CEO POWER AND BOARD DYNAMICS[*]

John R. Graham[†]

Hyunseob Kim[‡]

Mark Leary[§]

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Abstract

We use a new panel dataset to examine corporate governance from 1918 to 2011 in the context of a bargaining model between the CEO and board of directors. Substantial director turnover occurs when a new CEO is hired but, despite this turnover, board structure is persistent. The changes in board structure that do occur are consistent with economic theory: (i) In the year that a new CEO is hired, board independence increases significantly, consistent with new CEOs having less bargaining power initially; (ii) As the CEO's tenure (and bargaining power) increases, an additional year on the job is associated with a significant decline in board independence, an increase in the probability that the CEO holds the board chairman title, and an increase in compensation; (iii) The tenure-board independence relation is weaker when there is more uncertainty about the CEO's ability and after events that reduce CEO power, such as targeting by activist investors; (iv) Powerful CEOs are less likely to be replaced conditional on poor firm performance; (v) Finally, event studies document a positive market reaction when powerful CEOs die in office, in contrast to no market reaction to typical CEO deaths, consistent with powerful CEOs becoming entrenched.

[†] Fuqua School of Business, Duke University, and NBER; Email; john.graham@duke.edu; Phone: (919) 660-7857.
[‡] Johnson Graduate School of Management, Cornell University; Email: hk722@cornell.edu; Phone: (607) 255-8335.
[§] Olin School of Business, Washington University in St. Louis, and NBER; Email: leary@wustl.edu; Phone: (314) 935-6394.

I. INTRODUCTION

In recent years, regulators and investors have shown increasing interest in the composition of corporate boards of directors.[1] Academic research suggests there is no universally optimal board structure, and the optimal structure may vary both across firms and over time for a given firm. For example, while boards are expected to oversee and monitor managers on behalf of shareholders, too much monitoring can hinder the ability of management to make nimble, optimal decisions. In equilibrium, theory suggests that talented CEOs, whose skills match well to the firms they manage, should be optimally monitored less intensely by the board. Theory also suggests that inside directors are likely to monitor CEOs less intensely. Thus, an equilibrium outcome may result in board independence declining over the tenure of a successful CEO (Hermalin and Weisbach, 1998).

In this paper, we study how the structure of corporate boards evolves through time and how these dynamics relate to the success and tenure of the CEO. In particular, we ask whether the composition of corporate boards changes through time in a manner consistent with theories of optimal governance. Traditional theory suggests optimal board structure reflects firm characteristics that change slowly through time, such as the scope and complexity of a firm's operations or the degree of information asymmetry. At the same time, if optimal structure depends on the board's uncertainty about the CEO's ability and the perceived value of the CEO to the firm, board structure is expected to change both at CEO turnover and within a CEO's tenure.

Fully understanding the forces behind board dynamics requires long within-firm time series that span multiple CEOs and different regulatory and economic environments. And yet most empirical tests have been conducted on repeated cross-sections of data with a modest history of

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[1] For example, in the early 2000s the NYSE and NASDAQ implemented listing requirements that boards be majority independent; more recently, activist investors often focus on board structure and composition.

dynamics between boards and CEOs, and thus few conduct the *within-firm* tests called for by theory. We construct a new database of officers and directors of over 87,000 firm-year observations from 1918 to 2011, allowing us to study board dynamics over many regulatory and economic environments, and within the careers of over 15,000 CEOs. While we are not the first to empirically study CEO-board relations, our long data panel allows us to document many results for the first time, within firms, with more power, and out-of-sample relative to previous research.

We begin Section II by exploring long-term trends in board structure, the proclivity of dual CEO-board-chairs, outside CEO appointments, and CEO turnover. In Section III, among other things, we examine board turnover that occurs coincident with CEO turnover. On average, about one-third of the board is replaced when a new CEO is appointed: 3.6 directors leave the firm (one often being the CEO herself), consisting of about 2.6 dependent directors and 1 independent director (see also Cicero et al., 2013). Interestingly, these departing directors are replaced by about 2.5 new dependent directors and 1 independent director. Thus, even though there is material director turnover, board composition is fairly persistent. For example, we document that firms that initially have independent (or dependent) boards on average still have independent (dependent) dominated boards 30 years later.

While relatively stable, board structure does change, both when a new CEO is appointed as well as over the career of the typical CEO. In Section IV we explore whether these dynamics are consistent with predictions from economic theory. To keep the exposition focused, we organize our exploration of the data around the rich set of predictions emanating from the model of Hermalin and Weisbach (1998; HW), referencing other theory for interpretation and supplemental issues.

The structure of the board in HW (e.g., how 'independent' the board is), as well as compensation and other features of the board-CEO relationship, is determined by a dynamic

bargaining process. In this framework, CEOs prefer less monitoring and are able to affect the intensity of monitoring through their influence on the composition of the board of directors. The bargaining process between the CEO and board thus affects board structure, CEO tenure and compensation jointly. For example, in a given firm, good performance increases the CEO's bargaining power by improving the perception of her ability relative to potential replacements. Successful, powerful CEOs are more likely to be retained and are better able to bargain for a less independent board that monitors less. We explore a number of testable implications that emerge from this dynamic bargaining process. One such prediction is that board structure should persist due to hysteresis: a strong CEO will bargain to achieve a weaker board, which is inherited by the next CEO. Hence the next CEO will be relatively strong and the weaker board structure is likely to continue. As already discussed, we find evidence of persistent board structure.

Another prediction from the HW framework is that the value of monitoring declines as the CEO's perceived ability increases or as uncertainty about that ability declines. This makes the board more willing to accommodate the CEO's preferences by reducing independence as the CEO succeeds and her tenure increases. We find that the ratio of independent directors to total directors on the board declines over a CEO's tenure within a given firm. Thus, despite fairly persistent board structure, we document a negative *within-firm* relation between CEO tenure and board independence. Perhaps more importantly, we document substantial heterogeneity in the relation between tenure and board independence that is consistent with economic theory. In particular, the magnitude of the negative tenure-independence relation is stronger following strong corporate performance (thus higher perceived CEO ability) and when there is less uncertainty about CEO ability. Further, the CEO tenure-board independence relation is weaker when external forces reduce CEO power, such as when activist investors target a firm.

Hermalin and Weisbach (1998) argue that the effect of governance regulation may be muted if it does not alter the underlying bargaining process. Consistent with this prediction, we show that Sarbanes-Oxley and 2003 stock exchange regulations increased board independence as intended; however, consistent with an offsetting substitution effect, we find an increase in the propensity of long-tenure CEOs becoming dual board chairs post-2002. Likewise, HW predict that CEO replacement due to poor corporate performance will be muted for powerful CEOs. Consistent with this prediction, we document that CEOs of low ROA or low stock return firms are more likely to be replaced, but that this performance-turnover relation is attenuated among powerful CEOs (see also Coles et al. (2014) and Dikolli et al. (2014)).

Thus, many of the board-CEO dynamics we document are consistent with predictions from a model of optimal, endogenous governance. The evidence suggests that powerful CEOs receive many advantages, including higher pay, longer tenure, and greater job security. In Section VI, we explore market reactions to the departure of powerful CEOs. Models akin to HW would predict that if a CEO's power emanates from perceived superior ability (or match quality) and expected performance relative to a replacement, her departure could lead to a negative market reaction. Other models would note that powerful CEOs may become entrenched (in that they may extract excess compensation or be shielded from being fired even if expected performance deteriorates) and thus their departures may increase shareholder value (e.g., Taylor, 2010). Because of endogeneity concerns with a broad sample of departures, we focus on CEO turnover due to the CEO's death or serious health issues.[2] Consistent with powerful CEOs becoming entrenched, announcement returns to exogenous CEO departures increase in measures of CEO power (relatively long job tenure, dual board chair, or founder of the firm). In particular, the

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[2] See also Fee, Hadlock, and Pierce (2013), Quigley, Crossland, and Campbell (2016), and Jenter, Matveyev, and Roth (2016).

announcement of a powerful CEO's departure is associated with about a 3% higher abnormal cumulative return over a [-2, 2] day window, relative to departures of a less powerful CEO.

In summary, despite relatively persistent board structure, we find that changes in board structure are consistent with economic theory: CEOs who are powerful by some measures oversee boards that are less independent, earn more pay, and serve as dual board chair; and the magnitude of these relations varies conditionally as expected. Powerful CEOs are also less likely to be replaced upon poor corporate performance, and when they do finally leave office, the market reacts positively.

While some earlier studies have explored elements of board dynamics and the interaction between CEOs and board structure, ours is the first study to use a comprehensive panel of data on board structure and CEO tenure covering thousands of firms and over 90 years. This has several important advantages. First, it enables us to document long-term trends in board structure and CEO turnover. Lehn et al. (2009) also study average board structure over a long horizon, but use a survivorship sample including only 82 of the largest firms. We find substantially different trends using a more comprehensive sample.

Second, prior empirical studies of board dynamics and CEO-board bargaining rely primarily on small samples or short time horizons. While these studies provide helpful insights, this approach has limitations for testing *within-firm* predictions. For one, studies relying on cross-sectional or short panel data often have insufficient within-firm variation to control for fixed firm effects. This limitation makes it difficult to distinguish the effects of CEO tenure on board structure from the effects of other time-invariant firm characteristics that may be correlated with both board structure and tenure. Indeed, we show that the inclusion of firm fixed effects substantially affects these estimated relations. Further, unless one observes multiple CEOs within a given firm, it is

difficult to distinguish between tenure-related changes in board composition and an overall time trend, while still controlling for firm fixed effects.

Third, while bargaining models make numerous predictions about different elements of board structure, compensation, and CEO turnover, extant empirical evidence is based on a collection of studies, each of which typically focuses on a subset of issues and studies different time periods and samples of firms. Our comprehensive data allow us to test many of the predictions from the theory, all on the same sample and over a long time horizon, which enables us to examine how these relations have changed over time, for example, before and after the governance reforms of the early 2000s.

II. SAMPLE CONSTRUCTION AND LONG-TERM TRENDS

II.A. Corporate Boards of Directors and Officers

We construct a comprehensive database of corporate officers and directors, such as the Chief Executive Officer (CEO), Chief Financial Officer (CFO),[3] various corporate vice presidents, and others, at public U.S. companies from 1918 to 2011. We combine information from a number of sources. First, we hand-collect names of corporate officers and directors, as well as financial data on their firms, from Moody's Industrial Manuals ('Moody's') from 1918 to 1988, and also the year 1998.[4] Second, we collect names of corporate directors and officers from Compact Disclosure during 1985-2005. Compact Disclosure derives information from firms' public disclosure such as 10-Ks, 10-Qs, and Proxy Statements. Third, we supplement these two primary

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[3] The 'CEO' includes corporate officers with various titles depending on the era, including 'President' and 'Chief Executive Officer'. The 'CFO' is the finance chief and includes corporate officers in various titles depending on the era, including 'Treasurer' and 'Chief Financial Officer'.

[4] See Graham, Leary, and Roberts (2015) for a description of coverage and available financial statement information in Moody's. Papers that analyze smaller samples of Moody's financial and board information include Lehn, Patro, and Zhao (2009), Frydman, Hilt, and Zhou (2015), and Avedian, Cronqvist, and Weidenmier (2015).

board and officer databases using Mergent (which took over the Industrial Manual from Moody's; 2002-2009) and Board Analyst (2002-2011) for more recent years. We gather stock price and return data from CRSP and financial statement data from Compustat (for firm-years not covered by Moody's).[5] Like most corporate finance research, we do not include firms in the financial (SIC 6000-6999), transportation (4000-4599), and utility (4900-4999) sectors.

To maintain comparability across the various databases and years, we focus on U.S. firms listed on the NYSE or AMEX.[6] We have CEO and board information for nearly 80% of the NYSE/AMEX firms in the CRSP database over the 1918-2011 period. All total, our database contains 87,734 firm-year observations and more than 10,000 CEO turnover events.

II.B. Descriptive Statistics

Table I presents descriptive statistics on firm-year observations in the full database and by decade. CEO turnover averages 11.8% per year for the full sample, increasing from the first to the second half of the sample. The average CEO, CFO, and board chairman tenures are 6.3, 5.1, and 5.9 years, respectively. The CEO holds the title of board chairman ('CEO-Chairman duality') for 41.6% of observations, with substantial time-series variation over the century. The average board has about 10 reported directors (including the chair) for a typical sample firm. Importantly, the ratio of the number of outside directors (i.e., directors who are not current officers of the firm) to the total number of directors is 0.65, and the proportion of independent directors (i.e., directors who are (i) neither current nor previous officers of the firm, nor (ii) family members of the CEO,

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[5] We obtain stock price data from 1920 to 1925 from William Goetzmann.
[6] We identify and delete non-U.S. firms (i.e., ADRs) using an approach as in Marosi and Massoud (2008). Our main results are similar if we include ADRs and NASDAQ firms, or if we use NYSE firms only.

proxied by having the same last name) is 0.58.[7] Both ratios were stable until the 1980s, then increased in recent decades.

Panel B presents descriptive statistics on firm-level financial data (exclusively from Moody's before 1951; mostly from Compustat starting in 1951, though we fix the Compustat backfill problem during 1951-1962). The average firm has $2.31 billion of real book assets in 2000 constant dollars (CPI-adjusted) and is in our sample ("firm age") for about 21 years. Other characteristics are generally similar to those in modern Compustat analysis.

II.C. Long-Term Trends in CEO Turnover, CEO Appointment, and Board Structure

Figure I presents the long-term evolution of various U.S. CEO and board trends. Panel A shows that CEO turnover rates (3-year moving averages) for NYSE and AMEX firms were relatively low from 1922[8] to 1950 before increasing in the middle portion of the sample (1950-1970), then decreasing starting around 1970. The rate of CEO turnover for the later period is comparable with those documented in Kaplan and Minton (2012), who find an average 15.8% turnover rate from 1992 to 2007. In addition, we find a negative (-29.0%, *t*-statistic = -2.87) time-series correlation between CEO turnover rates and average ROA, suggesting that CEO turnover is counter-cyclical. This pattern is consistent with CEO turnover increasing following poor corporate performance (e.g., Warner and Watts, 1988).

Panel B shows 3-year moving averages of the fraction of "outside CEO" (i.e., neither a current nor previous officer of the firm) appointments from 1933 to 2011. We exclude years prior to 1933 to allow a start-up period to accumulate information on previous corporate officers. The frequency of outside CEO appointments declined from the 1930s to the 1940s, then stabilized until

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[7] We do not consider whether a director has business relations with the firm (e.g., lawyers and bankers), given that Moody's and Compact Disclosure do not provide such information on directors.
[8] The first CEO turnover in our database occurs in 1920.

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the 1970s. Beginning in the late 1980s, outside CEOs became increasingly common, reaching around 41% by the mid-2000s. This trend from the 1970s to the 2010s is consistent with evidence in Huson, Parrino, and Starks (2001) and Murphy and Zabojnik (2007) on the frequency of outside CEO appointment. Moreover, the trend is consistent with the argument by the latter that there has been a shift in the importance of managerial skills for CEOs from firm-specific knowledge to general (or portable) managerial ability, such as MBA education. Our evidence from the long time-series highlights this recent trend by placing it in the context of a much longer horizon and highlights that external hires were also common in the 1930s and 1960s.

Panel C presents the ratio of the number of independent directors to the total number of directors from 1933 to 2011. Board independence was stable at about 50% for four decades starting in the 1930s. From the late-1970s to mid-1990s, average board independence increased to around 60%. Following imposition of the 2003 NYSE and NASDAQ amendments that require majority independent boards (and 2002's Sarbanes-Oxley),[9] average board independence increased to 75% by 2011. We later examine whether this mandated increase in board independence affects bargaining outcomes between the CEO and board.

Lastly, Panel D presents the proportion of firms that have CEOs who are also board chairs from 1918 to 2011. The titles of the CEO and chairman were largely separate before the 1960s, at which time the frequency of the dual title increased to a peak of 73% in the mid-1980s. Shortly thereafter, duality began to decrease, possibly due to "governance activists" such as the National Association of Corporate Directors (NACD) which supported separating the two roles (see e.g., Wangler, 1994; NACD, 1996). The downward trend is also consistent with Dahya, McConnell,

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[9] SOX was signed into law in July 2002 and the SEC approved the NYSE and NASDAQ's proposals for new corporate governance requirements in November 2003. See Chhaochharia and Grinstein (2007) for a detailed timeline.

and Travlos (2002) who show that the duality of the titles began to disappear in the U.K. in 1992 when the Cadbury Committee recommended separation of chairman and CEO titles.

III. PERSISTENCE IN BOARD STRUCTURE

Figure I, Panel C suggests that changes in board structure are slow-moving at the aggregate level. In this section we examine the extent to which this is true at the firm level and if so, whether it occurs because directors rarely change or whether director rotation occurs in ways that keep board structure stable. We first document changes in board members in the years surrounding and following CEO turnover. In Table II, we sort observations in event time, where year 0 is the year of a change in CEO, and report the average additions and departures of independent and dependent directors in each year. Panels A and B show these turnovers for internal and external CEOs, respectively. In both panels, addition and departure rates increase in the year of CEO turnover, then revert to relatively stable addition and departure rates. When a new internal CEO is appointed (Panel A), on average one new independent director joins the board and one leaves (0.99 additions and 0.96 departures), a bit higher than the average addition (departure) rate of 0.81 (0.75) in non-turnover years. The increase in board turnover is more pronounced for dependent directors. On average, 2.6 dependent directors leave the board in the year of CEO change and 2.46 dependent directors are added. While in most cases one of the 2.6 (2.46) is the outgoing (incoming) CEO, this still represents a meaningful level of board turnover relative to the average board size of 9.9 members.

Even though roughly 35% of the board turns over in the year of CEO turnover (see also Cicero et al., 2013), because the addition rates are similar to the departure rates, the independence ratio changes little, leading to slow-moving board structure. The movement we do see in year 0,

though, is toward more independence, since slightly fewer dependent directors are added on average than depart. In the years following CEO turnover, the addition and departure rates are similar to each other within a given type of director. There are 0.75-0.89 (0.56-0.73) additions and departures of independent (dependent) directors per year, with the rates generally declining slightly over the CEO's tenure. Panel B shows that the addition and departure rates are also similar to each other within each of the independent and dependent director categories, and decrease over the CEO's tenure, suggesting again slow-moving board structure. One difference, though, is that in year 0, more independent directors leave and dependent directors are added on net.

We now more formally explore board persistent after netting the effects of director rotation. Hermalin and Weisbach (1998) argue that board independence should exhibit persistence or path-dependence over time: "Strong, independent boards will beget stronger, more independent boards than will weak boards" (p.107). Thus, we expect (i) board independence to persist, and that (ii) initial board independence will explain subsequent independence within firms.

First, we visually examine persistence. In each calendar year from 1918 to 1992, we sort all firms into four equal-sized groups based on their board independence ratio, and compute the groups' average independence ratios for the next 30 years. We repeat this process for all calendar years from 1918 to 1992 and then average across the calendar years. Figure II shows that while there is some convergence, differences in board independence ratios on average persist over 30 years (Denis and Sarin, 1999). For comparison, we note that the patterns we document here for board independence are similar to those documented for corporate leverage by Lemmon, Roberts, and Zender (2008), both in terms of the dispersion of initial ratios and the degree of convergence of average ratios over the subsequent 20 years.

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Second, we follow Lemmon, Roberts, and Zender's (2008) capital structure analysis and test whether initial board independence is a significant determinant of future independence by estimating the following equation:

$$Independence_{it} = \alpha_t + \beta_1 Independence_{i0} + \beta_2 CEO\ tenure_{it} + \beta_3 Firm\ age_{it} + X_{it}'\gamma + \varepsilon_{it}, \quad (1)$$

where $Independence_{it}$ is defined as the ratio of the number of independent directors to total directors; α_t represents year-fixed effects; $Independence_{i0}$ is the first observed board independence ratio for firm i; $CEO\ tenure_{it}$ is the number of years for which the CEO has been chief executive in firm i as of year t; $Firm\ age_{it}$ represents the number of years since firm i first appears in our database; X_{it} represents a vector of firm-level control variables including log board size, log number of officers, log book assets, Tobin's q, two-digit SIC industry-adjusted return on assets, and asset tangibility; and ε_{it} represents random errors clustered at the firm level.

Table III, Panels A and B use the full sample (excluding the first year for each firm) and subsamples consisting of the cross-section of firms that survives five, 10, and 20 years, respectively. Panel C repeats the analysis in regressions that include initial board independence as the only independent variable. To facilitate comparisons across variables, we scale each independent variable by its standard deviation. Thus, each coefficient estimate represents the change in board independence (in percentage points) corresponding to a one-standard deviation change in an independent variable. In all three panels, initial independence is positive and highly significant (at a better than 1% level). In fact, its statistical and economic significance is substantially higher than that of any of the other included variables shown in Panel A. In terms of economic magnitude, column 3 of Panel A, which controls for firm-level characteristics, shows that a one-SD increase in the initial independence (19.7 percentage points) is associated with a 7.9 percentage point increase in board independence 20 years after observing the initial independence,

which is greater than the economic magnitude of the effect of any other determinants. In addition, the R^2's in Panel C show that initial board independence explains 38.3% (27.6%) of the variation in board independence 10 (20) years later. As a point of comparison, in untabulated analysis in which we structure our regressions like those in Lemmon, Roberts, and Zender (2008) for capital structure persistence, our R^2's are of similar magnitude to theirs.

Persistence is also evident in Table III, Panel D, which shows the probability of transition from one quartile of board independence to another. In each year, we sort firms into quartiles based on board independence and follow them for ten years. Board independence is most persistent in the two extreme quartiles. For example, 82.5% of firms in the lowest quartile in year 0 are still in the quartile the following year; and the probability of remaining in this same quartile is 58.5% ten years after the initial sorting. Similarly, 77.7% (46.0%) of firms in the highest quartile in year 0 remain in the same quartile one year (10 years) later. We note that these transition probabilities are similar to those documented by DeAngelo and Roll (2015) for leverage. For example, after 10 years, we find that the probability of being in the initial quartile of board independence are 58.5%, 33.3%, 33.0%, and 46.0%, respectively, for quartiles 1 through 4. The same probabilities reported by DeAngelo and Roll (2015) are 52.9%, 33.2%, 34.4%, and 50.7%.

While persistence is evident, it is not complete. Panel E shows results from regressing board independence on firm and year fixed effects. Firm effects that are constant for the entire time a firm exists in our sample explain 57% of the variation in independence over the century. Allowing firm effects to change each 3 decades (e.g., two FEs for a firm that exists between 31 and 60 years in our sample), or including firm-decade FEs, increases the R^2's to 71% and 82%, respectively. Thus, over a long enough horizon, there are changes in board structure within the life of a given firm.

Overall, our descriptive evidence on changes in board composition reveals four main findings. First, there is substantial turnover of board members, especially when there is a change in CEO. Second, changes in board structure, as measured by the independence ratio, are modest relative to the changes in individual board members. Third, as a result, board structure is fairly persistent, of a degree comparable to that of corporate leverage. Fourth, despite this persistence, over longer horizons there are significant within-firm changes in board structures. In the next section, we explore the economic underpinnings of these changes.

IV. BARGAINING POWER, CEO TENURE, AND BOARD STRUCTURE

IV.A. Conceptual Links between CEO Tenure, Power, and Board Structure

Hermalin and Weisbach (1998) argue that board structure and CEO tenure are endogenous outcomes of a bargaining process between the board and the CEO, conditional on firm performance and underlying CEO ability. While CEOs are assumed to prefer less monitoring, when there is high uncertainty about the CEO's ability or her perceived ability is low, monitoring is valuable to the board. However, strong performance partially resolves this uncertainty and increases the board's perception of the CEO's ability, reducing the value of further monitoring. Therefore, when their firms perform well, CEOs are retained and are better able to bargain for reduced monitoring in addition to higher compensation. A powerful CEO thus negotiates that there be fewer independent directors on the board and/or to become its chair.

The HW theory produces many predictions, including (1) a negative relation between CEO tenure and board independence (and board independence increases at the time of CEO turnover); (2) the reduction in board independence over the CEO's tenure primarily occurs among CEOs who perform well; (3) this relation should become more pronounced when there is less uncertainty

about CEO ability; (4) negative external shocks to CEO power reduce the negative tenure-independence relation; (5) positive relations between tenure and both chairman duality and compensation; (6) regulations of the 'symptoms' of CEO power that do not affect the bargaining process may little affect overall board-CEO relations; (7) board structure is persistent (see Section III); and (8) CEO turnover is less sensitive to performance when the CEO is powerful. Note that these are *dynamic, within-firm* predictions, although in the past they have almost exclusively been tested in repeated cross-sections (see Adams, Hermalin, and Weisbach, 2010 for a review). Thanks to our long panel of data, we are able to conduct powerful within-firm tests.

IV.B. Empirical Analysis of CEO Power, Tenure, and Board Structure

In Figure III, we explore the first prediction in a univariate fashion by showing average board independence and the fraction of dual CEO-chairmen as functions of CEO tenure at a given firm. Panel A shows that board independence decreases almost monotonically in CEO tenure by 0.3 percentage points per year (significant at the 1% level). In particular, the independence ratio is about 58% for new CEOs and 51% for those with 25 or more years of tenure. Panel B shows that CEOs with longer tenure are more likely to be a board chairman as well. In particular, a one-year increase in tenure is associated with a 1.8 percentage-point increase in the probability that the CEO is a board chairman.

We formally test these relations on a panel of firm-years from 1918 to 2011 by estimating the following equation describing the dynamic relation between the CEO's tenure, board independence and chairman duality within firms:

$$Board\ outcome_{it} = \alpha_i + \alpha_t + \beta_1 CEO\ tenure_{it} + \beta_2 Firm\ age_{it} + X_{it}'\gamma + \varepsilon_{it}, \qquad (2)$$

where *Board outcome$_{it}$* is either board independence, defined as the ratio of the number of independent directors to total directors, CEO-chairman duality, or compensation (defined below);

α_i and α_t represent firm- and year-fixed effects; the other variables are defined in equation (1). By including firm fixed effects, our identification comes from within-firm variation in CEO tenure, board independence, and chairman duality.

Column 1 of Table IV, Panel A shows the basic relation between CEO tenure and board independence within firms, including firm fixed effects and firm age but without firm-level controls or year fixed effects. We find that board independence decreases by 0.14 percentage points per additional year of CEO tenure. The effect is statistically significant at the 1% level, and is the first robust evidence of a *within-firm, dynamic* relation between CEO tenure and board independence as opposed to across-firm relations (see Baker and Gompers (2003), Boone et al. (2007), and Dikolli et al. (2014) for evidence in repeated cross-sections of firms, without firm fixed effects).[10] The economic magnitude indicates that ten years of CEO tenure would lead to a 1.4 percentage-point (= 0.14 × 10) decrease in the independence ratio, which is about 11% of a within-firm standard deviation of board independence (12.6 percentage points). Thus, despite the persistence in board structure documented above, we show dynamic changes in board structure consistent with theory. These effects are modest in magnitude, which is to be expected given the persistence (Section III). However, as we highlight below, this average effect masks considerable heterogeneity across firms and time in the relation between CEO tenure and board independence. We show below that the magnitude is larger when theoretical predictions say that it should be.

Column 2 controls for board size and number of officers, as well as additional firm characteristics such as log assets, Tobin's q, and industry-adjusted ROA while Column 3 adds year-fixed effects to control for year-specific variation (including any time trends) in board

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[10] Using a sample of 142 firms from 1971-1983, Hermalin and Weisbach (1988) employ specifications both with and without firm fixed effects to examine the relation between CEO tenure and additions/departures of insider and outsider directors. However, their results with fixed effects are generally weaker than or inconsistent with those without, which the authors attribute to limited within-firm variation in their sample.

independence (and as a result, firm age drops out). These controls have little effect on the coefficient on CEO tenure and its significance level. The positive, significant coefficients on firm age, assets and board size are consistent with the cross-sectional findings in Boone et al. (2007) that board independence is positively associated with firm size and age. Importantly, the negative coefficient on industry-adjusted ROA suggests that CEOs who perform well (relative to industry peers) are more likely to have a less independent board. In terms of economic magnitude, from column (3), a one-standard-deviation (SD) increase in ROA is associated with a 0.217 percentage-point (= 0.087 × -2.496) reduction in the independence ratio. This finding is consistent with a bargaining framework in which the CEO becomes more powerful as she performs well (which the board uses to infer high ability), which in turn leads to a weaker board.

Column 4 estimates equation (2) *without* firm-fixed effects, which gives an idea of potential bias in such estimates. Compared to the coefficient in the other columns, the coefficient in column 4 (-0.243) suggests that not isolating within-firm variation may lead to an estimate that is inflated by two-thirds. This significant difference in economic magnitude illustrates another important reason to test the theory within firms.[11] In summary, across specifications we find that corporate boards become less independent as CEO tenure increases, which is consistent with the prediction of Hermalin and Weisbach (1998) that the bargaining power of a retained CEO increases with tenure, which the CEO uses to reduce the proportion of independent directors (implying less monitoring).

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[11] In Appendix A, we show that there is no within-firm effect of CEO tenure on board independence in a sample of modern (1996-2011) data that are dominated by the post-Sarbanes-Oxley era. Yet, as Panel A in Appendix Table I shows, there *is* a cross-sectional tenure effect in the modern data if one were to drop firm fixed-effects from the specification. Thus, it is important to test the bargaining predictions within-firm. Appendix Table I, Panel B shows that the effect of tenure on board independence is not driven by changing sample composition as CEO tenure increases.

Figure IV, Panel A visually summarizes the estimated relation between CEO tenure and board independence from column 2 of Table IV, Panel A; the overlaid dashed line is a time trend that represents the increase in board independence with firm age. Panel B shows that after removing the time trend, board independence for a typical firm (with sample average characteristics) follows a saw-tooth pattern, increasing on average when a new CEO is hired but then decreasing during the tenure of a given CEO.

Our data allow us to identify the within-firm relation between board independence and CEO tenure separately from that of firm age or a time trend because the data span the careers of multiple CEOs per firm (thus age or time and CEO tenure are not perfectly correlated within firms). However, the importance of CEO turnovers for our identifying variation raises the question of whether our estimated tenure-independence relation may reflect a CEO turnover effect on board independence that is unrelated to the change in CEO tenure. To control for any turnover-specific effects, in Panel B we include the cumulative number of CEO turnovers per firm as an additional independent variable. The magnitude of the estimated coefficient on CEO tenure is smaller, but still highly statistically significant in this specification.

Dual Chairs and CEO Compensation: Panel C of Table IV examines whether CEO tenure influences CEO-chairman duality and CEO compensation, important outcomes of negotiations between the CEO and board. Column 1 shows results from estimating equation (2) with a dependent variable dummy equal to one if the CEO also holds the title of the board chairman, and zero otherwise. The positive estimate for *CEO tenure* is the first within-firm evidence consistent with CEOs with long tenure negotiating to receive the dual chairman role. (Dikolli et al. (2014) find a similar relation in the cross-section.) In terms of economic magnitude, an additional

year of CEO tenure in the same firm is associated with an increase of 2.2 percentage points (significant at the 1% level) in the probability that the CEO becomes a board chair.

Column 2 shows results from estimating equation (2) with a dependent variable of the log of the CEO's total current compensation including salary and bonus. The sample consists of 3,326 firm-years from the combined database of corporate officers and directors merged with CEO compensation data drawn from Frydman and Saks (2009) from 1935 to 1991 and ExecuComp from 1992 to 2011.[12] The significantly positive coefficient on *CEO tenure* indicates that CEOs are rewarded with higher compensation as their tenures increase. In terms of economic magnitude, each additional year of CEO tenure leads to 2.4% higher pay (significant at the 1% level), beyond that associated with profitability, other controls, and firm and year fixed effects. This result is consistent with the bargaining framework of Hermalin and Weisbach (1998) in which powerful CEOs negotiate for both high compensation and less independent boards.

IV.C. Dynamics of Board Independence and Variation in the CEO Tenure Effect

Section III shows that board structure is persistent, while the previous subsection provides within-firm evidence that board independence declines moderately through a CEO's career. The rest of this section explores whether the CEO tenure-board independence relation varies in ways consistent with economic theory. In particular, we examine the relation conditional on firm performance (a reflection of CEO ability), uncertainty about CEO ability, and regulatory changes, in response to shocks to CEO power, in subsamples of arguably exogenous CEO turnover, and when instrumenting for tenure using performance. We begin by examining board structure year-by-year as a CEO's tenure increases.

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[12] We thank Carola Frydman for making the dataset of executive compensation from 1935 to 1991 available. For consistency across the sample, we only analyze 1992-2011 data for firms that appear in the Frydman and Saks database at least once.

To the extent that board composition results from bargaining between the CEO and board, the board is more likely to agree to a weaker monitoring structure when the marginal benefit of monitoring the CEO is lower. As emphasized by Hermalin and Weisbach (1998), monitoring becomes less valuable as the board's assessment of the CEO's ability increases and as uncertainty about that ability decreases. Uncertainty about the CEO's ability is likely to peak when the CEO is new to the job and decline after the board has had some time to evaluate her performance (Pan, Wang, and Weisbach, 2015). We therefore examine how board independence changes upon CEO turnover and how it evolves thereafter. Because the level of the CEO's perceived ability should depend on performance, we also study how the dynamics of board independence vary with firm performance. We explore these issues by estimating the following equation:

$$Independence_{it} = \alpha_i + \alpha_t + \sum_{k=0}^{12} \gamma_k d_{it}[k] + X_{it}'\delta + \varepsilon_{it}. \tag{3}$$

The key independent variables in equation (3) are a set of dummy variables, *d[0],…, d[12],* corresponding to the firm-year observations from the year of CEO turnover to 12 years after the turnover. "Year -1" observations are also included in this analysis, serving as the baseline level. As before, this specification includes firm fixed effects, and thus examines within-firm dynamics following CEO turnover. We exclude CEO changes after 2002 from the sample because the analysis requires a post-turnover period. We also require that the previous CEO had at least two years of tenure, and that we have data for the firm in year 1.

1. Firm Performance, CEO's Perceived Ability, and Board Dynamics. In this subsection, we explore how perceived CEO ability and uncertainty about the CEO affect the dynamics of board independence post-CEO turnover using a sample of 3,843 turnovers from 1920 to 2002 for which the new CEO is a corporate insider.[13] We focus on new insider CEOs because appointment

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[13] There are about twice as many insider- than outsider-appointed CEOs in our sample over the 1918-2011 period.

of outsiders could affect board structure for reasons different than those related to CEO bargaining power or the board's monitoring, which are our primary focus. In Appendix B, we separately examine the effect of CEO turnover on board independence when the new CEO is an outsider.

Figure V presents coefficients estimated from equation (3). Panel A presents the percentage of board members that are independent, relative to the firm-level average and after controlling for year-fixed effects and firm characteristics. In year 0, the y-intercept indicates that among firms appointing an insider CEO following the departure of the previous chief executive, board independence jumps in the year of turnover by about 0.58 percentage points (red dashed line).[14] The increase is statistically significant at the 1% level and is about four times the average annual change estimated in Table IV (Panel A).[15] This is consistent with greater value of board monitoring following a discrete jump in uncertainty about CEO ability or a decrease in perceived ability.[16]

After the initial jump, board independence stays relatively flat for the next eight years until it begins to decrease in year t+9, [17] decreasing by about 0.4 percentage points per year of additional tenure after year 8. This result suggests that board independence declines only after uncertainty about CEO ability has fallen, consistent with the theory.

The blue solid line in Panel A represents the subset of new internal CEOs who are ultimately employed by their firms for at least 12 years. Hence, this analysis avoids possible changes in sample composition. The blue solid line shows that board independence increases in the year of turnover (insignificant) and decreases afterward. The decreases from year t to years

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[14] In equation (3) and Figure V only, we start our analysis of a given firm at t-1 in order to observe the jump in board independence that occurs at CEO turnover.

[15] Dikolli, Mayew, and Nanda (2014) document an increase in board independence following CEO turnover among ExecuComp firms during 1996-2005. Denis and Sarin (1999) document that changes in board structure are stronger around executive turnover.

[16] By contrast, results discussed in Appendix B show a significant decline in board independence when a new external CEO is hired. This is consistent with the initial importance of the advisory role of the board, as opposed to the bargaining power and monitoring effects that appear to dominate for internal CEO appointments.

[17] The initial flatness of board independence holds whether the board is or is not staggered (not in figure).

t+10 and t+12 are -1.63 (*t*-statistic = 1.88) and -2.37 (*t*-statistic = 2.38). One plausible explanation for the decrease in board independence for CEOs with longer ultimate tenure is that these CEOs survive longer because they perform well particularly early in their careers. We examine this conjecture in Panel B.

In Panel B, we compare less successful CEOs (those with below-median industry-adjusted ROA averaged over the first three years in office) in the red dashed line to more successful CEOs (above median) in the blue solid line. To the extent that perceived CEO ability is correlated with operating performance (ROA), the panel shows that while both lines jump in the year of turnover, board independence decreases faster for CEOs with high perceived ability. This is consistent with the implication of Hermalin and Weisbach (1998) that the value of monitoring declines as the perceived ability of the CEO increases. By contrast, there is little, if any, reduction in board independence for CEOs who fail to send a positive signal through good initial performance.

Instrumenting tenure with ROA. In Table V, we further explore the role of firm performance in driving the negative CEO tenure-board independence relation. Specifically, we re-estimate equation (2), but instrument CEO tenure using operating performance of firms measured by industry-adjusted ROA (which HW argue is a reflection of CEO ability and thus her bargaining power). We use two versions of ROA in the IV estimation: average ROA over the past three years and current-year ROA.[18] While we do not argue that ROA is strictly exogenous to the choice of board composition, we ask here whether there is a relation between board independence and the portion of variation in CEO tenure that is associated with strong past performance. This approach

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[18] Hermalin and Weisbach's (1998) model consists of two periods: the first one for observing firm performance, and the second for bargaining on new director appointees. Given the ambiguity of the length of the first period, we implement IV estimates using these two proxies for firm performance.

also helps to address concerns over possible reverse causality in equation (2) – i.e., less independent boards monitoring less, leading to longer CEO tenure.

Panel A of Table V presents the first-stage results. Both columns 1 and 2 show that ROA has a significantly positive effect (at the 1% significance level) on CEO tenure within firms. Panel B presents the second-stage estimates of the relation between board independence and the component of tenure correlated with performance. Consistent with our previous estimates, both columns 1 and 2 show that CEO tenure, instrumented by current or past firm performance, is significantly negatively related to board independence. Moreover, the economic magnitude of the effect in Table V is much larger than that in Table IV.[19] For example, relative to the baseline coefficient of about -0.14 in Table IV, Panel A, the coefficient of -1.01 in column 1 of Table V is seven times larger, indicating that CEO tenure has a larger (negative) impact on independence of the board when the variation in tenure is driven by performance.

Note that if we were to instead instrument CEO tenure using (two-digit SIC) industry-level average ROA (rather than industry-adjusted firm-specific ROA as in Table V), which Bertrand and Mullainathan (2001) use as a measure of performance affected by "luck," we do not find that tenure is related to board structure or CEO compensation (not tabulated). These findings are consistent with the bargaining power channel *a lá* Hermalin and Weisbach (1998) in which firm performance that reflects underlying ability (and does not reflect "luck") increases the bargaining power of the CEO.

2. Death- and Health-Related CEO Turnover and Board Dynamics. Assigning a causal interpretation to the dynamics of board structure documented in the previous subsection is difficult because unobserved changes at the firm (e.g., variation in investment opportunities or strategy)

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[19] In unreported analysis, we also find that the increasing effects of tenure on dual chairmanship and compensation also are stronger when we instrument tenure using ROA.

may drive both CEO turnover and board independence (Casamatta and Guembel, 2010). To address this challenge, we study a subsample of CEOs for which turnover occurs for plausibly exogenous reasons: due to death or serious health issues of the previous CEO.[20] This analysis also highlights how the CEO tenure effect on board independence varies with perceived CEO ability and related uncertainty. First, CEOs appointed in sudden death/health transitions are likely to have less power than their predecessors, relative to new CEOs in the typical insider transition depicted in Panel A of Figure V. (Consistent with this conjecture, we find that the CEOs who died in office had longer tenure, and were much more likely to have been board chair, relative to typical CEOs who leave office.) Additionally, these firms will have had less opportunity for succession planning and grooming the new CEO, increasing uncertainty about her ability in the job.

We estimate equation (3) using the 94 death and health CEO turnover events that we are able to match to our CEO and board database in which the new CEO is an insider. Estimates in Panel C of Figure V generally support the conclusion from Panel A: These CEO turnovers lead to an immediate increase in board independence of 1.7 percentage points in the year of turnover (significant at the 10% level). After this relatively sharp increase in board independence, a gradual decrease begins in year 6, and the decrease sharply accelerates from year 10. These patterns are consistent with bargaining model predictions: A new CEO who presumably has weaker bargaining power and is subject to greater uncertainty about her ability initially faces a relatively strong board

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[20] We thank Charlie Hadlock, Jesus Salas, and Timothy Quigley for sharing their datasets of CEO turnovers from 1989 to 2006, 1972 to 2008, and from 1950 to 2011, respectively. We supplement their samples with our own data collection. Specifically, we use the following sources to ascertain whether the previous CEO died or had serious health problems (such as cancer or a heart attack) that forced her to step down. First, we collect names of CEOs who died in office and the dates of death from the obituary section of Standard and Poor's Register of Corporations, Directors, and Executives ('S&P Register') from 1950 to 2011 (Quigley, Crossland, and Campbell, 2016 also use this source). Second, we follow Fee, Hadlock, and Pierce (2013) and use news searches to collect additional CEO changes due to death or health reasons at public firms from 1968 to 2011. Third, we supplement this set of death and health events by examining all CEO turnovers in our database from 1973 to 2011 that are not identified above, and determine whether they are due to death or serious health issues of the CEO by searching for news articles using Factiva. (News articles from Factiva are sparse prior to the mid-1970s.)

but is able to eventually bargain for a weaker board over time as she accumulates tenure and uncertainty about her ability declines.

3. Uncertainty about CEO Ability and the Tenure-Board Independence Relation. In Hermalin and Weisbach's (1998) framework, the board monitors the CEO more intensely when her ability is known less precisely because the marginal benefit of monitoring (i.e., collecting more information) is greater. Above we presented evidence consistent with greater board monitoring when uncertainty is high (when a new CEO is hired) and less monitoring (i.e., a reduction in board independence) as this uncertainty is resolved over the CEO's tenure. We now contrast how board structure varies across CEOs about whom the board likely has the least uncertainty (the first CEO of the firm in our sample, such as the founder) relative to other CEOs.

Table VI shows results from an augmented version of equation (2) that includes interaction terms to capture uncertainty about CEO ability. The negative effect of tenure on board independence is more pronounced for first CEOs (-0.356) than for other CEOs (-0.087), with the difference being significant at the 1% level. This finding is consistent with the prediction that the board optimally monitors more intensely, and hence the CEO tenure-board independence relation is weaker, when there is more uncertainty about CEO ability.

4. Hedge Fund Activist Shock to CEO Power. External shocks to CEO power can potentially limit the ability of the chief executive to negotiate for reduced board independence as tenure increases. We investigate how hedge fund activism affects the CEO tenure-board independence relation (see e.g., Brav et al., 2008). Large active shareholders can limit the influence of CEOs (and management in general) on operations and governance of the firm, including selecting directors, with the goal of maximizing shareholder value (Shleifer and Vishny, 1986). We draw events of activist hedge funds targeting public firms from an extended version of the

sample used in Brav, Jiang, and Kim (2009) from 1994-2008, matched to our database of directors and officers. We estimate the following equation to study whether activist investor events affect the relation between CEO tenure and board independence within firms:

$$Independence_{it} = \alpha_i + \alpha_t + \beta_1 CEO\ tenure_{it} + \beta_2 CEO\ tenure_{it} \times Target_{it} +$$

$$\beta_3 CEO\ tenure_{it} \times Target_{it} \times After_{it} + X_{it}'\gamma + \varepsilon_{it}, \tag{4}$$

where a dummy variable *Target* is equal to one for firm-years that are targeted by an activist hedge fund[21] plus or minus 10 years relative to year *t*, and zero otherwise; and *After* equals one for the 10 firm-years after the targeting date, and is zero otherwise. In addition to these targeted firms, we include non-targeted firms from 1984 to 2011, resulting in a sample of 34,279 firm-years.

Column 1 of Table VII shows estimation results for equation (4). The significantly negative coefficient on *CEO tenure* confirms that long-tenure CEOs face less independent boards in this subsample, consistent with the baseline result. The negative coefficient on *CEO tenure × Target* (-0.127) suggests that prior to actual targeting, the ultimately targeted firms exhibited a stronger effect of tenure on board independence, although this effect is insignificant. The key coefficient of interest, *CEO tenure × Target × After* (0.326, *t*-stat = 2.18), shows that relative to years before activism, the effect of CEO tenure on board independence is significantly reduced after targeting. As a result, the effect of CEO tenure on board independence turns positive (0.118 = -0.081 - 0.127 + 0.326) and statistically insignificant (*p-value* = 0.34). Thus, we document attenuated effects of CEO tenure on boards after a shock to CEO power. Our evidence is consistent with activist investors disrupting the influence of powerful CEO's on boards. In untabulated analyses, we find that the effect of activist investors is significant up to seven years post-targeting, consistent with a

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[21] We follow Brav et al. (2009) and define activist investor targeting as when the fund files Schedule 13D filings indicating that it owns at least 5% of any class of a company's shares and intends to influence corporate control. They supplement this sample using news searches to identify activism events at large companies in which the activist holds an ownership stake between 2% and 5%.

long-term effect on governance. We also find that the coefficient on *CEO tenure × Target × After* is significantly positive when governance (e.g., seeking board seats, ousting the CEO) is a stated objective of the activist and insignificant when governance is not one of the listed objectives.

5. *CEO Tenure and Governance Outcomes Following 2002-2003 Regulations.* Table VIII examines the effect of CEO tenure on corporate governance outcomes (board independence, chairman duality, and CEO compensation) separately for years before and after 2002. During 2002-2003, various new regulations and laws (e.g., imposed by SOX, NYSE, and NASDAQ) began to require firms to increase board independence up to certain levels (see Chhaochharia and Grinstein, 2007; Duchin et al., 2010). These regulations therefore might attenuate the ability of powerful CEOs to increase board independence. Consistent with this conjecture, the coefficient on "CEO tenure × Post 2002" is 0.100, suggesting that after 2002, CEO tenure has essentially no impact on board independence (-0.147 + 0.100 = -0.047; *t*-statistic = -0.86). This result is consistent with the new regulations ending the effect of CEO tenure on board independence. This may explain the lack of a relation between CEO tenure and board structure in Coles et al. (2014), given their 1996 – 2010 sample period.

While the regulations increased board independence as intended, Hermalin and Weisbach (p. 111) argue that "As long as the bargaining process [between the CEO and board] itself is unaffected by reforms, the equilibrium will be little affected." Thus, we might expect to find powerful CEOs bargaining for greater rewards on other dimensions, to offset their reduced influence on board independence. Consistent with this conjecture, the coefficients on *CEO tenure* and *CEO tenure × Post 2002* are 0.022 (*t*-stat = 24.17) and 0.005 (*t*-stat = 2.58) in column 2, indicating that the years after the 2002 regulations saw increased chairman duality for long-tenured CEOs. This result is consistent with firms substituting a dual chairman role for low board

independence in response to Sarbanes-Oxley and related regulations. Column 3 explores whether the regulations affected compensation. The coefficient on *CEO tenure × Post 2002* is 0.014, suggesting somewhat higher compensation post-2002, although this coefficient is insignificant.

V. EFFECT OF CEO POWER ON CEO TURNOVER-PERFORMANCE SENSITIVITY

The evidence above is largely consistent with CEOs gaining power over tenure and bargaining for less independent boards that monitor them less intensely. To the extent this is true, are the jobs of powerful CEOs relatively protected, and if so, do long-tenure, powerful CEOs eventually become entrenched and adversely affect firm value? To investigate these questions, we start by examining CEO replacement conditional on performance.[22] Bargaining models in which the board learns about CEO ability from realized performance (e.g., Hermalin and Weisbach, 1998) predict that successful and therefore powerful CEOs would be optimally fired less often conditional on poor performance. A similar prediction comes from models with potential CEO entrenchment (e.g., Taylor, 2010): performance-CEO turnover sensitivity is lower when the CEO has more power.

We begin by estimating a linear probability model to predict CEO turnover conditional on firm performance and CEO power using our full sample of firm-years from 1918 to 2011 (see Weisbach, 1988; Warner and Watts, 1988; Jenter and Lewellen, 2014). Specifically, we estimate the following equation using Ordinary Least Squares:

$$CEO\ turnover_{it} = \alpha_i + \alpha_t + \beta_1 \Delta ROA_{it} + \beta_2 \Delta ROA_{it} \times Power_{it} + \beta_3 Excess\ return_{it}$$

$$+\beta_4 Excess\ return_{it} \times Power_{it} + \beta_5 Power_{it} + X_{it}'\delta + \varepsilon_{it}, \tag{5}$$

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[22] We proxy for the decision to fire the CEO using a CEO turnover dummy equal to one if the current CEO is different from the previous year's CEO, and equal to zero otherwise (e.g., Jenter and Lewellen, 2014).

where *CEO turnover$_{it}$* is a dummy variable equal to one if the current CEO is different from the previous year's CEO, and zero otherwise; *ΔROA$_{it}$* is the change in return on assets; *Excess return$_{it}$* is the stock return minus value-weighted market return from CRSP; *Power* is one of four proxies for CEO power: Board independence, CEO-chairman duality, past performance, and CEO tenure (Adams, Almeida, and Ferreira, 2005; Morse, Nanda, and Seru, 2011); X_{it} is a vector of firm-level controls including CEO tenure, log book assets, and Tobin's q for firm i in year t; and standard errors are clustered at the firm level.[23] Note that while the specification generally follows those in Weisbach (1988) and Warner and Watts (1988), we differ by including firm fixed effects to account for unobserved firm-level heterogeneity in the propensity to replace the CEO. When stock returns are included in the equation, we confine the estimation to the years after 1925 to align with the availability of CRSP data.

We note first that CEO turnover is significantly negatively associated with performance, as measured either by ROA or excess stock returns, consistent with prior research (see Appendix Table II).[24] Our focus is on the effects of CEO power on CEO turnover-performance sensitivity. We start with the classic proxy for monitoring intensity of the board: the board independence ratio. Column 1 of Table IX shows that less independent boards are associated with significantly lower operating performance sensitivity of CEO turnover. Our result is based on within-firm variation and is consistent with Weisbach's (1988) cross-sectional finding. Column 2 uses a dummy variable for CEO-chairman dual title as a proxy for CEO power and shows that dual chairman-CEOs face a significantly lower sensitivity of turnover to performance measured by either changes in ROA or excess stock returns (see also Goyal and Park (2002)).

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[23] CEO age is not available in Moody's or Mergent; thus, we do not include it as a control variable.
[24] See, for example, Warner and Watts (1988); Weisbach (1988); Murphy and Zimmerman (1993); Jenter and Lewellen (2014).

Next, we directly examine whether CEOs who have performed well in the past three years face different turnover decisions conditional on current performance. Column 3 (4) examines the subset of firms with higher ROA (stock returns) than the median firm in the past three years. Consistent with good past performance making the CEO powerful, we find that current performance (proxied either by changes in ROA or excess stock returns) has little effect on turnover propensity when the CEO's performance in the past three years is better than the median. Lastly, column 5 measures CEO power with a "long tenure" dummy which is equal to one if CEO tenure is larger than its third quartile (nine years) and shows that powerful CEOs face little more than half the stock return-turnover sensitivity of less powerful CEOs.[25] Overall, these results are consistent with powerful CEOs being somewhat shielded from board monitoring and in particular, the risk of being fired due to poor firm performance.

VI. MARKET REACTION TO DEPARTURES OF POWERFUL CEOs

The results in the previous sections are consistent with CEO bargaining power affecting board structure and chief executive retention decisions. These findings beg an important question: Do powerful CEOs add value to the firm (consistent with them having "high ability"), or do they eventually become entrenched and potentially reduce value in the long run? To address this question, we examine market reactions to CEO turnover, conditional on the power of the departing CEO. We use three proxies for CEO power: tenure, chairman duality, and founder status. To examine plausibly exogenous CEO turnover, we use events of death and health-related CEO

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[25] Dikolli et al. (2014) show that performance-related CEO turnover declines in CEO tenure for Execucomp firms. As mentioned above, our analysis includes firm fixed effects and hence tests the within-firm theoretical prediction.

turnover (see e.g., Bennedsen, Perez-Gonzalez, and Wolfenzon, 2010; Jager, 2016).[26] We first

estimate excess daily stock returns using a market model:

$$\varepsilon_{it} = R_{it} - R_{mt} \tag{6}$$

from day -2 to day +2, where R_{it} is the rate of stock return for firm i on day t, and R_{mt} is the rate of

return for the market portfolio ("vwretd" from CRSP). We compute cumulative excess returns

during the [-2, +2] window around the announcement of CEO turnover by compounding the daily

excess returns.[27]

Footnote 21 describes how we identify death and health events. To determine the

announcement date of the event, we first obtain dates (or often year-months) of CEO deaths from

the obituary section of S&P Register, and CEO death and health-related events from Salas (2010),

Hadlock, Fee, and Pierce (2013) and Quigley, Crossland, and Campbell (2016) for the 1950 to

2011 period. Second, we search news articles for these CEO death and health events using Factiva

and other sources, to identify the exact announcement date of death or health-related events. If

there are multiple news articles, we use the first publication date as the event date. We also collect

founder status from the news articles. Lastly, we match each of these events with our officer and

director database using firm identifiers, names, and event dates. To increase sample size, in this

analysis only we include NASDAQ firms in addition to NYSE/AMEX firms. This sample

selection process results in 336 events with matched information on directors and officers. The

average cumulative abnormal return for death and health events is 0.82%, which is similar to the

0.66% average buy-and-hold-abnormal return during the month of death announcement

documented by Jenter, Matveyev, and Roth (2016).

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[26] Previous research finds generally weak *average* announcement returns around CEO turnover due to death of the CEO (e.g., Johnson et al., 1985; Jenter et al., 2016).
[27] The results are robust to alternative event windows such as [-3, +3], [-2, +3], and [-1, +2].

Table X shows the results of regressing cumulative excess return in response to plausibly exogenous CEO turnover on various proxies for CEO power: (1) A dummy for CEO tenure above the third quartile (at least 11 years), (2) a dummy for whether the CEO also holds a board chairman title, and (3) a dummy for whether the departing CEO is the founder of the firm. Across the columns of Panel A, death-related CEO turnover is associated with 3.1% to 3.9% higher announcement returns when the departing CEO was more powerful, and the differences are significant at the 1% to 5% levels. In contrast, departures of CEOs who had relatively little power before stepping down entail insignificant announcement returns ranging -1.3% to 0.2%, as captured by the intercepts.[28] Panel B uses data on both death and health-related events and provides similar evidence. These findings are consistent with the argument that powerful CEOs can become entrenched or extract excess pay, and thus removing CEOs (which presumably would have been costly without a death occurrence) would increase shareholder value. Note that the economic magnitudes of our estimates in Table X are approximately equal to those in Taylor (2010), who uses a structural model to estimate that shareholder value would increase by 3% if the perceived cost of removing (entrenched) CEOs was eliminated.

This result can be interpreted as being inconsistent with the spirit of the dynamic bargaining model of HW, since in their model the CEOs who are retained should be more skilled, on average. However, we also note an alternative interpretation that, because of the CEO's aversion to monitoring and the cost of monitoring to directors, the board is willing to accept some degree of entrenchment in the "second-best" optimal bargaining outcome. Thus, we might think of these

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[28] In a contemporaneous paper, Jenter et al. (2016) find a negative market reaction to the deaths of founder CEOs, which they interpret as reflecting the value of CEO-firm matching. They find positive market reactions to the deaths of old founders and in some specifications, long-tenure CEOs. Salas (2010) finds that market reactions to deaths of older, longer tenured, and founder CEOs are significantly positive only when their firms performed poorly in the years prior to the death. Johnson et al. (1985) find positive reactions to the deaths of founder CEOs. Our analysis in this section complements these findings by documenting how the market reacts to the death of a CEO conditional on several measures of CEO power in the context of the Hermalin and Weisbach (1998) bargaining model.

positive market reactions as an ex-post measure of the cost of these frictions, even if firm are optimizing board structure conditional on the relevant agency conflicts.

VII. CONCLUSION

We construct a new database of more than 87,000 firm-year observations over 94 years to explore dynamic interactions between the CEO and board of directors. Given our long panel of data, we are able to investigate potentially slow-moving processes such as whether board structure is persistent. We find that it is: board independence lagged 20 or 30 years is by far the strongest predictor of board independence today, suggesting that a board once weakened (or strengthened) may remain so far into the future. Future research should attempt to uncover the frictions or other forces that lead to strong board persistence.

Despite persistent boards, our long sample enables us to document that the changes in board structure that do occur are largely consistent with economic theory. We provide robust within-firm evidence consistent with the rich, nuanced within-firm predictions of governance models such as Hermalin and Weisbach (1998). Consistent with successful CEOs gaining power that is reflected in their longevity at their firms, we find that board independence decreases with CEO tenure. These long-tenure (powerful) CEOs also are more likely to become board chair and earn higher compensation. The CEO tenure-board independence relation is attenuated in circumstances that plausibly reduce relative CEO power, such as being targeted by activist investors. The relation strengthens when board incentives to monitor weaken, such as following strong CEO performance or a decline in uncertainty about the CEO's ability.

We explore CEO turnover events in detail. There is a jump in board independence when a new internal CEO is appointed, consistent with a prediction that new CEOs are relatively less

powerful or subject to more uncertainty about their abilities. In contrast, boards become less independent when an external CEO is hired, consistent with external CEOs benefiting more from the advice of insider directors than from monitoring. We also find that powerful CEOs are less likely to be replaced conditional on poor performance. Given this greater job security of powerful CEOs, we investigate whether powerful CEOs might become entrenched in the sense that replacing them would increase firm value. To achieve some degree of exogeneity, we study market reactions when turnover occurs because a CEO dies in office. We find no market reaction to the typical CEO death, but we find a positive reaction when powerful (long-tenure, dual board chair, founder) CEOs die in office. This is consistent with powerful CEOs becoming entrenched.

Broadly speaking, our results are consistent with multidimensional bargaining between CEOs and the board. We find evidence that regulation succeeded in reducing one outcome from these negotiations (less board dependence following a change to stock exchange listing requirements) but not preventing other outcomes, such as the CEO being appointed board chair, perhaps in substitution for increased post-regulation board independence. Thus, not finding evidence of a negative relation between board independence and CEO tenure post-2002 does not necessarily mean that CEO-board bargaining dynamics do not occur – they might still occur at a different negotiating point.

Overall, our evidence is consistent with the life-cycle of powerful CEOs being that (on average) they are successful early in their careers and hence gain power, which they use to achieve job security, dual chair roles and greater pay, and eventually on average powerful CEOs become entrenched. Given that these are likely to be equilibrium outcomes of a dynamic bargaining process, our tests do not always allow us to prove causality of these results, but they do suggest interesting avenues for future research.

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Appendix A - Robustness Tests for Subsamples and Firm Survival

In this appendix, we describe two robustness tests. First, we split the full sample into subsamples by time period to examine whether the effect of CEO tenure on board independence is robust in various sub-periods. Second, we repeat our estimation using subsamples consisting of firms that survive for more than T years, where T=2, 5, 10, or 15.

Appendix Table I presents results for these tests. Columns 1 to 3 of Panel A split the full sample into three non-overlapping time periods (1918-1947, 1948-1977, and 1978-2011) and find that the board independence-CEO tenure effect generally decreases over the century. Column 4 uses a subsample consisting of firm-years from 1996 to 2011, which mimics potential samples from modern databases of corporate directors, such as Institutional Shareholder Service's Risk Metrics. We find that the coefficient on CEO tenure is -0.024 and insignificant for the subsample, which is not surprising given that a substantial fraction of firm-years in that sample are affected by post-2002 regulations on board independence (see Section IV.C.5). This insignificant result for the modern sample suggests that employing a long panel data that starts well before 2002 is important when testing board independence implications from dynamic bargaining models between the CEO and board. Even though column 4 finds no evidence in the modern era for the within-firm prediction from the HW model, column 5 shows that without firm fixed effects, the modern sample produces a strong negative relation between CEO tenure and board independence in the *cross section*. This again highlights the importance of studying these issues using a long sample that permits within-firm tests.

In Panel B, we estimate equation (2) for subsamples consisting of firms that exist in the database more than 15 years (or more than 10 years, etc.). Subsetting in this manner allows us to examine whether our within-firm results hold for firms with a long history and therefore are not driven by sample composition effects (new or short-lived firms entering the full sample). Column 1 shows the baseline estimate from column 3 of Table IV, Panel A as a basis for comparison. Across the columns, the coefficients on CEO tenure are very similar, suggesting that our results are in fact driven by (long) within-firm dynamics.

Appendix B – External CEO Appointments

In this appendix, we examine board dynamics when a new, external CEO is appointed (i.e., not a previous officer of the firm). Given that a new outsider CEO likely has less experience or expertise with the firm than does an insider, hiring an outsider may increase the benefit of having inside directors on the board, due to their ability to provide firm-specific advice (e.g., Mace, 1986; Adams and Ferreira, 2007). In Panel D of Figure V, the patterns differ from those in the earlier panels. Board independence *decreases* by 2.8 percentage points in the turnover year when the new CEO is an external hire, in stark contrast with results for new internal CEOs above. The decrease is significant at the 1% level. Thus, the negative relation documented above between CEO tenure and board independence reverses when the benefits of an insider board are greater.

Board independence increases rapidly in the first few years of an outsider CEO's tenure, offsetting most of the initial decline by year t+6. The increase from years t to t+6 is significant at the 1% level. This pattern is consistent with the new external CEO gaining more experience within the firm, reducing the need for internal advisor-directors on the board. Board independence eventually shows the familiar decrease after year t+9, with the decrease from t+9 to t+10 significant at the 10% level. Overall, the dynamics of board structure for external CEO appointments seem consistent with the advantage of inside advice playing a dominant role initially, in contrast to the bargaining power and monitoring effects that appear to dominate for internal CEO appointments.

FIGURE I – LONG-RUN TRENDS IN CEO TURNOVER, OUTSIDE CEO APPOINTMENT, BOARD INDEPENDENCE, AND CEO-CHAIRMAN DUALITY

This figure shows annual means of CEO turnover (Panel A), outside CEO dummy (Panel B), board independence (Panel C), and CEO-chairman duality dummy (Panel D). Panels A and B plots three-year moving averages. For Panel C, the sample begins in 1933 given that identification of dependent directors relies on historical observations for given firms.

Panel A: CEO Turnover (3-year Moving Average)
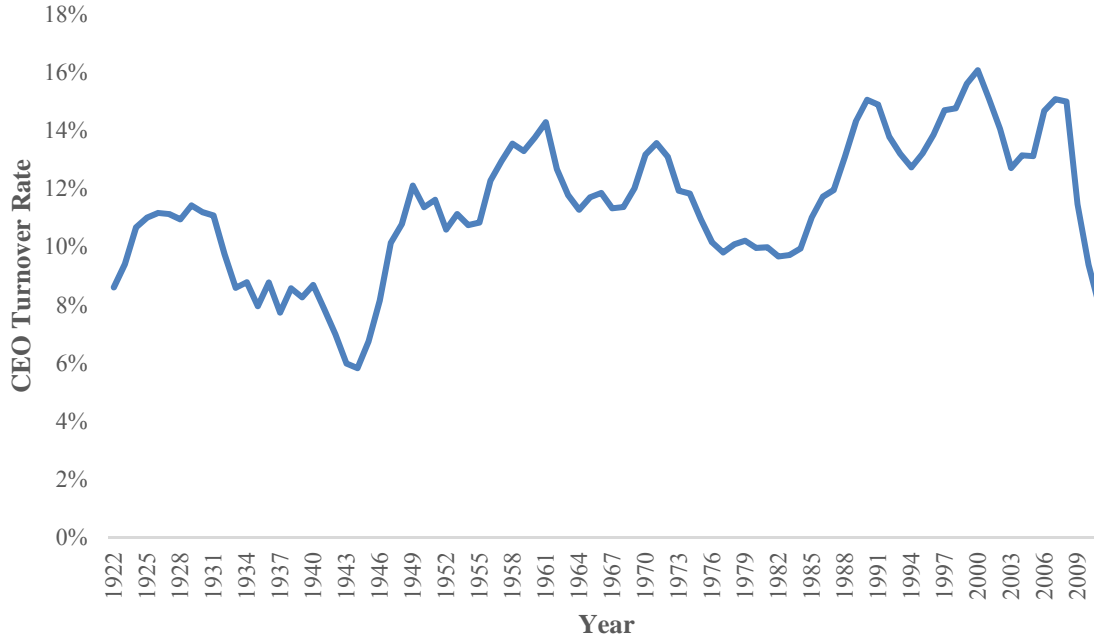
Panel B: Outside CEO Appointment (3-year Moving Average)
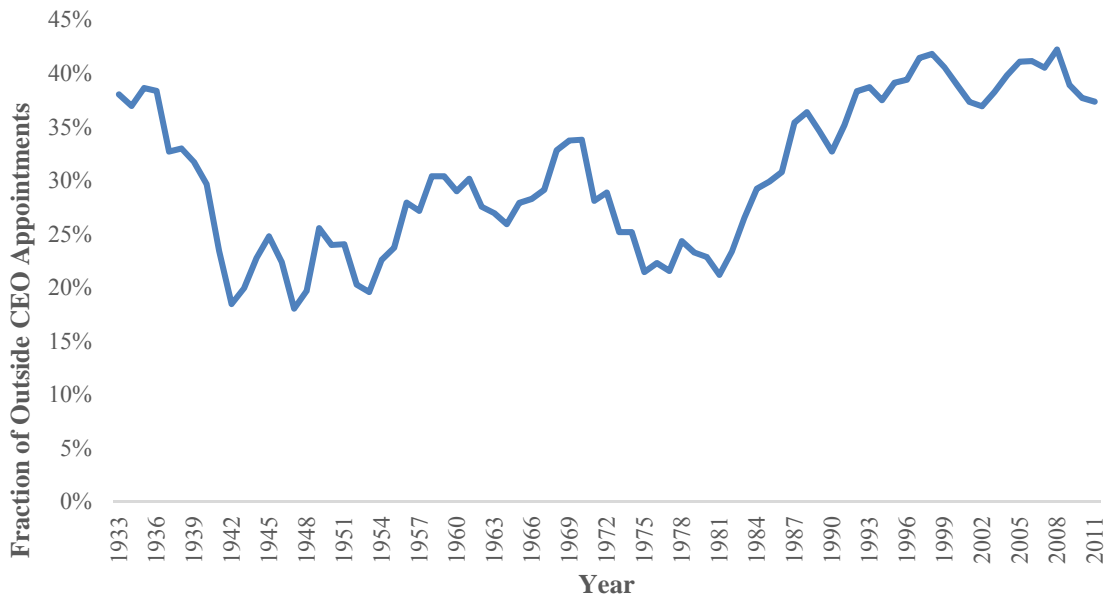
Panel C: Board Independence
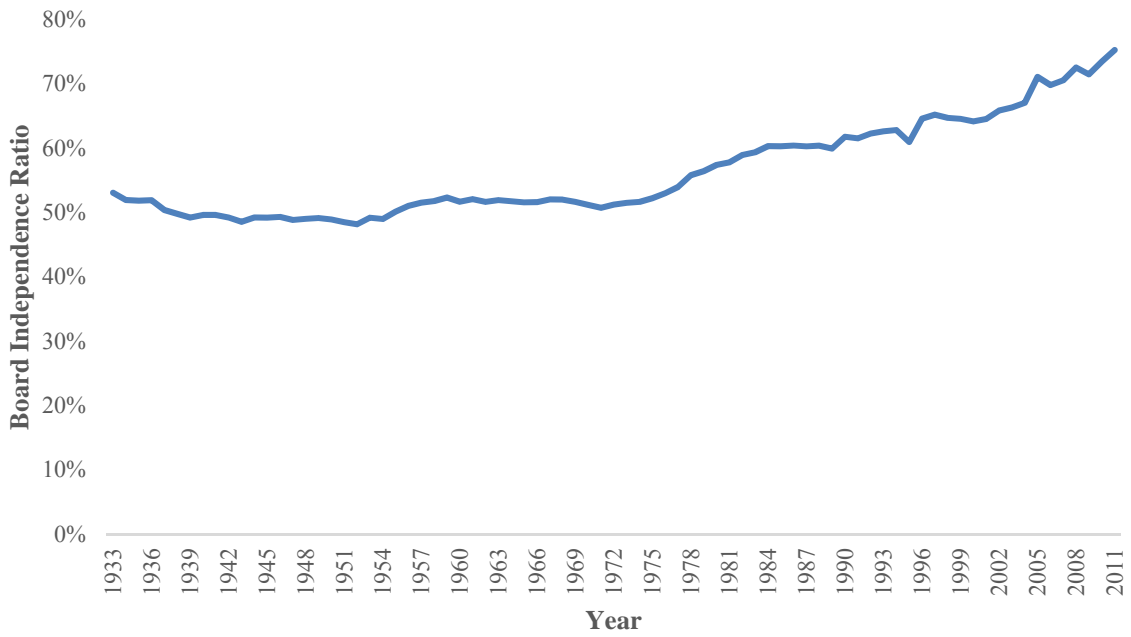
Panel D: CEO-Chairman Duality
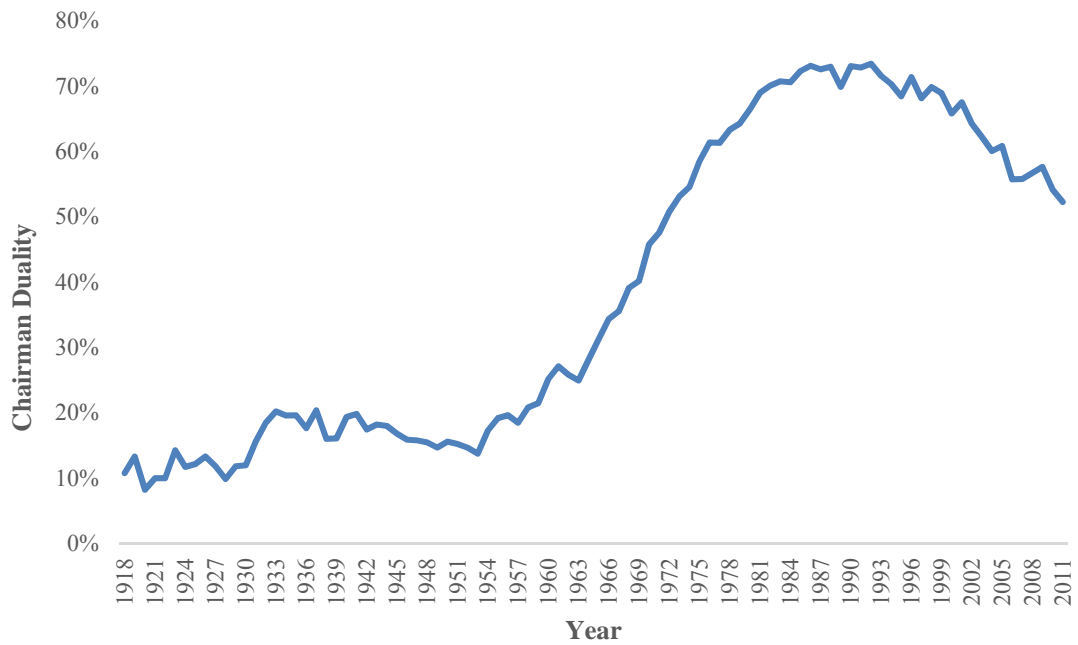
FIGURE II – PERSISTENCE IN BOARD INDEPENDENCE

This figure presents the dynamics board independence for four groups of firms sorted on initial level of board independence ratio. Specifically, for each calendar year, we form groups by ranking firms based on their independence ratios, and compute the groups' averages for the next 30 years. We repeat this process for all calendar years and compute the average across the calendar years.

This figure shows the univariate relation between CEO tenure and board independence (Panel A) and CEO-chairman duality (Panel B). Board independence is measured by the ratio of the number of independent directors to all directors (see Table I for definition). Firm-years with at least two directors are included in the figures. CEOs with 25 or more years of tenure are shown as 25+. The straight line is a linear trend.

Panel A: Board Independence Ratio

$y = -0.30x + 59.64$
$R^2 = 0.9624$
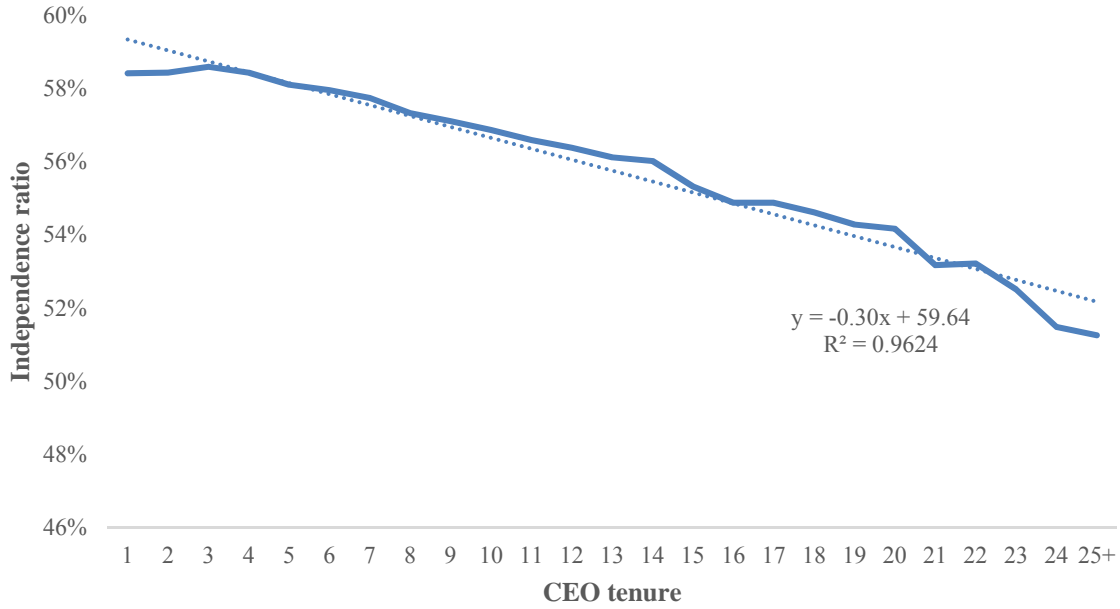
Panel B: CEO-Chairman Duality

$y = 1.80x + 44.68$
$R^2 = 0.8987$

43
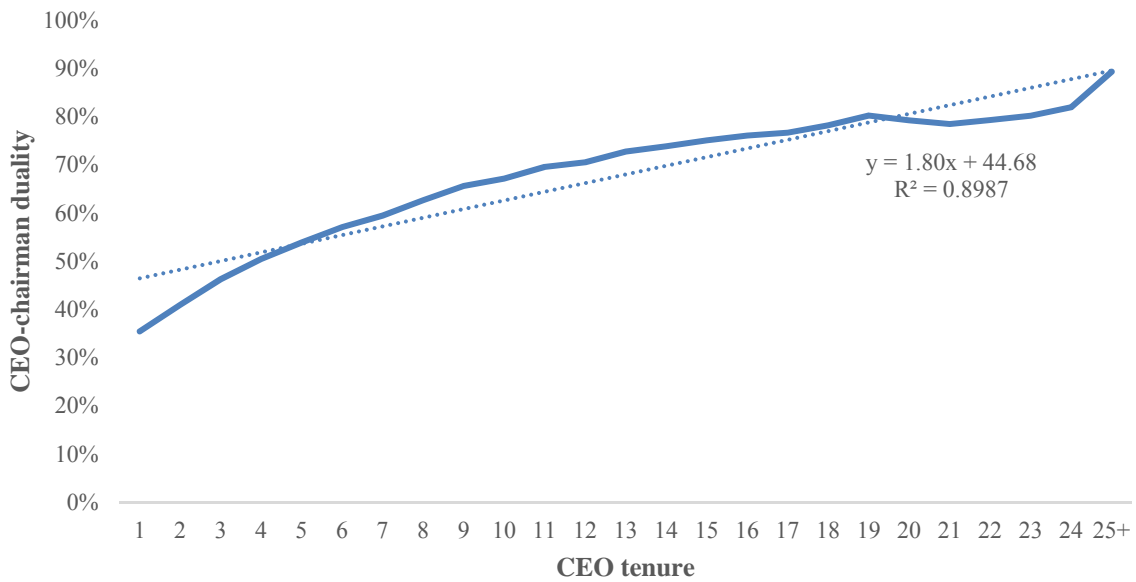
FIGURE IV – FIRM AGE, CEO TENURE AND BOARD INDEPENDENCE

This figure plots the relation between board independence and CEO tenure based on regression coefficients in Column 5 of Table IV, Panel A (full sample with a full set of firm-level controls). Board independence generally increases as a firm ages (dotted line). After controlling for firm age, and other determinants of board structure and firm characteristics (e.g., asset size, board size, q, profitability), board independence decreases during a CEO's tenure relative to the trend line (e.g., from year 1 to year 6 in the graph) and then jumps when a new CEO is appointed (e.g., in year 7). Panel B shows the same patterns of board independence after removing the linear time trend in independence.

Panel A: Board Independence Overlaid on Firm Age
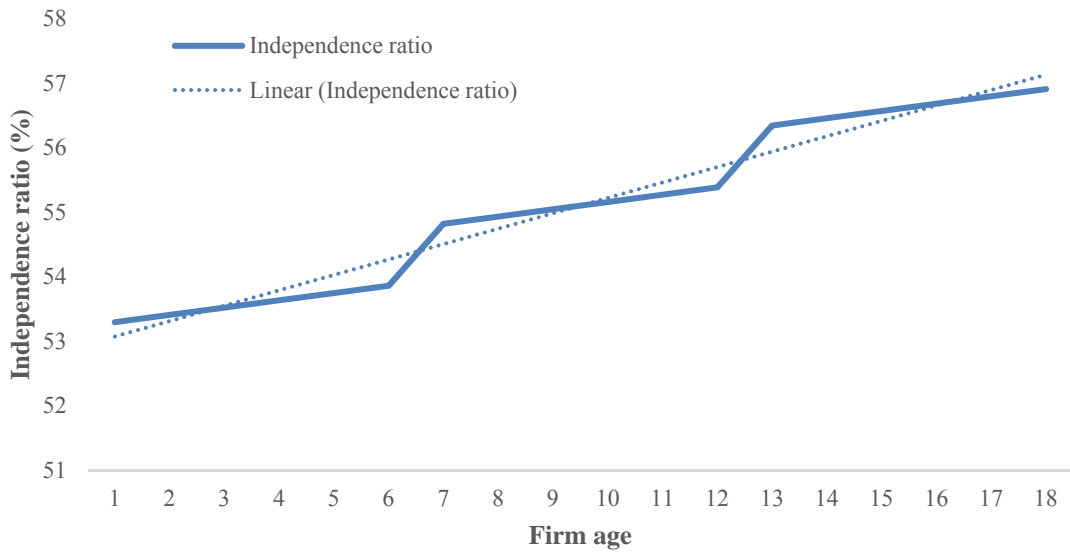
Panel B: Board Independence through Three CEO Cycles after Removing Time Trend
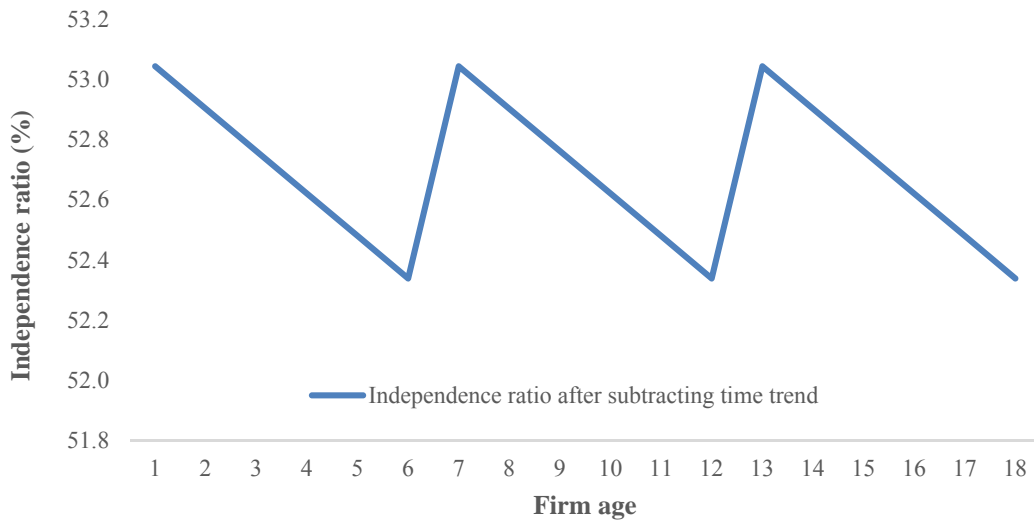
FIGURE V – DYNAMICS OF BOARD INDEPENDENCE FOLLOWING CEO TURNOVER

This figure presents the dynamics of board independence following CEO turnover from the year of turnover, relative to the year before the turnover. A dummy variable "d[t+j]", $0 \leq j \leq 12$ is equal to one if there was a CEO turnover j years ago, and zero otherwise. The sample includes firm-years from t-1 to t+12 (hence, year "t-1" serves as baseline), although any observations from t+k and onward are excluded if there is another CEO turnover in year "t+k." The following "abnormal turnovers" are excluded: i) the previous CEO has less than two years of tenure, ii) the new CEO is replaced within two years. The regression includes firm and year fixed effects and firm-level controls as in Table IV. In Panel A, the red dashed line shows dynamics of ROA for average new internal CEOs, and the blue solid line shows dynamics of ROA for new internal CEOs whose ultimate tenure is at least 12 years. In Panel B, the blue solid line shows dynamics of independence for new internal CEOs whose average industry-adjusted ROA in the past three years is above the median, and the red dashed line shows new internal CEOs whose average ROA is below the median. Panel C presents results for CEO turnovers due to death or health issues of the previous CEO. Panel D presents estimates for new external CEOs. All standard errors are adjusted for sample clustering at the firm level.

Panel A: New Internal CEOs
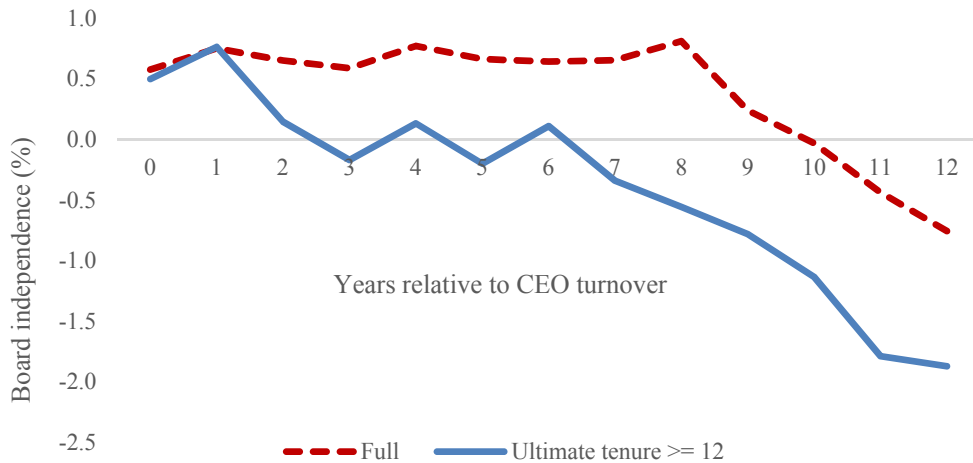
Panel B: New Internal CEOs Conditional on Average ROA over First 3 Years of Tenure
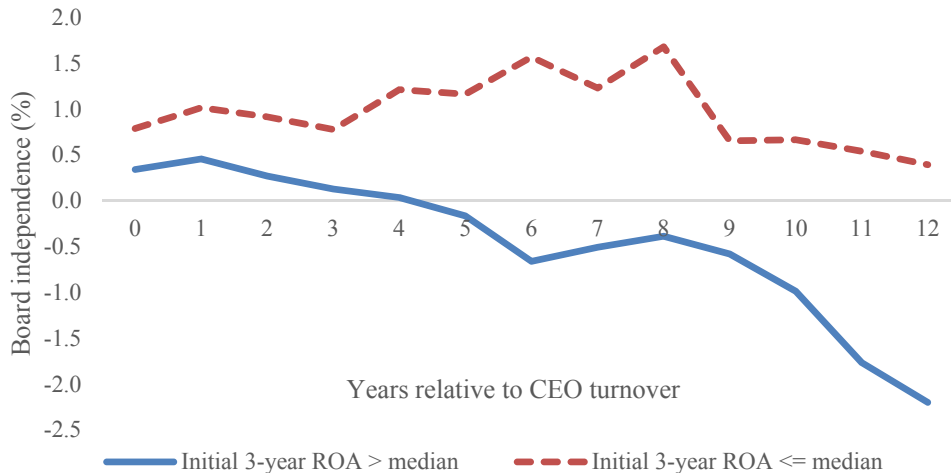
Panel C: CEO Turnovers due to Health Issues and Death of Previous CEO
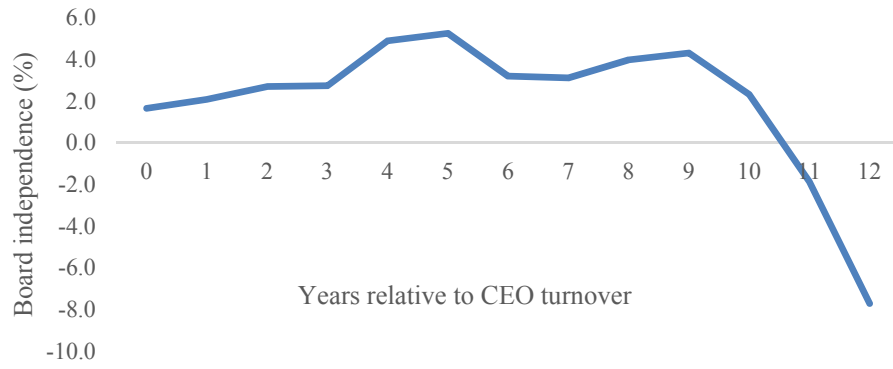
Panel D: New External CEOs
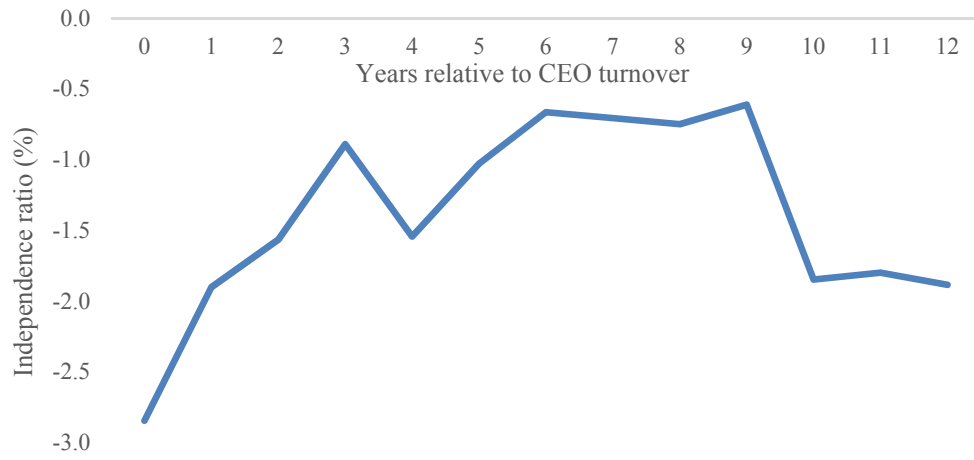
This table presents summary statistics on corporate boards and the CEO for U.S. firm-year observations in a combined database described in Figure I from 1918 to 2011. Panels A and B show the statistics for board/officer characteristics and firm characteristics. "CEO turnover" equals one if the name of the CEO changes relative to the previous year; "CEO (CFO) [Chairman] tenure" is the total number of years during which an individual serves as CEO (CFO) [Chairman] of a given firm; "CEO-Chair duality" is a dummy equal to one if the CEO and Chairman of the board are the same person; "Board size" is the number of directors; "Outsider ratio" is the number of outsider directors scaled by the total number of directors, where outsider directors are defined as all directors other than current officers of the firm. "Indep. ratio" is the number of independent directors scaled by the total number of directors, where independent directors are defined as directors who are neither current nor previous officers of the firm nor family members of the CEO (identified using last names); "Outside CEO" is a dummy variable equal to one if the new CEO is not a previous officer of the firm, and zero otherwise. "Total assets" is book assets; "Firm age" is 1+ number of years since a firm appears in our database for the first time; "ROA" represents return on assets defined as "Income Before Taxes" scaled by lagged assets; "Tangibility" is PP&E scaled by assets; "Industry-adj ROA" represents ROA adjusted for the average ROA at the two-digit SIC industry and year level; "Tobin's q" is book assets minus book equity plus market equity scaled by assets; "Cash/assets" is cash and equivalents scaled by total assets. 1920s* include 1918-1919, and 2000s* include 2010 and 2011.

Panel A: Board and Officer Characteristics

Variable	N (firm-years)	CEO turnover	CEO tenure	CFO tenure	Chairman tenure	CEO-Chair duality	Board size	Outsider ratio	Indep. ratio	Outside CEO (new appt)
					Panel A: Full Sample (1918-2011)					
Mean	87,734	0.118	6.27	5.08	5.87	0.416	9.89	0.647	0.577	0.326
Median	-	0.000	5.00	4.00	4.00	0.000	9.00	0.667	0.600	0.000
STD	-	0.323	5.60	4.70	5.32	0.493	3.51	0.189	0.193	0.469
					Panel B: By-decade Mean					
1920s*	3,148	0.105	4.54	4.33	3.75	0.051	11.24	0.597	0.560	0.422
1930s	5,125	0.087	6.61	6.33	5.30	0.084	10.81	0.571	0.520	0.365
1940s	6,159	0.091	7.97	7.55	6.75	0.091	10.47	0.544	0.492	0.220
1950s	6,570	0.119	7.14	6.98	6.24	0.112	11.12	0.571	0.502	0.256
1960s	9,679	0.119	5.36	4.81	4.71	0.226	10.81	0.584	0.518	0.292
1970s	15,336	0.112	5.83	4.74	5.37	0.455	10.02	0.601	0.527	0.250
1980s	12,289	0.115	7.42	5.06	6.76	0.621	9.80	0.666	0.594	0.293
1990s	14,548	0.142	5.81	3.88	5.84	0.639	8.70	0.698	0.632	0.397
2000s*	14,880	0.129	6.01	4.41	6.21	0.574	8.99	0.785	0.689	0.398

Panel B: Firm Characteristics

Variable	N (firm-years)	Total assets ($million in 2000)	Firm age	ROA	Industry-adj ROA	Tangibility	Tobin's q	Cash/assets
			Panel A: Full Sample (1918-2011)					
Mean	87,734	2,305.93	21.14	0.053	0.000	0.339	1.444	0.073
Median	-	380.76	16.00	0.058	0.002	0.302	1.160	0.045
STD	-	12,011.22	17.72	0.095	0.087	0.204	0.965	0.081
			Panel B: By-decade Mean					
1920s*	3,148	681.27	6.43	0.076	-0.001	0.443	1.263	0.062
1930s	5,125	707.69	11.64	0.046	0.001	0.443	1.117	0.092
1940s	6,159	736.48	18.22	0.096	0.000	0.321	1.123	0.138
1950s	6,570	1080.45	24.70	0.079	0.000	0.354	1.184	0.100
1960s	9,679	1373.86	22.30	0.072	0.000	0.341	1.612	0.062
1970s	15,336	1562.01	21.20	0.064	0.000	0.332	1.169	0.038
1980s	12,289	2227.12	24.49	0.050	0.000	0.346	1.349	0.037
1990s	14,548	3026.26	21.61	0.031	0.000	0.329	1.735	0.068
2000s*	14,880	5124.64	23.13	0.022	0.000	0.295	1.813	0.095

TABLE II – CEO TENURE, AND ADDITION AND DEPARTURE OF DIRECTORS

This table presents the number of additions and departures of independent and dependent directors by a given CEO's tenure for internal (Panel A) and external CEOs (Panel B). A CEO is defined as an 'internal' ('external') CEO if she is (not) a previous officer of the firm. "N" is the number of firm-year observations for each tenure group.

Panel A: Internal CEOs

Year rel. to turnover	N	Independent directors		Dependent directors	
		# Addition	# Departure	# Addition	# Departure
-1	3882	0.83	0.79	0.68	0.65
0	3882	0.99	0.96	2.46	2.60
1	3651	0.89	0.81	0.66	0.73
2	3139	0.87	0.81	0.63	0.68
3	2764	0.83	0.79	0.63	0.69
4	2349	0.88	0.81	0.58	0.66
5	1988	0.84	0.76	0.58	0.64
6	1722	0.84	0.75	0.56	0.61

Panel B: External CEOs

Year rel. to turnover	N	Independent directors		Dependent directors	
		# Addition	# Departure	# Addition	# Departure
-1	1300	1.03	0.93	0.58	0.64
0	1300	1.65	1.80	2.37	2.06
1	1188	1.04	1.03	0.78	0.91
2	937	1.03	0.90	0.63	0.67
3	751	0.97	0.94	0.55	0.63
4	599	0.94	0.84	0.58	0.59
5	503	0.89	0.88	0.49	0.51
6	417	0.90	0.70	0.46	0.56

TABLE III – PERSISTENCE IN BOARD INDEPENDENCE

This table examines persistence of board independence. 'Initial independence ratio' is the board independence ratio for the first available observation of each firm. Panel A uses all firm-years (except for the very first year for each firm), and Panels B and C use the cross-section of firms T years after observing the initial board independence (T = 5, 10, or 20). Panel D sorts firms into board independence ratio quartiles in a given year, and follows them over the next 10 years. Panel E reports R^2's from panel regressions with various layers of fixed effects. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var.	Independence ratio		
	(1)	(2)	(3)
Panel A: Full Sample			
Initial independence ratio	9.383***	8.507***	7.949***
	(38.93)	(36.96)	(35.26)
CEO tenure	-1.307***	-1.195***	-0.926***
	(-7.80)	(-7.56)	(-6.20)
Firm age	4.055***	3.603***	2.460***
	(18.13)	(16.81)	(11.12)
log(board size)	-	-	3.585***
	-	-	(16.11)
log(N. officers)	-	-	-3.189***
	-	-	(-14.63)
log(assets)	-	-	1.740***
	-	-	(5.72)
q	-	-	0.111
	-	-	(0.76)
ROA	-	-	-0.398***
	-	-	(-3.84)
Tangibility	-	-	0.468***
	-	-	(2.76)
Firm-level controls	N	Y	Y
Year fixed effects	N	Y	Y
R^2	0.271	0.345	0.379
N	81901	81901	81901
Panel B: Cross-Section			
Timing relative to initial year:	**t+5**	**t+10**	**t+20**
Initial independence ratio	10.956***	8.666***	6.567***
	(37.83)	(26.01)	(14.07)
CEO tenure	0.052	-1.253***	-0.971***
	(0.13)	(-3.25)	(-2.65)
Firm-level controls	N	Y	Y
Year fixed effects	Y	Y	Y
R^2	0.491	0.420	0.333
N	3675	2654	1393
Panel C: Cross-Section (with initial IR only)			
Timing relative to initial year:	**t+5**	**t+10**	**t+20**
Initial independence ratio	11.824***	9.503***	7.056***
	(41.52)	(28.48)	(14.45)
Firm-level controls	N	N	N
Year fixed effects	N	N	N
R^2	0.458	0.383	0.276
N	3675	2654	1393

Panel D: Transition Matrix for Board Independence

Year	1	2	3	4	5	6	7	8	9	10
Year 0 Quartile = 1										
% quartile 1	82.5%	75.6%	71.0%	68.0%	65.3%	63.2%	61.9%	60.4%	59.4%	58.5%
% quartile 2	14.2%	18.8%	21.0%	22.4%	23.6%	24.1%	24.4%	24.5%	24.3%	24.3%
% quartile 3	2.4%	4.2%	5.9%	7.3%	8.2%	9.3%	10.0%	10.9%	11.9%	12.3%
% quartile 4	0.9%	1.4%	2.0%	2.3%	2.9%	3.4%	3.7%	4.2%	4.4%	4.9%
Year 0 Quartile = 2										
% quartile 1	15.3%	19.7%	22.4%	24.2%	25.4%	26.7%	27.3%	27.7%	28.3%	28.5%
% quartile 2	64.1%	53.2%	47.2%	43.0%	39.8%	37.5%	35.8%	34.7%	34.0%	33.3%
% quartile 3	17.7%	22.0%	23.6%	24.5%	25.3%	25.5%	25.9%	25.9%	25.7%	25.9%
% quartile 4	3.0%	5.1%	6.9%	8.3%	9.4%	10.3%	11.0%	11.7%	12.0%	12.3%
Year 0 Quartile = 3										
% quartile 1	2.5%	4.7%	6.4%	7.9%	9.4%	10.5%	11.7%	12.5%	13.2%	13.9%
% quartile 2	17.1%	21.0%	22.8%	23.7%	24.4%	24.9%	24.8%	25.5%	25.7%	26.2%
% quartile 3	63.8%	52.9%	46.7%	42.7%	39.7%	37.8%	36.3%	34.6%	33.9%	33.0%
% quartile 4	16.6%	21.5%	24.2%	25.8%	26.4%	26.8%	27.2%	27.5%	27.1%	26.9%
Year 0 Quartile = 4										
% quartile 1	0.8%	1.6%	2.5%	3.2%	3.9%	4.5%	5.0%	5.7%	6.3%	7.3%
% quartile 2	3.2%	5.6%	7.5%	9.5%	10.8%	12.0%	13.4%	14.3%	15.2%	15.7%
% quartile 3	18.3%	23.7%	26.9%	28.7%	29.8%	30.3%	30.9%	31.3%	31.0%	31.0%
% quartile 4	77.7%	69.0%	63.1%	58.7%	55.6%	53.2%	50.7%	48.7%	47.5%	46.0%

Panel E: R-Squared of Fixed-Effect Regressions

Dep. Var.	Independence ratio						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Full Sample							
Firm-decade fixed effects			Y				Y
Firm-3-decade fixed effects		Y				Y	
Firm fixed effects	Y				Y		
Year fixed effects				Y	Y	Y	Y
R^2	0.570	0.706	0.819	0.134	0.647	0.725	0.824
N	87734	87734	87734	87734	87734	87734	87734
Survival Sample (at least 20 years)							
R^2	0.516	0.695	0.824	0.158	0.651	0.730	0.833
N	28026	28026	28026	28026	28026	28026	28026

TABLE IV – CEO TENURE, BOARD STRUCTURE, AND COMPENSATION

This table presents the relations between the CEO's tenure and other variables with board independence (Panels A and B), CEO-chairman duality (Panel C, column 1), and total current compensation including salary and bonus (Panel C, column 2). Firms with only one reported director are excluded from the sample. Firm fixed effects are used throughout the table except for Column 4 of Panel A. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Panel A: CEO Tenure and Board Independence

Dep. Var.	# Indep. / # Total Directors (Independence ratio)			
	(1)	(2)	(3)	(4)
Sample	Full			
CEO tenure	-0.136***	-0.141***	-0.142***	-0.243***
	(-5.84)	(-6.27)	(-6.37)	(-8.51)
Firm age (Time trend)	0.380***	0.254***	-	0.066***
	(23.02)	(10.90)	-	(5.55)
log(board size)	-	8.366***	11.018***	13.146***
	-	(12.03)	(16.30)	(17.74)
log(N. officers)	-	-3.777***	-4.457***	-5.843***
	-	(-16.95)	(-15.16)	(-16.21)
log(assets)	-	1.657***	0.284	1.239***
	-	(6.38)	(1.04)	(7.21)
q	-	0.216	0.030	0.311*
	-	(1.34)	(0.19)	(1.77)
ROA	-	-1.698	-2.496**	-6.160***
	-	(-1.46)	(-2.18)	(-4.49)
Tangibility	-	5.801***	3.241**	4.698***
	-	(4.28)	(2.41)	(4.89)
Const.	50.493***	31.862***	32.061***	37.118***
	(148.76)	(17.72)	(6.33)	(7.25)
Firm fixed effects	Y	Y	Y	N
Year fixed effects	N	N	Y	Y
R^2	0.625	0.644	0.664	0.221
N	87734	87734	87734	87734

Panel B: CEO Tenure and Board Independence and Cumulative Number of CEO Turnovers

Dep. Var.	# Indep. / # Total Directors (Independence ratio)			
	(1)	(2)	(3)	(4)
Sample	Full			
CEO tenure	-0.091***	-0.100***	-0.126***	-0.263***
	(-3.01)	(-3.44)	(-4.46)	(-8.96)
N. cumulative CEO turnovers	0.576**	0.531**	0.208	-0.172
	(2.46)	(2.44)	(1.00)	(-1.15)
Firm-level controls	Y	Y	Y	Y
Firm fixed effects	Y	Y	Y	N
Year fixed effects	N	N	Y	Y
R^2	0.626	0.644	0.664	0.221
N	87734	87734	87734	87734

Panel C: CEO Tenure, Chairman Duality and Compensation

Dep. Var.	1 (CEO-Chairman Duality)	Log (CEO compensation)
	(1)	(2)
CEO tenure	0.022***	0.024***
	(25.64)	(5.75)
log(board size)	-0.105***	0.044
	(-7.08)	(0.54)
log(N. officers)	-0.047***	-0.073*
	(-6.59)	(-1.71)
log(assets)	0.035***	0.297***
	(5.10)	(7.86)
q	0.007	0.007
	(1.63)	(0.20)
ROA	0.011	1.502***
	(0.32)	(4.68)
Stock return	-	2.526***
	-	(4.24)
Tangibility	0.053	-0.084
	(1.38)	(-0.50)
Const.	0.193***	4.260***
	(3.37)	(9.94)
Firm fixed effects	Y	Y
Year fixed effects	Y	Y
R^2	0.535	0.881
N	68645	3326

TABLE V – INSTRUMENTAL VARIABLE ESTIMATES OF CEO TENURE USING ROA

This table provides an instrumental-variable estimate for the effect of the CEO's tenure on board independence. Panel A shows the first-stage regression estimates and Panel B shows the second-stage estimates. Column 1 (2) of each panel uses ROA over the last three years (in the current year) as an instrument. Firms with only one reported director are excluded from the sample. Firm and year fixed effects are used throughout the table. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

	(1)	(2)
Instrumental Var.:	ROA (3 year)	ROA (current)
Panel A: First-stage Estimates		
Dep. Var.:	Tenure	
ROA	4.635***	2.472***
	(7.59)	(5.83)
log(board size)	-0.077	-0.077
	(-0.38)	(-0.38)
log(N. officers)	0.311***	0.314***
	(3.37)	(3.39)
log(assets)	0.397***	0.435***
	(4.29)	(4.72)
q	-0.092	-0.051
	(-1.56)	(-0.86)
Tangibility	0.355	0.284
	(0.71)	(0.57)
Panel B: Second-stage Estimates		
Dep. Var.:	Independence ratio	
CEO tenure	-1.014***	-1.152**
	(-2.91)	(-2.41)
log(board size)	10.949***	10.940***
	(16.24)	(16.03)
log(N. officers)	-4.184***	-4.140***
	(-13.39)	(-12.38)
log(assets)	0.659**	0.723**
	(1.99)	(1.96)
q	-0.025	-0.022
	(-0.15)	(-0.13)
Tangibility	3.512**	3.527**
	(2.56)	(2.53)
Firm fixed effects	Y	Y
Year fixed effects	Y	Y
N	87174	87174

This table presents the effect of CEO power on the relation between board independence and the CEO's tenure, conditional on uncertainty about the ability of CEOs. We classify a CEO as a 'first' CEO if she is the very first CEO of the firm in the database, and 'non-first' if she is either an internal or external CEO hired after the firm enters our sample. We interact "CEO tenure" with dummies for the categories of first and non-first CEOs. The dependent variable is the ratio of the number of independent directors to all directors ("independence ratio"). Firms with only one reported director are excluded from the sample. Firm and year fixed effects are used throughout the table. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var.	Independence ratio
	(1)
CEO tenure × First CEO	-0.356***
	(-8.92)
CEO tenure × Non-first CEO	-0.087***
	(-3.18)
log(board size)	11.299***
	(16.77)
log(N. officers)	-4.382***
	(-14.90)
log(assets)	0.334
	(1.21)
q	-0.064
	(-0.39)
ROA	-3.405***
	(-2.98)
Tangibility	3.417**
	(2.54)
First CEO	3.941***
	(8.38)
Const.	26.760***
	(5.29)
Firm fixed effects	Y
Year fixed effects	Y
R^2	0.665
N	87734

TABLE VII – HEDGE FUND ACTIVISM AND CEO TENURE-BOARD INDEPENDENCE

This table examines the effect of the CEO's tenure on board independence when CEO power is affected by hedge fund activists. "Target" is a dummy variable equal to one for plus or minus 10 years of firm-years that are targeted by activist hedge funds, and zero otherwise. "After" is a dummy variable equal to one for firm-years that were targeted by activist hedge funds within the past 10 years, and zero otherwise. Hedge fund activism events from 1994 to 2008 are drawn from Brav, Jiang, and Kim (2009). Firms with only one reported director are excluded from the sample. Firm and year fixed effects are used throughout the table. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var.	Independence ratio
	(1)
Sample:	HFA targets & non-targets 1984-2011
CEO tenure	-0.081**
	(-2.40)
CEO tenure × Target	-0.127
	(-1.29)
CEO tenure × Target × After	0.326**
	(2.18)
Firm fixed effects	Y
Year fixed effects	Y
Firm-level controls	Y
R^2	0.666
N	34279
F-tests (p-value):	
CEO tenure × (1 + Target) = 0	0.03
CEO tenure × (1 + Target + Target × After) = 0	0.34

TABLE VIII – REGULATIONS, CEO TENURE, AND GOVERNANCE OUTCOMES

This table examines the effect of the CEO's tenure on board independence, CEO-chairman duality, and compensation separately for years before and after 2002 when various new regulations and laws began to require firms to increase board independence up to certain levels. "Post 2002" is a dummy variable equal to one for years equal to or after 2002, and zero for years before 2002. The dependent variables are independence ratio, a dummy for CEO-chairman duality, and the log of the CEO's current compensation in columns 1, 2, and 3. Firms with only one reported director are excluded from the sample. Firm and year fixed effects are used throughout the table. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var.	Independence ratio	1 (Chairman Duality)	Log (Compensation)
	(1)	(2)	(3)
CEO tenure	-0.147***	0.022***	0.023***
	(-6.41)	(24.17)	(5.45)
CEO tenure × Post 2002	0.100*	0.005***	0.014
	(1.81)	(2.58)	(0.45)
Firm age × Post 2002	0.058***	0.003***	0.006
	(2.83)	(7.10)	(0.88)
log(board size)	11.103***	-0.098***	0.042
	(16.47)	(-6.67)	(0.52)
log(N. officers)	-4.419***	-0.045***	-0.078*
	(-15.03)	(-6.23)	(-1.83)
log(assets)	0.295	0.036***	0.299***
	(1.08)	(5.32)	(8.05)
q	0.013	0.006	0.016
	(0.08)	(1.39)	(0.45)
ROA	-2.733**	-0.003	1.651***
	(-2.39)	(-0.09)	(5.54)
Tangibility	3.306**	0.060	-0.062
	(2.46)	(1.58)	(-0.37)
Const.	32.065***	0.192***	3.667***
	(6.32)	(3.30)	(5.01)
Firm fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
R^2	0.664	0.536	0.880
N	87734	68645	3327

TABLE IX – CEO TURNOVER CONDITIONAL ON FIRM PERFORMANCE AND CEO POWER

This table examines how CEO power affects the sensitivity of CEO turnover to firm performance proxied by changes in return on assets (ROA) defined as income before taxes (as 'IB' in Compustat) and average stock return for the 12-month period prior to the fiscal year ending date. All accounting variables are from Moody's Industrial Manual or Compustat and stock returns are from CRSP. Linear probability models (i.e., OLS) with firm and year fixed effects are used throughout the table, although results largely hold up in logit models with firm fixed effects (i.e., conditional logit). As a proxy for CEO power, columns 1 to 5 use a dummy "Low independence" that is equal to one if the board independence ratio is less than the median, a dummy for CEO-chairman duality, a dummy for average ROA during the CEO's past three years higher than the median, a dummy for average stock returns during the CEO's past three years higher than the median, and a dummy for CEO tenure higher than its third quartile, respectively. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var. - Model	CEO Turnover [t]{0,1} - LPM				
Sample:	1926-2011	1960-2011	1926-2011		
Power proxy:	Low indep.	Chairman dual	High ROA	High return	Long tenure
	(1)	(2)	(3)	(4)	(5)
ΔROA [t]	-0.206***	-0.304***	-0.417***	-0.124***	-0.175***
	(-7.55)	(-5.67)	(-14.05)	(-3.72)	(-6.23)
ΔROA [t] × Power	0.157***	0.215***	0.925***	-0.057	0.009
	(2.73)	(3.52)	(18.68)	(-1.18)	(0.16)
Excess Ret [t]	-0.341***	-0.546***	-0.443***	-1.719***	-0.362***
	(-6.68)	(-5.91)	(-7.93)	(-26.19)	(-6.98)
Excess Ret [t] × Power	0.058	0.251**	0.197***	2.671***	0.165*
	(0.67)	(2.52)	(2.59)	(35.34)	(1.94)
Power	-0.002	-0.209***	-0.046***	-0.047***	0.000
	(-0.51)	(-35.75)	(-12.71)	(-15.83)	(0.06)
CEO tenure	0.007***	0.012***	0.007***	0.007***	0.007***
	(21.59)	(22.91)	(21.76)	(22.08)	(14.12)
Log assets	-0.013***	-0.009**	-0.011***	-0.011***	-0.013***
	(-4.64)	(-2.25)	(-3.83)	(-4.05)	(-4.65)
q	-0.004*	0.000	-0.004	-0.005*	-0.004
	(-1.65)	(0.04)	(-1.61)	(-1.92)	(-1.63)
Firm fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
R^2	0.120	0.201	0.129	0.135	0.120
N	75925	50323	75925	75925	75925

TABLE X – CEO POWER AND ABNORMAL STOCK RETURNS AROUND DEATH- AND HEALTH-DRIVEN CEO TURNOVER

This table examines cumulative abnormal returns from two days before to two days after the announcement of CEO turnovers due to death and serious health issues of the departing CEO for U.S. firms from 1950 to 2011, conditional on proxies for CEO power: A dummy for CEO tenure higher than 11 years, the third quartile (Column 1); a dummy for whether the CEO also holds board chairman title (Column 2): and a dummy for whether the departing CEO is a founder of the firm (Column 3); a. Panel A reports for death-driven events only, and Panel B reports estimates for both death and health-related events. To increase sample size, in this table only NASDAQ firms are included in addition to NYSE/AMEX firms. White standard errors are reported in parentheses. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var.	Cumulative abnormal returns [-2,2]		
	(1)	(2)	(3)
Panel A: Death only, 1950-2011			
High tenure	0.039***	-	-
	(2.68)	-	-
Chairman duality	-	0.031**	-
	-	(2.59)	-
Founder	-	-	0.032**
	-	-	(2.53)
Constant	0.002	-0.013	-0.002
	(0.42)	(-1.35)	(-0.41)
R^2	0.037	0.022	0.030
N	246	223	260
Panel B: Death and Health, 1950-2011			
High tenure	0.027**	-	-
	(2.05)	-	-
Chairman duality	-	0.031***	-
	-	(3.01)	-
Founder	-	-	0.031***
	-	-	(2.62)
Constant	0.006	-0.013*	-0.001
	(1.16)	(-1.66)	(-0.12)
R^2	0.015	0.023	0.025
N	320	295	336

This table provides robustness tests for the effect of CEO tenure on board independence. Panel A splits the full sample into subsamples consisting of different time periods; Panel B uses subsamples that require that the firm survive more than a certain number of years. Firms with no or only one reported director are excluded from the sample. Firm fixed effects are used throughout the table. All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Panel A: Subsample Periods

Dep. Var.	Independence ratio				
	(1)	(2)	(3)	(4)	(5)
Sample:	1918-1947	1948-1977	1978-2011	1996-2011 (ISS period)	1996-2011 (ISS period)
CEO tenure	-0.227***	-0.037	-0.110***	-0.024	-0.294***
	(-4.22)	(-1.19)	(-3.81)	(-0.64)	(-6.95)
Firm-level controls	Y	Y	Y	Y	Y
Firm fixed effects	Y	Y	Y	Y	N
Year fixed effects	Y	Y	Y	Y	Y
R^2	0.775	0.745	0.669	0.707	0.165
N	12943	30241	44550	21257	21257

Panel B: Firm Survival

Dep. Var.	Independence ratio				
	(1)	(2)	(3)	(4)	(5)
Sample:	Full sample	Survive > 2 years	Survive > 5 years	Survive > 10 years	Survive > 15 years
CEO tenure	-0.142***	-0.142***	-0.141***	-0.137***	-0.131***
	(-6.37)	(-6.39)	(-6.36)	(-6.15)	(-5.80)
Firm-level controls	Y	Y	Y	Y	Y
Firm fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
R^2	0.664	0.661	0.654	0.642	0.634
N	87734	87115	84687	78690	70755

APPENDIX TABLE II – AVERAGE EFFECT OF FIRM PERFORMANCE ON CEO TURNOVER

This table examines the sensitivity of CEO turnover to firm performance proxied by changes in return on assets (ROA) defined as income before taxes (as 'IB' in Compustat) and average stock return for the 12-month period prior to the fiscal year ending date. All accounting variables are from Moody's Industrial Manual or Compustat and stock returns are from CRSP. Linear probability models (i.e., OLS) with firm and year fixed effects are used throughout the table, although results largely hold up in logit models with firm fixed effects (i.e., conditional logit). All standard errors are adjusted for sample clustering at the firm level. *, **, and *** represent results significant at the 10, 5, and 1% levels, respectively.

Dep. Var. - Model	CEO Turnover [t]{0,1} - LPM					
	1918-2011	1926-2011		1918-2011	1926-2011	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔROA [t]	-0.250***	-	-0.182***	-0.225***	-	-0.173***
	(-9.65)	-	(-6.55)	(-9.68)	-	(-7.08)
ΔROA [t-1]	-0.154***	-	-0.101***	-	-	-
	(-6.08)	-	(-3.72)	-	-	-
Excess Ret [t]	-	-0.463***	-0.336***	-	-0.421***	-0.325***
	-	(-10.42)	(-6.46)	-	(-9.71)	(-6.95)
Excess Ret [t-1]	-	-0.323***	-0.252***	-	-	-
	-	(-8.09)	(-5.26)	-	-	-
CEO tenure	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***
	(21.51)	(22.09)	(21.58)	(21.56)	(22.02)	(21.59)
Log assets	-0.012***	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***
	(-3.80)	(-4.64)	(-4.08)	(-4.43)	(-4.69)	(-4.64)
Q	-0.007***	-0.000	-0.001	-0.009***	-0.005*	-0.004*
	(-2.67)	(-0.17)	(-0.17)	(-3.62)	(-1.75)	(-1.65)
Firm fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
R^2	0.118	0.118	0.120	0.118	0.117	0.120
N	68735	80177	67145	77336	80769	75925