.271)	0.0086 (0.737)	0.0094 (0.646)	0.00833 (0.600)
Same industry	-0.0034 (-0.981)	-0.0089* (-1.781)	-0.0079 (-1.478)	-0.0115 (-1.202)	-0.01894** (-2.501)
Industry fixed effects	Yes	No	No	No	No
Firm fixed effects	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	2,171	2,171	1,526	922	1,526
Adj.-R-squared	0.041	0.017	0.034	0.085	0.069

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