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CEO Tenure, Performance and Turnover in S&P 500 Companies

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ABSTRACT

The centrality of the CEO is reflected in the empirical literature linking CEO turnover to poor firm performance. However, less is known about the institutional and personal correlates of CEO turnover. In this study, we find two CEO characteristics interact with turnover: tenure and ownership. We interpret our results as indicating that CEOs of S&P 500 firms divide into two groups with different tenure patterns – "owners" (who have large personal shareholdings) and "managers" (who have smaller holdings). The tenure of manager-CEOs (as opposed to owner-CEOs) exhibits a term structure loosely similar to the one produced by the tenure process at academic institutions. Turnover of all kinds is low during a CEO's first four years on the job. In contrast, once a CEO reaches his fifth year, retirements begin a multi-year increase and exits via merger exhibit a large one-year spike. These term effects are strongest for relatively young CEOs, and appear to be independent of such factors as firm performance or retirement norms. We also find that deals and retirements are partially related, but partially distinct, modes of CEO turnover in other respects, which are similar along some dimensions but sharply different along others.

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1. INTRODUCTION

Conventional wisdom holds the CEO to be the most important actor in the hierarchical world of the widely-held American company. The CEO manages the company, glorying in its successes and taking the blame for its failures. In contrast, the company's board of directors acts principally in a supportive role by advising and monitoring the CEO, and – inevitably – by replacing her when the time comes. Even shareholders exert influence chiefly through the CEO by, for example, lobbying the board to replace CEOs in whom they have lost confidence. The centrality of the CEO is reflected in the empirical literature on CEO turnover, which links turnover to poor firm performance.[1] Less is known, however, about the institutional and personal correlates of CEO turnover.

In this paper we explore two CEO characteristics that interact importantly with turnover: tenure on the job and share ownership. We interpret our results to indicate that the CEOs of S&P 500 firms divide into two groups with very different tenure patterns – "owners" (who have large personal shareholdings) and "managers" (who have smaller holdings). In those firms, the tenure of manager-CEOs (but not of owner-CEOs) exhibits an implicit term structure loosely similar to the one produced by the tenure process at academic institutions, and perhaps more similar to the tenure patterns for university presidents and law school deans. A manager-CEO's tenure has three "terms":

- During the first four years on the job, turnover of all kinds is low.
- In year five, exits via merger experience a nearly four-fold, one-year spike; while retirements, which also increase sharply in year five, continue to exhibit additional increases for several more years.
- After year eight, voluntary retirements remain high, but show no persistent rate change.

These term effects are robust to a variety of controls and alternative empirical specifications. They are strongest for relatively young CEOs, and appear to be independent of factors such as firm performance or retirement norms. We also find that while some common factors appear to influence both deals and retirements, many other factors seem to have opposite effects on these two modes of CEO exit.

[1] See, e.g., Murphy (1999), Jensen et al. (2004), Jenter and Kanaan (2006), and Kaplan and Minton (2006).

II. PREVIOUS LITERATURE

This paper contributes principally to the management turnover literature. It is kindred in spirit to a recent working paper by Kaplan and Minton (2006), which distinguishes between "internal" CEO turnover that is driven by boards of directors, and "external" turnover that results when firms are sold or delist in the wake of financial distress. Kaplan and Minton find that poor stock performance predicts internal but not external turnover — a relationship that has strengthened since 1997. Our study also investigates rates of "internal" and "external" turnover during the years 1992-2004. Unlike Kaplan and Minton, however, we focus on how CEO tenure, share ownership, and other institutional factors influence turnover, rather than on how turnover rates have changed over time. In addition, we treat only acquisitions — and not delistings — as an external turnover mechanism for reasons we address below. Nevertheless, insofar as our analysis overlaps with Kaplan and Minton, our results are compatible with theirs.

This paper also relates to Jenter and Kanaan's investigation of the influence of firm performance on the "forced turnover" of CEOs in a large sample of firms, including the S&P 500, between 1993 and 2001 (Jenter and Kanaan, 2006). Like Kaplan and Minton, Jenter and Kanaan find that industry-wide shocks to share returns influence CEO turnover as much as poor performance relative to a firm's industry competitors. This finding is consistent with our results, although it contradicts earlier suggestions (e.g., Gibbons and Murphy, 1990) that boards insulate CEOs from market- and industry-wide shocks. This finding is also important because, as Jenter and Kanaan point out, it is consistent with the behavioral hypothesis that "boards . . . credit or blame CEOs for performance caused by factors beyond their control" as well as with more conventional hypotheses such as the conjectures that CEO ability is better assessed when the industry as a whole is doing poorly (id. at 29).[2]

Also relevant to our study is the larger literature on managerial turnover, which focuses predominantly on internal turnover, i.e., retirements, voluntary or otherwise. The general results of this literature are succinctly summarized by Brickley (2003). Particularly relevant to our paper are investigations by Algood, et al. (2003), Huson, et al. (2001), and Fisman, et al. (2005). Algood, et al., examine CEO turnover through match theory, which assumes that the productivity of a CEO depends on the "match" between the CEO and the firm. Unlike prior research relating CEO tenure to turnover, however, Algood, et al., find that turnover increases until the fifth year of a CEO's tenure, consistent with match theory, and then decreases, consistent with the findings we report below. Unlike the present

[2] Dirk Jenter and Fadi Kanaan were also kind enough to lend us their data on forced turnovers, which we incorporated into our own dataset of S&P 500 firms.

paper, however, Algood, et al., study turnover in the 1980s (when CEO turnover was much lower than in our sample period), do not control for ownership, focus exclusively on non-deal-related turnover, do not contrast deal-related and non-deal-related turnover, and find a consistent interaction between firm performance and the tenure/turnover relationship. Huson, et al., and Fisman, et al., tag samples of CEO departures as "forced" or "voluntary," based on CEO age (departures of CEOs below 60 are presumptively forced) and the authors' interpretations of contemporaneous press reports. Huson, et al., find that chronological age is highly significant, and negatively related to forced departures, as is CEO membership in one of the firm's founding families, while poor performance is positively associated with forced turnover. Fisman, et al., who use a two-stage model to predict CEO firings, find that firms exhibit superior performance when entrenched boards retain CEOs who performed poorly in the past, despite shareholder pressure to dismiss these CEOs.

In addition, Denis, et al., (1997) find that ownership structure mediates the relationship between turnover and performance: among Value Line firms during the late 1980s, turnover was *less* sensitive to performance when directors and officers held 5+% of a firm's shares, and *more* sensitive to performance when an outside blockholder held a stake of 5+%. The broader turnover literature, then, suggests several important control variables for this investigation, including CEO age and firm ownership structure, in addition to standard controls for size, industry, and calendar year.

Finally, because this paper focuses as much on turnover-by-deal as on CEO retirements, it also relates to the literature on the incentives of target managers to participate in deals. Much of this literature dates from the 1980s or early 1990s, and addresses factors salient in that period, such as manager ownership of stock and golden parachutes. For example, Walking and Long (1984) examine the reactions of managers to takeover bids, and a number of investigations attempt to predict takeover bids (Morck, et al., 1988; Mikkelson and Partch, 1989; Shivdasani, 1989; Song and Walking, 1993). There are, however, a few more recent studies. One of these is our own investigation of the role of option compensation in motivating target CEOs to accept acquisition offers. Coates and Kraakman (2006). A second paper by North (2001) addresses most of the CEO characteristics that are examined here. North analyzes the ability of various managerial and board characteristics to distinguish between 342 NYSE/AMEX target firms that were acquired in friendly transactions during the 1990s and a matched set of firms that were not acquired. North's principal finding is that share ownership by corporate officers and inside directors is *negatively* associated with acquisitions, while share ownership by non-management shareholders with board representation is *positively* associated with acquisitions (2001: 144-45). North finds managerial entrenchment to be the most plausible explanation of the negative relationship between insider share ownership and acquisitions. In contrast to our results, however, neither CEO age nor CEO tenure is significantly related to acquisitions in

North's multivariate analysis (2001: 144). These differences may be due to the fact that the median firm in North's sample is much smaller than median firm in our S&P 500 sample--and, correlatively, that insiders hold a larger percentage of company shares in North's sample than they do in ours.

III. INITIAL HYPOTHESES

The turnover literature suggests that poor performance by firms is a major driver of both "external turnover" of CEOs – principally turnover associated with friendly merger deals – and "internal turnover" of CEOs–or CEO resignations from firms that remain independent. Yet the finding that CEO turnover is associated with firm performance tells us little about how turnover is mediated by the personal characteristics of CEOs, including in particular their tenure on the job. Tenure can plausibly affect turnover directly as well indirectly, by interacting with other factors that influence turnover.

Directly, one might expect the incidence of turnover to vary as tenure increases. In the case of retirements, for example, *accelerating* turnover might result naturally from aging or burnout, but it might also result from heterogeneous firm policies mandating retirement at certain age thresholds. In the case of external turnover — i.e., deals — increasing turnover with tenure is consistent with an agency cost hypothesis: CEOs on the cusp of retirement or discharge might opt to sell their companies instead, in order to trigger option plans and liquidate equity holdings. By contrast, internal or external CEO turnover that declines with tenure might be explained by CEO entrenchment or, alternatively, by improvements in CEO performance that result from selection effects or learning on the job. Finally, consider the possibility that turnover might *spike* at one or more points in the tenure cycle. A sudden but short increase in turnover would be loosely similar to the pattern observed among academics, whereby universities promote or terminate young professors after a set number of years, or perhaps even more similar to the tenure patterns of university presidents and departmental deans. Such a pattern would result if boards (and CEOs themselves) made use of natural focal points in the course of a CEO's tenure, such as renewals of employment or compensation contracts, as occasions for evaluating CEO performance.

The second and closely-related issue is the interaction between CEO tenure and other factors that influence turnover. Regardless of the shape of aggregate turnover by tenure year, different factors might prompt turnover during different phases of the tenure cycle. Under an entrenchment hypothesis, for example, firm performance might be more important to turnover at the outset of the tenure cycle and less so subsequently, as CEOs gain power within the firm. Under a monitoring hypothesis, performance variables might become important several years into the tenure cycle, as the results of CEO policies first become evident to boards and CEOs themselves – a pattern that would again be

consistent with one or more spikes in turnover. Different mechanisms might dominate at different stages of CEO tenure. Screening might drive a high rate of resignations and/or sales for CEOs early in their tenure, while age-driven retirements might result in a high rate of resignation or sale for late-tenure CEOs.

IV. CONSTRUCTION OF THE DATA SET

We construct a composite data set for all companies in the Standard & Poor's (S&P) 500 index from 1992 through 2004, which includes a variety of firm-level and CEO-specific variables extracted from a half-dozen sources.

A. Data on S&P 500 CEOs

We extract compensation data for S&P 500 CEOs from Compustat's Execucomp database. For each year from 1992 to the present, Execucomp maintains data on all firms in the S&P 500 for that year, which exceeds 500 companies because a small number of firms exit the S&P 500 each year, primarily due to acquisitions.[3] We collect data on chief executive officers (meaning the single highest paid officer[4]) for any given firm for all firms in the S&P 500 at any time from 1992 to 2004. Our total sample includes data on 6449 firm-years, with partial data in the Execucomp database for 1992 and 2004. For each firm-year, we gather data on CEO equity ownership and compensation. Thus we record the CEO's total direct compensation (TDC), as well as its discrete components.[5] We also report the top officer's end-of-year total holdings of shares of stock, vested options, and unvested options. We calculate the value of CEO stock holdings (SHARVAL) by multiplying the total number of CEO shares by the company's end-of-year stock price. Similarly, we calculate CEO percentage shareholdings (SHARPCT) by dividing the number of CEO shares by total shares outstanding. Execucomp maintains data on the intrinsic value of options (i.e., the difference between strike prices and the company's end-of-year stock price). The sum of the intrinsic value of a CEO's vested and unvested options is reported as OPTVAL.

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[3] Execucomp's 1992 data is substantially incomplete; we include it in what we report, but our results are qualitatively unchanged when we drop 1992 observations. Our access to Execucomp was through Wharton's on-line collection of databases. In the Wharton collection, Execucomp does not make publicly available its codes for S&P 500 membership for firms no longer included in the S&P 500 (i.e., historic S&P 500 membership) and commingles those observations with firms that were, but no longer are, in the S&P Midcap and Smallcap indices, so we hand-code historic S&P 500 membership by reference to S&P annual publications.

[4] Although not all top executive officers have the title "Chief Executive Officer," for brevity we refer herein to top executive officers as CEOs.

[5] These include SALARY, BONUS, LTIP (long-term incentive payments), RSTKGRNT (restricted stock grants), and BLKSHVAL (the Black-Scholes value of new option grants).

We search proxy statements for missing data on when CEOs first joined their firms in any capacity, and when they initially stepped into the top job. The TENURE variable, which plays a large role in our analysis, is the difference between the current calendar year and the year in which an executive became CEO. Because available data on CEOs is annual, our count of years on the job is somewhat rough. If, for example, a CEO joins a firm in February of Year 1, and is recorded as CEO in the firm's annual proxy statement, but then departs in April of Year 1, after only three months on the job, we will record him as having a TENURE of one at the time of his departure. Thus, in effect, TENURE of 1 includes CEOs with up to one year of tenure; TENURE of 2 consists of CEOs with between 1 and 2 years on the job, etc. In addition, if another CEO joins a firm in April of Year 1, but was not reported in the annual proxy statement for that year, and then resigns later that year, we will not observe his tenure at all. In the regression analysis that follows, these data limitations should bias against finding evidence of term structures or relationships between tenure, turnover, and other variables of interest. They also mean, however, that we can only be so precise in reporting and interpreting the evidence of term structure that we report below – we cannot say with any certainty, for example, whether a CEO's first "term" is, on average, four or five years.

In addition, we obtain CEO age and employment data from Execucomp, which lists CEO ages, initial employment dates, and dates on which CEOs acquired their firms' top job.[6] As Execucomp's age data is spotty, we supplement it by direct reference to proxy statements for approximately half the sample, and report the corrected data here as AGE. We also construct an age-based variable, RETIREZONE, to reflect the social norm of retirement at or around age 65. This variable takes on a greater weighting as the CEO approaches age 65, with a value of 1 if the CEO is 61, 2 if the CEO is 62, and so on, up to 5 for age 65.

B. Firm-Level Data

The Execucomp and Compustat databases also provide most of our firm-level data, including basic firm demographics: yearly market capitalization, book asset value (ASSET), SIC industry code to four digits, year-end share price (PRICE), and a variety of financial variables, including LEVERAGE (the ratio of total liabilities to common share book value). We map SIC codes into Fama-French (1997) industry classifications, which serve as the principal industry control in our analysis, although our results do not change if we use raw two-digit SIC codes. Similarly, financial data from Compustat allow us to generate a variety of measures of firm performance, including the three that we particularly rely on here: (1) total one-year return on shares for a company divided by median share returns for all

[6] Oddly, Execucomp maintains data on the current age of a CEO for any given observation year, even if the observation year is historic. That is, the "CEO Age" variable will be, say, 60 for each yearly observation for a given CEO who is 60 at the time the data is downloaded from the database. We have adjusted the CEO age data in our database accordingly.

S&P 500 firms in the company's Fama-French industry classification for the year in question (REL_TRS1YR), (2) annual change in sales revenue less median change in sales revenue for the company's Fama-French industry classification in the appropriate year (ADJ_SALECHG), and (3) the ratio of the firm's Tobin's q to median Tobin's q (RELATIVEQ) for the company's industry classification in the appropriate year.[7] These are measures, respectively, of a firm's recent stock market performance, growth trajectory, and firm-specific performance (purged of the industry and market components of total performance). Execucomp also provides a measure of Black-Scholes volatility (or total risk) associated with company shares, which we record as RISK.

To obtain data on ownership structure, we look to two sources. The Dlugosz, et al. (2004), database supplied highly reliable data on blockholder ownership and identity for the years 1996 through 2001. We turn to the noisier CDA Spectrum database to obtain blockholder data from 1992 though 1995, and from 2002 through 2004. Because we use ownership structure as a control variable, we compress ownership's most important effects on turnover into a single variable. To this end, we construct a composite measure (BLOCKSCORE) based on the intuitive idea that inside shareholders may use their shares to entrench, while outside shareholders may use share blocks to induce turnover, an intuition generally consistent with the reports of Denis, et al. (1997), that outside blockholders increase the sensitivity of turnover to performance while inside blockholders decrease it, and of North (2001) that inside blockholders reduce the probability of a company sale while outside blockholders with board representation increase it. BLOCKSCORE takes the value of "1" if a trust or family foundation holds shares with more than 5% of the company's voting power, a value of "2" if the CEO herself holds shares with more than 5% of the voting power, a value of "4" if two or more institutional shareholders (e.g., mutual funds, pension funds) hold blocks with 5% or more of the voting power, and a value of "5" if an independent entity—most often another operating corporation—holds shares with 5% or more of the voting power. BLOCKSCORE assumes the neutral value of "3" if there are no 5+% blockholders, if there is a single 5+% institutional blockholder, or if there are only outsider individual or issuer-related pension and ESOP 5+% blockholders. All firms in our sample can be assigned a unique block score on the basis of this coding. Figure A1 in the Appendix charts the increasing probability of a deal or the retirement of a CEO under the age of 60 as BLOCKSCORE scores increase.

C. Data on CEO Turnover

External turnover as defined by Kaplan and Minton (2006) includes both acquisitions in which target company CEOs lose their positions, and delistings in which companies leave the public market in the wake of financial distress. By contrast, we focus in this paper on acquisitions of firms, which are

[7] We are grateful to Allen Ferrell for supplying us with the program and parameters used to calculate RELATIVEQ.

far more common than delistings among S&P 500 firms.[8] We use the terms "external turnover" and "deal" interchangeably to refer to acquisitions of a firm that accompanies CEO turnover. Our rationale for excluding delistings from the analysis is that deals and internal CEO turnover are parallel exit modes for CEOs and, on occasion, possible substitutes. In most cases they are both the result of discretionary decisionmaking, either by the board or the CEO. (For example, Boone and Mulherin (2004) report that target firms initiate the bulk of friendly deal transactions.) But delistings are different: they are usually driven by collapse, they involve little short-run discretion on anyone's part, and they are hardly substitutes for CEO resignations. We also expect the determinants of deals to differ from determinants of delistings.

We obtained information on acquisitions of S&P 500 targets from the Thomson Financial Securities Data M&A database for each firm in our sample. We then matched each yearly observation with the subsequent year's data from the M&A database, to produce a variable (DEAL), coded "0" if the company was not acquired in the subsequent year, or "1" if it was.[9] We supplemented this procedure by deriving a list of all companies that were removed from the S&P 500 before the end of the sample period, searching news reports in Lexis/News for an explanation for the removal, and correcting DEAL where news reports indicated that the company was acquired.

We obtained data on internal turnover in the usual way: by noting when S&P 500 companies reported new CEOs. The internal turnover variable RETIRE assumes the value of "0" in the current year if, in the succeeding year, there is no deal and the firm remains in the S&P 500 without a turnover of its CEO. RETIRE assumes the value of "1" if there is no deal, the firm remains in the S&P 500, but a new CEO takes the helm in the succeeding year. Thus, RETIRE, DEAL, and continuing CEO are mutually exclusive categories. Of course, the variable RETIRE conveys no information about why CEOs leave. Many CEOs retire voluntarily, while others are dismissed, find other employment, or die on the job. To focus more narrowly on dismissals or forced retirements, we generally follow the practice – common in the turnover literature – of examining the RETIRE for the subsample of CEOs below 60, the age at which mandatory retirement policies first begin to have bite, and interpret the pre-60 internal turnover as likely to reflect involuntary terminations. We supplement our dataset with hand-

[8] In our sample, 53 firms were dropped from the S&P 500, more than half for reasons of financial distress, in the period 1993 – 2004. By contrast, 194 firms were dropped as the result of friendly acquisitions in which target CEOs lost their positions.

[9] To ensure that the transactions are of the type in which we are primarily interested (sales of control, not acquisitions or partial block sales), we exclude deals unless they involve a merger or an acquisition of at least half a company's voting stock, and we review each deal in the sample to verify that the company in our sample was being acquired and not truly an acquiror (as when NationsBank acquired BankAmerica but maintained BankAmerica's stock listing and renamed the combined company BankAmerica).

collected data on forced CEO turnovers, generously provided to us by Dirk Jenter and Fadi Kanaan. The Jenter-Kanaan data is undoubtedly underinclusive, since it flags only the turnover of CEOs under 60 for which press releases or news stories provide evidence of a forced dismissal.[10] We reflect this flag in the dummy variable FIRED, which is a subset of RETIRE.[11]

Appendix Figure A2 provides an overview, similar to that discussed by Kaplan and Minton (2006), of the remarkable volatility in internal and external turnover of CEO during our sample period. In 1993, total CEO turnover was 8.6%, of which only one-seventh (1.3%) took the form of deals. By 2000 and 2001, total turnover had increased to 17.8% and 22.1% (25% if we include delistings), of which between a quarter and a third resulted from deals. By 2003, total turnover had subsided to an annual rate of 12%, of which once again only about a seventh resulted from deals. Clearly, turnover has varied dramatically from one year to next over the past decade. Our focus here is not on the variation, but on influences on turnover that persist, after controlling for factors that correlate with time, so we control for macroeconomic or other time-varying shocks by employing annual dummy variables in our multivariate analysis.

IV. UNIVARIATE ANALYSIS

One CEO characteristic correlates exceptionally strongly with CEO tenure, namely, CEO shareholdings – particularly when CEOs hold more than one percent of their companies' shares. Because CEOs with large holdings tend to have long tenures and are distinct in other respects, we make a rough analytical division of S&P 500 CEOs into two groups: "*owner-CEOs,*" who hold more than one percent of their company's common shares, and "*manager-CEOs,*" who hold less than one percent.

A. Share Ownership, Tenure, and Turnover

Table 1 below provides summary t-statistics on the differences in means between owner-CEOs and manager-CEOs for several key variables:

[10] For a full description of the collection methodology, see Jenter and Kanaan (2006) at 17.

[11] Of the 224 retirements of CEOs under 60 in our sample, only 72 qualified as forced dismissals under the Jenter and Kanaan criteria.

Table 1

Variable	Managers N=5040	Owners N=1143	t-statistic (unequal means)
Tenure – Years served as CEO	5.5	13.4	-26.1***
Sub_Tenure—Years served before becoming CEO	14.4	9.5	12.9***
Age – CEO age in years	55.5	56.3	-2.72**
Lnass – Log of firm asset value	9.05	8.17	17.9***
Leverage – Liabilities / common share book value	74.5	65.3	1.68**
SP500_1982 – 1 if firm was in S&P 500 in 1982	0.47	0.16	24.1***
SP500_1993 – 1 if firm was in S&P 500 in 1993	0.81	0.75	4.8***
Tobin's q	2.04	2.83	-9.02***
Relative q – Tobin's q / median industry q	1.11	1.42	-10.16***
Salechg – Annual change in sales revenue	11.3	19.4	-6.22***
Adj_salechg – Salechg – median industry salechg	2.86	9.80	-7.60***
Trs1yr – Total return on shares over the past year	17.7	29.0	-4.67***
Rel_trs1yr – Trs1yr / median industry trs1yr	1.54	2.00	-0.55
Roa – Return on assets	4.27	6.54	-6.20***
Deal – 1 if deal next year, otherwise 0	0.032	0.017	3.18***
Retire – 1 if retire next year, otherwise 0	0.114	0.093	2.16*
Fired – 1 if fired next year (1993 –2001 only)[1]	0.023	0.007	4.45***
Resigned – 1 if retire, not fired ('93 –' 01 only)[1]	0.099	0.090	0.81

[1]Jenter-Kanaan forced turnover data: N = 3710 for managers; N= 903 for owners.

Table 1 documents a striking difference of almost seven years in average tenure between manager-CEOs and owner-CEOs. Although owner-CEOs and managers are roughly the same age on average – *and have worked roughly the same number of years at their companies* – owner-CEOs have longer tenures because they become CEOs at earlier ages. Consistent with this observation, on average, owner-CEO-led firms are, relative to other S&P 500 firms, much smaller (in terms of assets), less leveraged, newer to the S&P 500, and – as one might expect from fast-growing firms – better on our metrics of economic performance. As an illustration, only 16% of owner-CEO-led firms in our sample (which begins in 1993) were listed on the S&P 500 in 1982, a large majority of these firms first qualified for S&P 500 membership between 1982 and 2003. By contrast, 47% of firms with manager-CEOs in 1993 were already members of the S&P 500 in 1982.

At first cut, then, Table 1 suggests an idealized story in which the typical owner-CEO is the founder or major shareholder of fast-growing firm that has recently joined the S&P 500. This owner became a CEO early in life by joining (or founding) a small firm that subsequently prospered. By

contrast, the typical manager-CEO devotes the larger portion of her career working her way to the top of a big, widely held firm. She spends roughly the same number of years with her firm as the average owner-CEO does (19.9 vs. 22.9 years), but she spends most of this time in subordinate positions.

A second feature of Table 1 is that owner-CEOs are less likely to sell their companies than manager-CEOs, and are also much less likely to be "fired" – or subject to forced turnover (even though they are equally likely to resign). The import of these results for the alignment and attachment-entrenchment hypotheses is ambiguous. On the one hand, reluctance to sell by owner-CEOs seems to favor the attachment-entrenchment hypothesis; on the other, the superior performance of owner-CEOs firms may justify a greater reluctance on the part of boards to sell these companies or to force their owner-CEOs out of office.

B. Tenure, Turnover, and Performance

CEO tenure is more complex than share ownership. While CEO tenure in our sample ranges up to 45 years, 90% of our CEOs have served less than 14 years, and median tenure is 5 years. Summary statistics for turnover by CEO tenure strongly supports the hypothesis that a term structure underlies the tenure and turnover of S&P 500 CEOs. Table 2 below illustrates this point for the subsample of S&P 500 firms between 1993 and 2001 for which we can decompose internal turnover--i.e., "retirements" (RETIRE)--into voluntary turnover (RESIGN) and Jenter-Kanaan forced turnover (FIRED).

Table 2

Turnover by Deal, Resignation, and Forced Exit for Manager-CEOs in the S&P 500 Between 1993 and 2001

Year of Tenure	Mean Total Turnover	Mean Deal	Mean Resign	Mean Fired	Frequency
1	.097	.046	.045	.006	350
2	.137	.037	.068	.032	519
3	.134	.033	.069	.032	430
4	.112	**.037**	**.053**	.022	378
5	.206	**.078**	**.107**	.021	357
6	.232	**.045**	**.157**	.030	292
7	.281	**.029**	**.228**	.024	244
8	.254	.047	.187	.020	211
9	.250	.018	.201	.031	170
10	.274	.022	.228	.024	137
11	.151	.017	.125	.009	119
12	.220	.028	.192	.000	107
13	.227	.000	.179	.048	87
14	.249	.025	.203	.021	80
>14	.224	.018	.185	.021	450

The most striking result in Table 2 is that the incidence of *both* deals and resignations doubles in the fifth year of CEO tenure. Excluding the relatively few CEOs who are "fired" outright, the proportion of CEOs who depart through resignation or merger jumps from 9% to 18.5% in the fifth year of tenure. Indeed, more than one-sixth (17.5%) of all deals in the full sample occur during this year. After the fifth year, deal incidence sharply declines, but resignations continue to rise until they plateau at about 20% per year in roughly the eighth tenure year.

These results suggest a term structure underlying CEO tenure. It takes time to appoint, assess, and replace CEOs, especially since large hierarchical organizations cannot afford continuous instability at the top. In addition, both boards and CEOs themselves need time to implement business plans and evaluate the their results. A plausible conjecture is that Table 2 reflects the effects of successive three-, four- or five-year contracts. CEOs with initial three-year contracts who do not fail ignominiously can expect their initial contract to be renewed at least once. Depending on the length of their contracts, CEOs can expect tougher evaluation – and possible dismissal – after either one or two contract periods,

in year four, five or six. In anticipation of (or to avoid) that evaluation, CEOs may choose to resign or sell the company.[12] Those that survive beyond year five are thereafter less likely to feel pressure to sell the company, either because relevant constituencies (the board, shareholders, research analysts) believe the CEO has already been screened as successful, or because efforts by CEOs to entrench themselves (e.g., by appointing friends to vacancy board seats) are largely in place after that point.

Forced terminations, by contrast, do not show a clear term structure in Table 2. That may be because of forced terminations are out-of-equilibrium (since CEOs who sell their firms are likely to benefit more than by being fired) or caused by unexpected events (e.g., a personal or legal scandal tarnishing the CEO). In addition, the data in Table 2 do not control for many variables of interest that may be indirectly driving turnover – CEO age, for example, obviously increases in parallel with CEO tenure, and can also be expected to influence turnover. To confirm the existence of the term structure that seems to be revealed by Table 2, and to explore its precise shape, we turn to multivariate analysis.

V. MULTIVARIATE ANALYSIS

Because we have data on forced turnover (FIRED) for only a subset of our firm-year observations, and because the observable difference between forced and voluntary resignations is necessarily noisy, we present two basic models of the effects of CEO tenure on turnover. In the first model, presented in Table A-2 in the appendix, we use a two-outcome multinomial logit regression, in which the dependent variables are RETIRE and DEAL. In the second model, presented in Table A-3, we use a three-outcome logit regression, in which the dependent variables are FIRED, RESIGN, and DEAL. This set-up allows our explanatory variables to vary in their effects across substitute modes of CEO turnover, and to explore the degree to which the observable component of forced turnover differently correlates with our independent variables. After presenting these basic models, which we believe provide results consistent with the existence of the term structure sketched above, we explore more intensively the interactions between term structure, turnover, and measures of firm performance. Finally, we more carefully explore the relationships among CEO tenure, turnover, retirement norms, and age.

[12] Another possibility is that CEOs, after five years on the job, have track records that permit them to move on to more remunerative CEO positions. However, a Google search of the post-turnover activities of all 28 sample manager-CEOs leaving after their fifth year tenure year reveals that 17 retired as active managers while continuing to serve on corporate or non-profit boards for at least two years. Five continued to serve as a subordinate officer (e.g., COO/president) of the surviving (acquiring) company; three pursed a second, non-managerial career; and two became CEOs of other public companies. Thus, "serial CEOs," who leave one top job to take on another, are rare at the level of the S&P 500. It seems unlikely, then, that the spike in CEO turnover after the fourth year of tenure is due to more attractive offers in the managerial labor market.

A. A Note on the Shifting Composition of the S&P 500

The S&P 500 did not remain static over the twelve years covered by our data set. Of the 6,478 firm-years in our sample, 21% arise from firms that were added to the S&P 500 between 1994 and 2003 to replace incumbent firms that were sold or were dropped, often because of financial distress. Most of the new firms added to the S&P 500 were smaller than incumbent firms, performed significantly better on our three performance metrics (relative Tobin's Q, sales growth, and one-year share returns), and were more likely to enter deals. It follows that, as compared to true panel data, the S&P 500 is subject to a double selection bias: firms that are sold or dropped are often poor performers while added firms are generally top performers that have experienced significant sales growth in the recent past. As a check on these biases, we examine logit results for the subsample of firms that comprised the S&P 500 in 1993 (the "1993 cohort").[13] We also note parenthetically that initial listing dates should be consulted in evaluating the results of other papers that find a strong positive relationship between firm performance and CEO ownership or founder participation in S&P 500 firms.[14]

B. The Basic Two-Outcome Model: Predicting DEAL and RETIRE

Table A-2 displays the multinomial logistic results of regressing DEAL and RETIRE on our target and control variables. Each table presents results for the full sample, and for the subsets of firms with owner- and manager-CEOs separately.

For RETIRE (Panel A), CEO tenure is a strong correlate starting in year 4 (the fifth full year of a CEO's tenure), when the relative risk ratio almost doubles, from 1.2x to 2.0x, and continues to increase in absolute and statistical significance through year 7 (the eighth full year of a CEO's tenure), by which point the coefficient has doubled again, to 4.1x, at which point it levels off (while remaining strongly correlated) with turnover. Using the method of recycled predictions (holding actual values for other variables constant), these coefficients imply that CEO retirements jump from 4% prior to year four to 9% in year four and continue to rise to 16% in year seven. In sum, CEO turnover is low in the first four full years of tenure, rises dramatically through year seven of tenure, and then continues to be high throughout the remaining years of tenure.

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[13] Of course this leaves the selection bias introduced by firms that are dropped from the S&P 500 list and makes the entire list less representative of the changing composition of large American public companies.

[14] See, e.g., Anderson and Reeb (2003). Anderson and Reeb control for the ages of firms, which may proxy for listing dates. Our results suggest, however, that a recent listing date for an S&P 500 company is more strongly correlated with superior performance than the date on which the firm originally went public.

These patterns are stronger for manager-CEOs than for the full sample, but they are completely absent for owner-CEOs. This striking difference between manager- and owner-CEOs is consistent with the univariate findings presented in Table 1, and it is consistent with a general hypothesis that firm governance and behavior are sufficiently different for the two kinds of CEOs to justify treating them differently in the remaining regressions.[15] Among manager-CEOs, the odds ratio for RETIRE jumps from 1.3x in year three to 2.4x in year four, and to 4.7x in year seven, where again it levels off but remains strong and statistically significant.

For DEAL (Panel B), CEO tenure also emerges as a strong predictor of whether a company will be sold. More precisely, there is no statistically significant relationship between any year of a CEO's tenure and deals, except for year 4 (the fifth year of a CEO's tenure). In that year, when a CEO is "up for tenure" (to use the loose analogy to academic tenure), a randomly-selected firm with a manager-CEO has a 6.4% probability of being sold (using the method of recycled predictions), roughly double the likelihood of being sold in either year 3 or year 5, and also roughly double the average annual level of deal activity for the sample as a whole. Again, this one-year spike does not appear for owner-CEOs, who, as previously discussed, generally have much longer tenures than manager-CEOs.

Thus, for both RETIRE and DEAL, the fifth year of a manager-CEO's term in office is a crucial inflection point: in that year, firms are much more likely to be sold, and the odds of a CEO retiring outside the context of a deal jump sharply. More generally, however, the fifth year plays a different role for different types of turnover. For deals, the fifth year has a now-or-never quality (to overstate our findings for effect), as deals are unaffected by the CEO's tenure after the fifth year, and ceterus paribus, are much less to occur after that turning point. For retirements, by contrast, the fifth year only marks the beginning of a period of several years in which turnover continues to mount, before flattening out (and remaining relatively high thereafter).

Among control variables, AGE and RETIREZONE are strong predictors of retirements, consistent with prior research (see Brickley 2003), and weak predictors of deals. As CEOs age, they are, not surprisingly, increasingly likely to retire, die, or sell the company, and this seems particularly true as CEOs approach age 65. We return to a more careful exploration of the effects of age below.

Unlike research from the 1980s, which typically finds that size correlates positively with takeovers, we find that deals are less likely at larger firms, measured by logged assets (LNASS)--a finding that is consistent with financing constraints on bidders. Perhaps because retirements and deals are substitute methods of turnover, internal turnover is more common at larger firms. Conversely,

[15] The difference is consistent with a variety of more specific hypotheses, including better incentives (reducing the odds of disciplinary firings), entrenchment (reducing the odds of forced turnover of any kind), and attachment (reducing the odds of deals), but distinguishing among possible explanations is beyond the scope of this paper.

highly leveraged firms are more likely than low-debt firms to be sold in deals, but leverage is not robustly associated with retirements for manager-CEOs, consistent with the plausible interpretation that financing constraints push a firm to enter into a deal, but have no clear implication for whether a CEO will step down or not, absent a deal. We also find that RISK (stock price volatility) is additional predictor of retirements for manager-CEOs.

Among performance controls, retirements are positively associated with positive RELATIVEQ, whereas deals are negatively associated with RELATIVEQ, as well as with ADJ_SALECHG. The implications are that CEOs are more likely to sell firms that are performing poorly or growing slowly relative to their industry peers, but CEOs are more likely to retire when firms are highly valued by the market, relative to industry peers. As do many other studies, we find no relationship between DEAL and poor short-term stock performance. We analyze the interactions among term structure, performance and turnover in more detail below.

Finally, insider block holdings discourage deals while outsider holdings encourage them. BLOCKSCORE is not correlated with retirements, on the other hand, suggesting that institutional owner influence is limited to pushing through (or encouraging) deals, and does not extend to forcing out (or encouraging the retirement of) manager-CEOs.

C. The Basic Three-Outcome Model: RESIGN, FIRED, and DEAL

Our basic three-outcome results are generally consistent with the two-outcome results. With respect to CEO tenure, RESIGN shows a significant increase in tenure year 4 (jumping from 3.1% to 8.0%) and a further increase through year 7 (when it is a very large 15.9%). Interestingly, FIRED shows an additional, earlier jump in year 2 (to 3.1%), suggesting that CEOs who wash out quickly get terminated before they have time to sell the company, and then another jump in year 5 (to 3.1%). DEAL also shows a sharp increase in year 4 (jumping to 8.3% in the three-outcome model). In year 4, when deals and resignations jump up, FIRED is an all-time low (1.2%), consistent with the conjecture that RESIGN, FIRED, and DEAL are substitute means for CEOs to exit the firm.

The more complex model also allows us to focus on which factors drive turnover that is clearly and observably forced, and which drive turnover that is in large part truly voluntary. LEVERAGE and CEO equity holdings, for example, appear to drive FIRED, but not RESIGN, which suggests that CEOs may be more likely to be involuntarily terminated if their firms face greater financial stress or CEOs themselves have weaker equity-based incentives. Moreover, as one might expect Intuitively, AGE and RETIREZONE drive RESIGN (as well as DEAL), but do not drive FIRED. Less intuitively, however, more highly compensated CEOs are more likely to engage in deals, and less likely to resign, than their counterparts, but higher total compensation has no strong relationship with FIRED, i.e., with

involuntary termination. LNASS and RISK, finally, are positively correlated with both types of internal turnover.

As before, firm performance as measured by RELATIVEQ is positively associated with RESIGN, negatively associated with DEAL, and not strongly correlated with FIRED. ADJ_SALECHG is also negatively associated with DEAL, and unrelated to internal turnover. REL_TRS1YR is not strongly associated with any type of turnover. Again, BLOCKSCORE increase the odds of a deal, but not internal turnover.

We also run the three-outcome model on the subset of 454 firms with manager-CEOs that were in the S&P 500 in 1993 to control for survivorship and selection bias, as was discussed above. Although the sample size is smaller, our year 4 results on DEAL remain marginally statistically significant, and our overall results are qualitatively the same (see column (3) of Table A-3).

D. Robustness and Sensitivity

Our findings are generally robust to the inclusion of other control variables in our dataset, to the inclusion of squared or polynomial terms for the various controls that are included, produce stronger statistical relationships if we use Newey-West standard errors to allow for the possibility of autocorrelation in error terms, and produce qualitatively similar results if we use different specifications (e.g., separate binomial logits for DEAL and RETIRE (or RESIGN and FIRED), or a Cox hazard model in which the odds of DEAL or RETIRE (or RESIGN and FIRED) are measured over a CEO's tenure).

It should be noted, however, that the relationship between tenure and DEAL may not be time-invariant: while the relationship appears in most subperiods within our full period, including many single years (despite the reduction in observations annual regressions entail), the relationship seems to disappear after 2000, i.e., after the collapse of the deal wave of the 1990s. The shift in 2000 may simply be a statistical artifact, reflecting the much smaller number of deals after 2000, or it may be that in a general M&A downturn, CEOs have less ability to "retire" via a transaction (or, alternatively, boards may have less ability to fire a CEO by selling the firm). Consistent with the latter interpretation, we find in an unreported regression that the odds of a retirement in year 4 of a manager-CEO's tenure becomes even larger and statistically sharper after 2000, relative to the 1990s, which suggests a substitute relationship between internal and external turnover.

By contrast, the relationship between tenure and RETIRE does not diminish after 2000. In fact, the results slightly increase in strength, consistent with the idea that internal and external turnover are substitutes, so that while the *type* of CEO turnover is time-variant, the relationship between CEO term structure and turnover is not.

E. Summary of Term Structure Results from Basic Models

In sum, our basic two- and three-outcome models show clear signs of a term structure for turnover of manager-CEOs, but not for owner-CEOs. CEOs do not typically resign or sell their firms in the first four years after taking the helm of an S&P 500 firm, but are sometimes forced to quit after only a year or two in office. Manager-CEOs show a marked willingness and ability to sell their firms in the fifth full of year of their tenure, when deals spike at roughly 6% of all firms, but before and after that year, CEO tenure shows no strong relationship with deals.

Retirements and resignations by manager-CEOs also begin to increase sharply in year 4, and continue to increase (along with involuntary terminations) in years 5-7. Since some of this turnover observably forced, monitoring and turnover are linked to the CEO term structure. Resignations that are not observably forced also increase, although our data do reveal how much of this increase is truly voluntary. In contrast to deals, internal turnover does not spike, but continues to increase for several years through year 7 and persists at a high level thereafter. Our findings are depicted in Appendix Figures A4--A11, which show both observed and predicted CEO turnover, by year of CEO turnover, broken down by deal-related turnover and non-deal-related turnover, and by owner-CEOs and manager-CEOs.

One plausible interpretation of our results is that a manager-CEO may – depending on the deal environment – have a window of opportunity (in year 4) in which she may be able to use a deal as a personal exit strategy. Once that window of opportunity passes, she is more likely either to be forced out or to resign voluntarily as her time on the job increases. Again, we note that these tenure effects are independent of the effects of age or retirement norms, to which we return below, and do not generally apply to owner-CEOs.

Given our two basic findings – that a term structure exists, with key inflection points at year 4 (for all types of turnover) and year 7 (for internal turnover), and that this term structure affects turnover among manager-CEOs but not owner-CEOs – we turn in the remainder of this paper to a further exploration of the interaction of performance and age, on the one hand, with manager-CEO tenure and turnover, on the other hand. In all of the remaining models, we focus exclusively on manager-CEOs. Because the term structure for manager-CEOs seems to operate somewhat differently for deals than for other types of turnover, we use separate logits for retirements and deals, rather than a multinomial logit in which both are predicted simultaneously, although our basic qualitative findings remain the same if we use the latter specification. For retirements, we collapse TENURE into three "terms" that correspond to the breakpoints in tenure from our basic models. Specifically, we include TERM_2 and TERM_3, each of which are set to 1 for manager-CEOs that are in years 5-8 or 9+, respectively, showing the incremental impact of a CEO entering those years on the job. For deals, we simply use

TENURE4 as the explanatory variable of interest, set to 1 for manager-CEOs that are in year 4 on the job.

F. The Interaction of Tenure, Turnover, and Performance

In Tables A-4 and A-5, we explore the interaction between term structure and our three measures of firm performance (industry-relative Tobin's q, industry-relative one-year return to shareholders and industry-adjusted sales growth). These models examine the simple impact of term structure given average performance, and the impact of each aspect of firm performance within each period of a manager-CEO's term in office, controlling for other aspects of firm performance. In each model we include our term structure variables on their own, our three performance variables, and the interactions of our term structure variables (TERM2 and TERM3, or TENURE4) with the remaining performance variable. We mean center the interacted performance variables, to reduce collinearity and ease interpretation.

We also use a likelihood ratio test to determine if we should expand the model to include the square of the interacted performance variable, and its interactions with the term structure variables, to allow for the possibility of non-linear performance/turnover relationships or non-linear performance/tenure interactions with turnover. These tests (not reported) indicate that two of the squared performance variables matter for retirements (prob < chi-squared < .05 for share returns and sales growth), but none matter for deals (prob > chi-squared >.8). Accordingly, we include those squared terms and related interaction terms in the retirement models in Tables A-4. Finally, for our deal regressions, we also report results for a model that includes PRETENURE4 (which equals "1" if a CEO is in years 1 through 3, and zero otherwise), as well as the interaction between PRETENURE4 and each of our performance variables, in order to test for the possibility that underperformance during a CEO's early tenure contributes to the spike in deals in year 4.

Our results confirm the independent role of the term structure, even with the more complex performance controls. For retirements, as shown in Table A-4, the coefficients on TERM2 and TERM3 show that, at average levels of performance, retirements jump sharply in the second and third terms of a manager-CEO's tenure, just as the results from our basic models would lead us to expect. For deals, as shown in Table A-5, the coefficient on TENURE4 shows that, at average levels of performance, deals jump sharply during year 4 of a manager-CEO's tenure. We also find that deals are more likely before year 4 than after it--but even before it, they occur much less frequently than they do during year 4 itself (the odds ratios for PRETENURE4 range from 1.4x to 1.6x, depending on the performance measure, while for TENURE4, they range from 2.6x to 2.8x).

As the basic models would lead us to expect, poor RELATIVEQ predicts deals here, and its predictive power does not vary significantly with CEO tenure. In addition, neither ADJSALECHG nor RELTRS1YR are strongly related to deals--either in, or after, year 4. (Although the product of RELTRS1YR and PRETENURE4 correlates negatively with DEAL at a marginal level of statistical significance, it does not weaken the relationship between TENURE4 and DEAL.) In sum, for deal activity, we find weak evidence that poor industry-relative stock returns during the early years of tenure accentuate the spike in deals in year 4, but poor industry-relative Tobin's Q is a stronger predictor of deal activity throughout a CEO's tenure, and the spike in deal activity in year 4 is an even stronger predictor of deal activity after controlling for all three measures of performance, before and during year 4.

With respect to the effect of term/performance interactions on retirements for manager-CEOs , neither RELATIVEQ nor RELTRS1YR affects retirements during manager-CEOs' first term (i.e., up to year 5)--although, in contrast to our basic models, negative industry-adjusted sales growth increases the odds of retirement during the first term. Second- and third-term retirements are unaffected by relative performance; all of the term structure effect is derived simply from tenure itself, and not from the interaction of performance and tenure. Our findings suggest that although some "voluntary" first-term retirements are triggered by lackluster growth, CEOs enjoy relative autonomy in deciding whether and when to retire after their first term, regardless of their firms' performance.

In sum, performance interacts weakly with the term structure for manager-CEOs, while term structure influences turnover even when we include a variety of performance-related controls and interaction terms. Deals are predicted by low relative Q throughout a manager-CEO's tenure. In particular, poor stock performance prior to year 4 makes deals marginally more likely, and poor sales growth prior to year 4 makes retirements more likely. But in each model the relevant term structure variables continue to have their own, stronger relationship with deals and retirements.

G. The Interaction of Tenure, Turnover, Age and Retirement Norms

In Tables A-6 and A-7, we explore the interaction between term structure, age and retirement norms. By definition, age and tenure move in lockstep, so we examine their interactions carefully to be sure that we do not mistake an indirect effect of age for an effect of tenure (or term structure). Since many CEOs become CEOs at roughly similar ages, they are likely to reach normal retirement age after roughly the same number of years on the job. Thus what looks like a tenure effect may simply reflect the effects of approaching retirement. While we control for the effects of age and retirement norms by including AGE and RETIREZONE in our basic models, we here explore the extent to which our term

structure findings carry over to CEOs who are not plausibly affected by the approach of either old age or normal retirement age.

To do this, we first divide our sample into two, based on age. The first half consists of manager-CEOs under the age of 58; the second of those over the age of 57. We then run our basic two-outcome model on each subset separately. This operation is similar to interacting age 58 with CEO tenure. If our tenure and term structure effects were driven by aging and retirement, they should show up only for older CEOs. Instead, as can be seen from Table A-6, our tenure and term structure effects are strongest for relatively young CEOs. Older CEOs do not begin to retire more frequently until year 7 of their tenure, whereas younger CEOs exhibit the strong increase in retirements in years 5 and 6 (as well as an even stronger increase in years 7 and 8). Likewise, the spike in deals in year 4 only shows up for younger CEOs. Relatively younger CEOs are nearly three times more likely to sell their firms in year 4 than they are in either the year before year 4 or in the year after. The tenure of older CEOs, by contrast, seems to have no effect on the odds they will sell their firms.

A likelihood ratio test indicates that the findings in table A-6 do not differ importantly from the results of similar models that include as independent variables the interaction of AGE and TENURE4 (in a logistic model of DEAL) and the interaction of AGE with TERM2 and TERM3 (in a logistic model of RETIRE). Likewise, such a test indicates that we may safely omit a dummy equal to one if the CEO is older than 57, and its interactions with TENURE4, TERM2 and TERM3.

To separate the effects of tenure and retirement norms, we undertake two analyses. First, we divide the sample by tenure and examine the effects of age and proximity to conventional retirement age on retirements and deals separately for manager-CEOs in their first terms and for those in their second or third terms (Table A-7). Second, we perform a likelihood ratio test (not reported) of whether the effects of our term structure variables differ significantly from similar models that include as independent variables the interaction of RETIREZONE with TENURE4, TERM2 and TERM3. Again, this test indicates that these interaction variables have no significant effect on deals or retirements.

Thus, our analyses produce consistent results. Retirement norms and age help to predict the retirements of both new and relatively long-serving CEOs. But term structure has an independent effect on RETIRE, even after controlling for age and retirement norms. However, retirement norms and age only seem to affect deals for relatively new CEOs. Long-serving CEOs, by contrast, tend not to sell their firms as they approach retirement age, since, for these CEOs, age seems not to affect deals. Put differently, there is, in general, no widespread "Van Gorkom" effect[16] of long-serving CEOs who

[16] Named for Jerome W. Van Gorkom, Chairman and CEO of the Trans Union Corporation for 17 years prior to the sale of Trans Union in 1980 to the Pritzker family's Marmon Group, Inc. 1980 was the year that Van Gorkom himself was scheduled to retire. In a controversial decision, *Smith v. Van Gorkom*,

choose to sell their firms rather than allow the board to appoint a successor as they approach retirement age. And neither set of interaction terms have significant effects warranting their inclusion in our models of deals or retirements.

In short, term structure seems to be just as important as age and retirement norms as an influence on retirements (which include, recall, both forced terminations and voluntary resignations). Moreover, term structure seems to be more important than age and retirement norms as an influence on deals. Each factor – age, retirement norms, and term structure or tenure – seems to work independently, without being affected by (or requiring the presence of) the others.

H. The Interaction of Age and Sub_Tenure

A final variable of interest in the prediction of RETIRE and DEAL is SUB_TENURE, i.e., the number of years that a CEO was employed by her firm prior to becoming CEO. In unreported multinomial logistic models, we find that adding SUB_TENURE alone to the basic models does not significant affect the probability of either retirements or deals. However, the interaction term of SUB_TENURE crossed with CEO age does significantly affect these probabilities. This interaction term is difficult to interpret straightforwardly.[17] In Appendix Table A-8 and Figure A-3, we present a boot-strapped analysis of the interactive effect on RETIRE and DEAL of age crossed with the number of years in which a S&P 500 CEO served in a subordinate position with her company.

One result of this analysis is the finding that age matters relatively little to whether a CEO who has been recently hired from outside the firm (an "outsider-CEO") *retires*, but that it makes an older outsider-CEO significantly more likely to *sell his company* than a younger outsider-CEO. This finding is intuitive insofar as a board is unlikely to appoint an older outsider in the expectation that he will soon retire. Many old *and* young outsiders do "retire" soon after their appointments, but not, presumably, for reasons of age, physical infirmity, or retirement norms. Boards know these things beforehand. Rather, we suspect that older and younger outsider-CEOs "retire" for much the same reason: boards (or

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488 A.2d 858 (Del. 1985), a divided Delaware Supreme Court held that not only Van Gorkom, but the entire board of Trans Union, were liable to Trans Union shareholders for violating their legal duty of care by selling Trans Union to Marmon in a casual and overly-hasty fashion. Although it did not say so explicitly, the Court signaled its suspicion that Van Gorkom had favored a quick deal, even at the cost of a lower price, in order to liquidate his holdings of Trans Union stock before he retired. The Court also seemed to suspect that the Trans Union board had indulged Van Gorkom's desire for a quick sale of the Company, rather than taking a hard look at the merits of the Marmon transaction. Owen (1986) provides an interesting if partisan review of this transaction and its legal consequences, which sent shock waves through the entire business community.

[17] See Powers (2005) for a discussion of the difficulty of interpreting interaction terms in logit models.

perhaps CEOs themselves) learn about how they "fit" with their companies, which no one knew beforehand, but which becomes known during the first few years of their tenure.

Matters stand differently with deals, however, which older outsiders are more likely to pursue than younger outsiders. Perhaps boards are less likely to solicit younger outsiders to assist in the sales of their firms. Conversely, younger outsiders are less likely to benefit as caretakers for companies that are on the auction block. For older outsiders, such a position might be the capstone on a career; but for younger outsiders, such a position might seem to be an unwelcome delay before taking on a real job in the corner office.

In contrast to the import of age for the retirement of outsiders, age matters a great deal to the retirement decisions of "insider-CEOs," who have spent many years with their firms before taking over the top job. Unlike older outsiders, older insiders are far more likely to retire than younger insiders. This finding is what one would expect if conventional retirement norms and the infirmities of age were the major drivers of retirement decisions. The fact that younger insider-CEOs know their companies – and are well-known to their companies' boards -- plausibly explains why they are much less likely to "retire" early than equally young outsider-CEOs. Again, nasty surprises are less likely with insiders than with outsiders.

I. A Note on the Economic Significance of our Logit Model of DEAL

A logit model of DEAL using our term structure variable (TENURE4) and our other CEO-related variables (AGE, RETIREZONE, etc.) has an economically significant advantage in predicting transactions over models that use only firm performance, industry, and year -- the standard controls for predicting deals in the existing literature (and varibles that we also include in our model). In fact, the standard model has no ability to predict deals using a 50% cutoff value for determining when the estimated probability of a deal should be translated into a predicted deal. By comparison, adding our CEO variables to the model improves the sensitivity of the model with a cutoff of 50% from 0% to 3%.

Moreover, this understates the potential economic significance of the new CEO variables that we include in our model. The potential benefits of correctly predicting deals (i.e., avoiding type 2 errors) are likely to outweigh the costs of falsely predicting deals (i.e., making type 1 errors). An investor stands to reap a 30% premium on average by correctly predicting a deal. Given that the average deal in our sample has a value of over $10 billion, an investor might earn significant returns by capturing such a premium in a reliable way. By contrast, overpredicting deals (and thus overinvesting in sample firms in anticipation of those deals) does not produce an equivalent "negative premium." The direct costs of mis-predicting a deal are the transaction costs associated with investing in the putative target company, which are likely to be an order of magnitude smaller than the deal premium from

correctly predicting a deal. As a result, a cutoff value of, say, 20%, might be more appropriate for purposes of predicting deals. At such a cutoff value, a standard model of deals without CEO variables predicts roughly 8% of the sample deals, whereas our model with CEO variables included nearly doubles that predictive power to roughly 14%, representing a benefit of additional 8 correctly predicted deals, at a cost of overpredicting the same number of additional incorrectly-predicted deals.[18]

VII. Conclusions

Our investigation of turnover mechanisms and corporate performance yields three principal conclusions. The first is that there is a term structure implicit in the tenure of CEOs who own less than one percent of S&P 500 firms. This term structure is evident in the internal turnover data driven by retirements as well as the external turnover data driven by friendly deals. Both deals and the retirements of manager-CEOs reflect an initial four-year "term," during which overall turnover of either kind is low. During fifth year of CEO tenure, retirements double, and then continue to increase for the next two years. In the same fifth year of tenure, deals spike to roughly twice their frequency in the years immediately preceding and following. A reasonable conjecture is that boards (and CEOs themselves) require several years to evaluate CEO performance in large, publicly held firms and to decide upon alternative plans. Multivariate models confirm that term structure influences deals and retirements in its own right rather than as a proxy for some other variables that also influence turnover.

Second, we find that some CEOs are not subject to this term structure. Specifically, the minority of owner-CEOs who hold one percent or more of their firms' shares are no more likely to retire or sell their firms in the fifth year than in any other year of their tenure. These CEOs have an average tenure that is more than twice as long as manager-CEOs, and their firms differ from manager-led firms in a number of other respects.

Third, internal and external turnover—retirements and deals—do not select for the same firm and CEO characteristics, even though they reflect a similar term structure. Some factors affect both: poor sales growth appears to be related to both deals and early-tenure retirements, as is CEO age. But age plays a much larger role in retirements than deals, and retirement norms have a strong affect on retirements but not on deals. Large-block outside shareholders, by contrast, are associated with deals but not retirements. Industry-adjusted relative Q is negatively related to deals, but positively related to retirements. Leverage is positively related to deals, but not robustly related to retirements; risk (stock

[18] Likewise, adding tenure, subtenure, ownership and compensation variables to a more conventional logit model of CEO retirements improves the sensitivity (i.e., the correct classification rate) (at a 50% cutoff) from roughly 12% to nearly 16%, with only a marginal increase in false predictions (1.33% to 1.63%).

price volatility) is just the opposite. Despite these contrasting factors, we found some indirect evidence suggesting that deals and retirement are at least partial substitutes: firm size (log assets) were negatively related to deals, and positively related to retirements, but the increase in retirements in a CEO's fourth year was much more muted during the 1990s, when the M&A market was strong, than after 1999, when the M&A market was weak, and when the fourth year increase in deals was much more muted. The relationship between internal and external turnover exits, then, but it is complex and moderated by a number of factors that can increase one without increasing--or in some cases, while actually reducing--the other.

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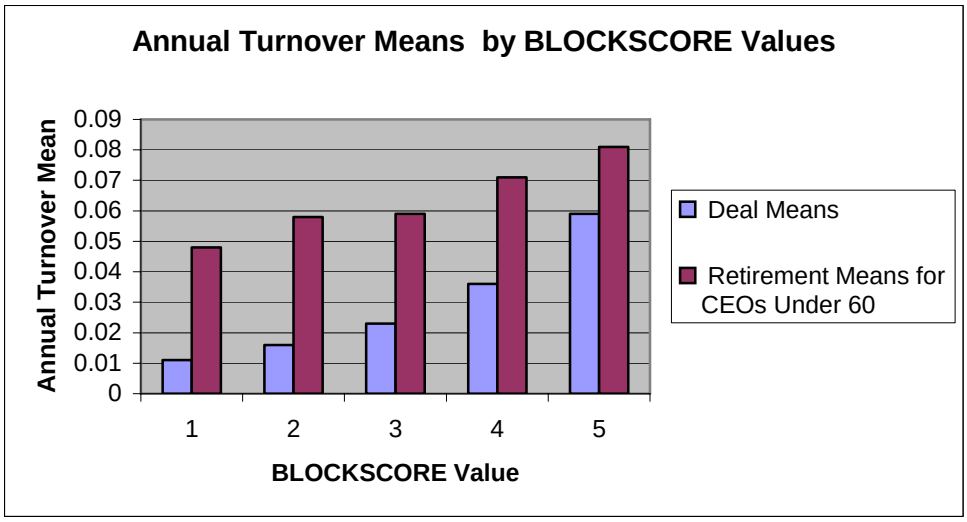
Appendix

Figure A-1



BLOCKSCORE takes the value of "1" if a trust or family foundation holds shares with more than 5% of the company's voting power, a value of "2" if the CEO herself holds shares with more than 5% of the voting power, a value of "4" if two or more institutional shareholders hold blocks with 5% or more of the voting power, and a value of "5" if an independent entity—most often a corporate parent—holds shares with 5% or more of the voting power. BLOCKHOLDER assumes the neutral value of "3" if there are no 5% plus blockholders, if there is a single 5% plus institutional blockholder, or if there are only outsider individual or issuer-related pension and ESOP 5% plus blockholders.

Figure A-2

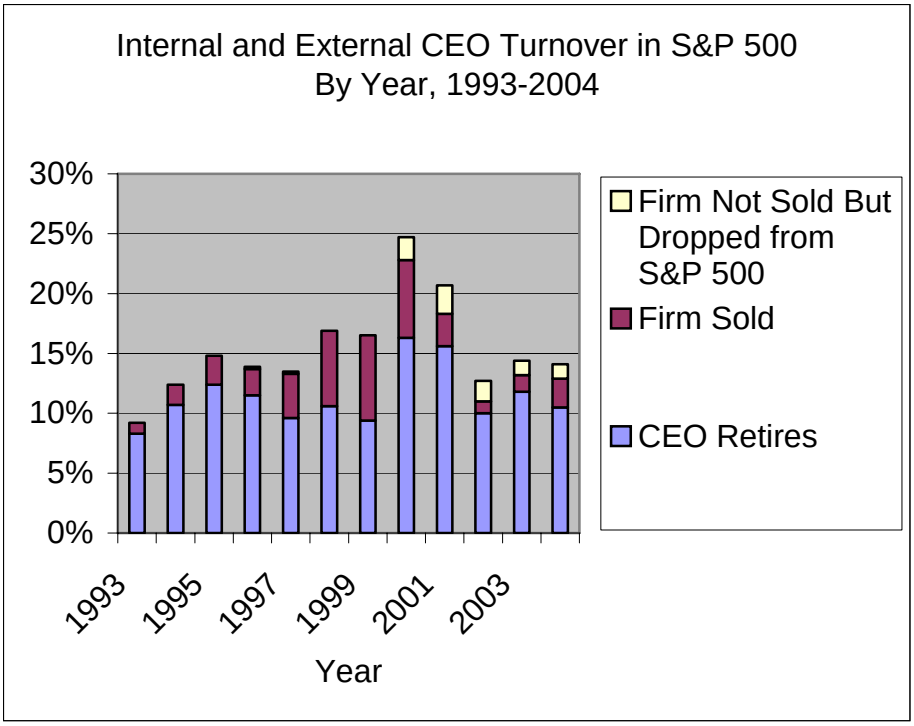


Figure A-3

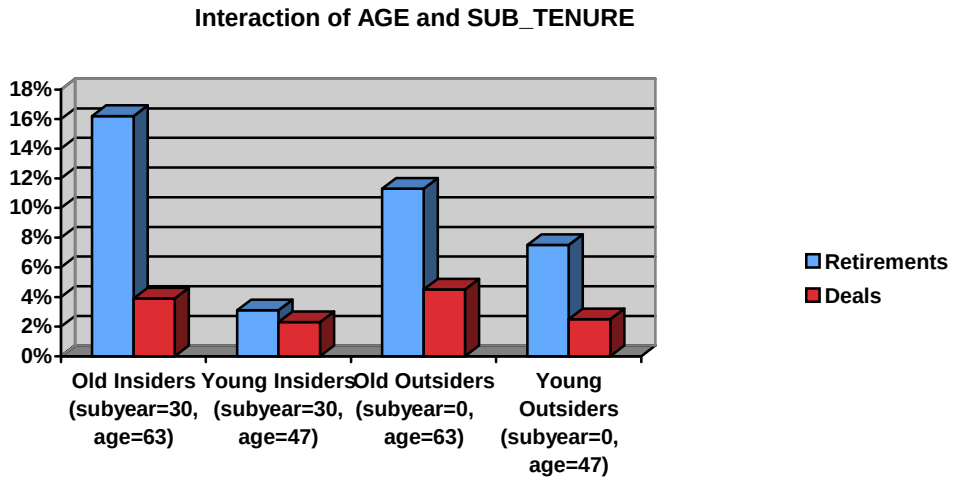


Figure A-3 draws on the data presented in Table A-8 to illustrate graphically the interactive effect of CEO and pre-CEO tenure at the firm. While "outsiders" (those with no prior experience at the firm of which they are CEOs) are more likely to retire when old than when young, "insiders" (here, those with 30 years experience at the firm, which is the 90th percentile of the sample for SUB_TENURE) have a much greater difference between the predicted probability of retirement for older CEOs compared to younger CEOs.

Figure A-4
Observed (Sample) Deals, by CEO-Manager Tenure Year

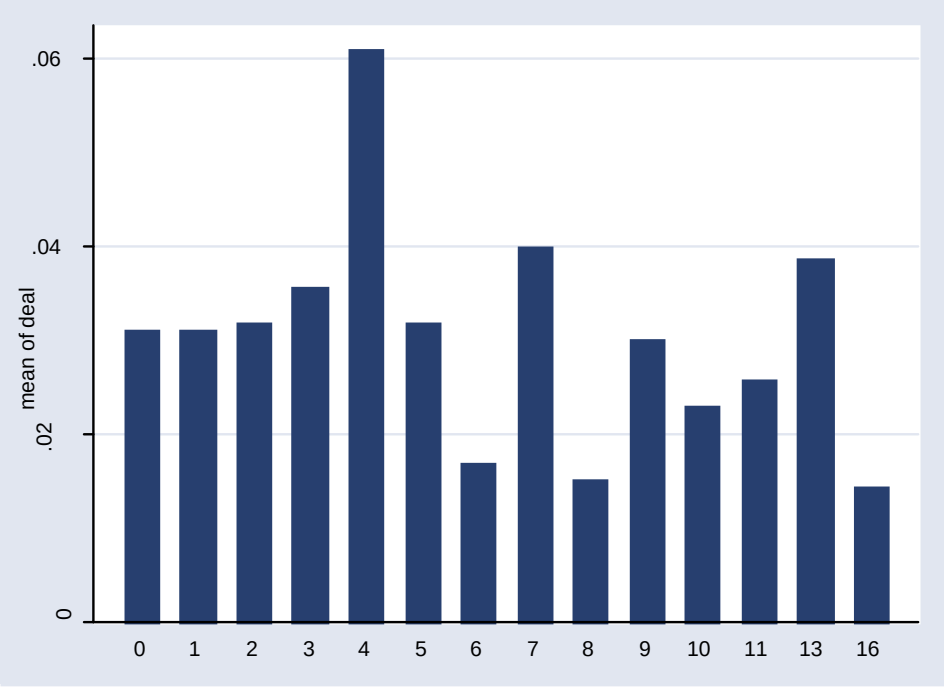


Figure A-5
Predicted Deals, from Two-Outcome Basic Model, by CEO-Manager Tenure Year

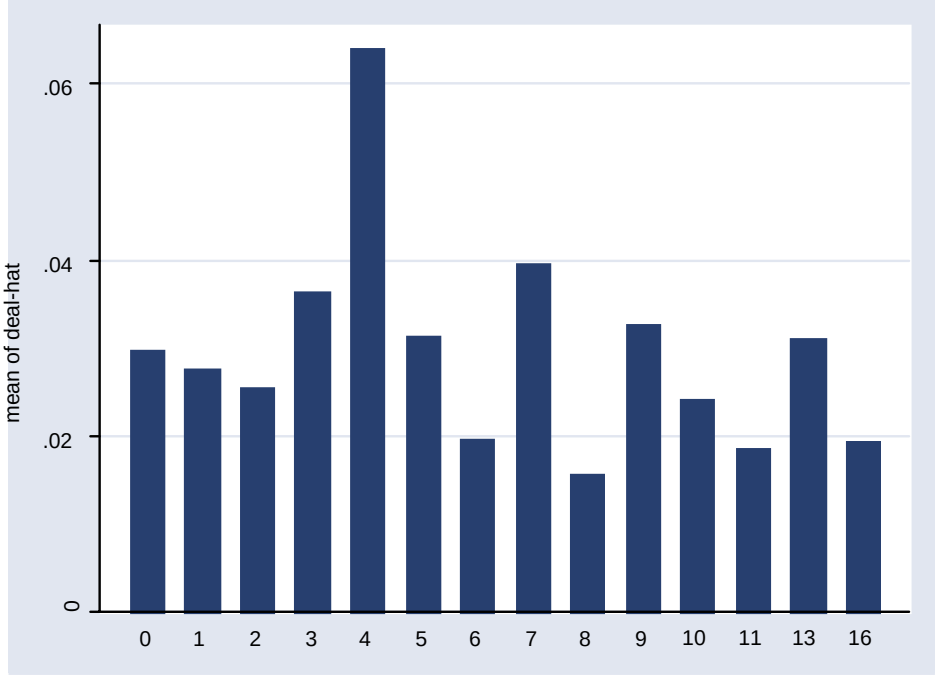


Figure A-6
Observed (Sample) Retirements, by CEO-Manager Tenure Year

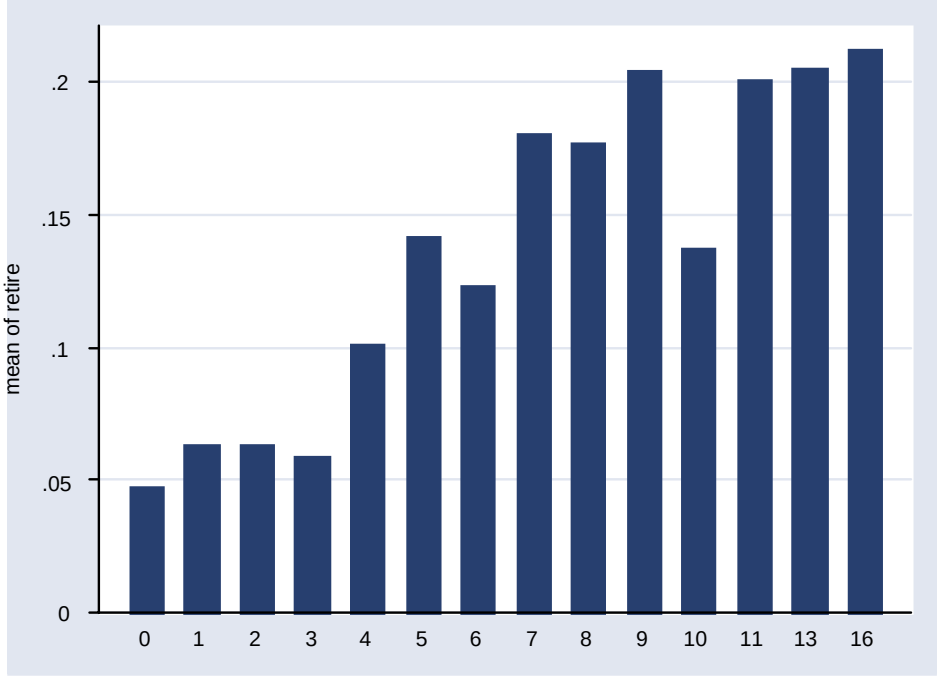


Figure A-7
Predicted Retirements, from Two-Outcome Basic Model, by CEO-Manager Tenure Year

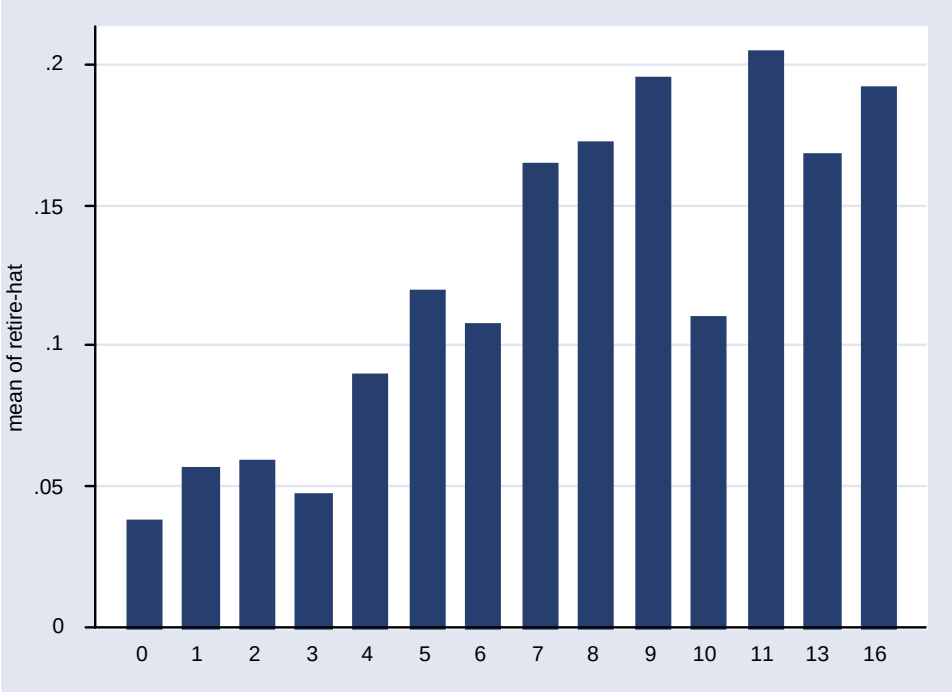


Figure A-8
Observed (sample) Deals by CEO-Owner Tenure

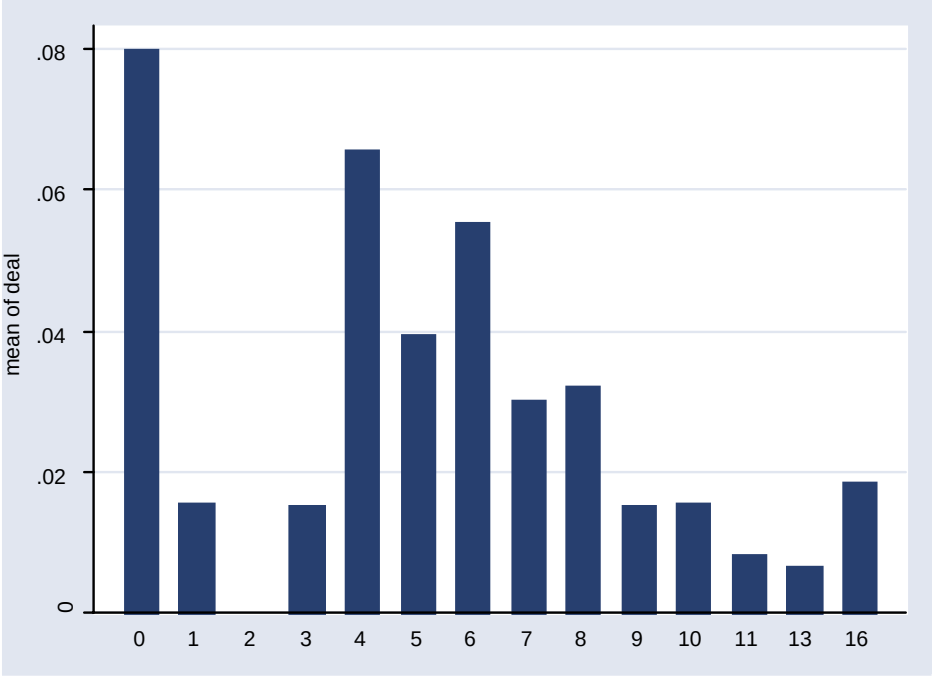


Figure A-9
Predicted Deals from Basic Two-Outcome Model, by CEO-Owner Tenure

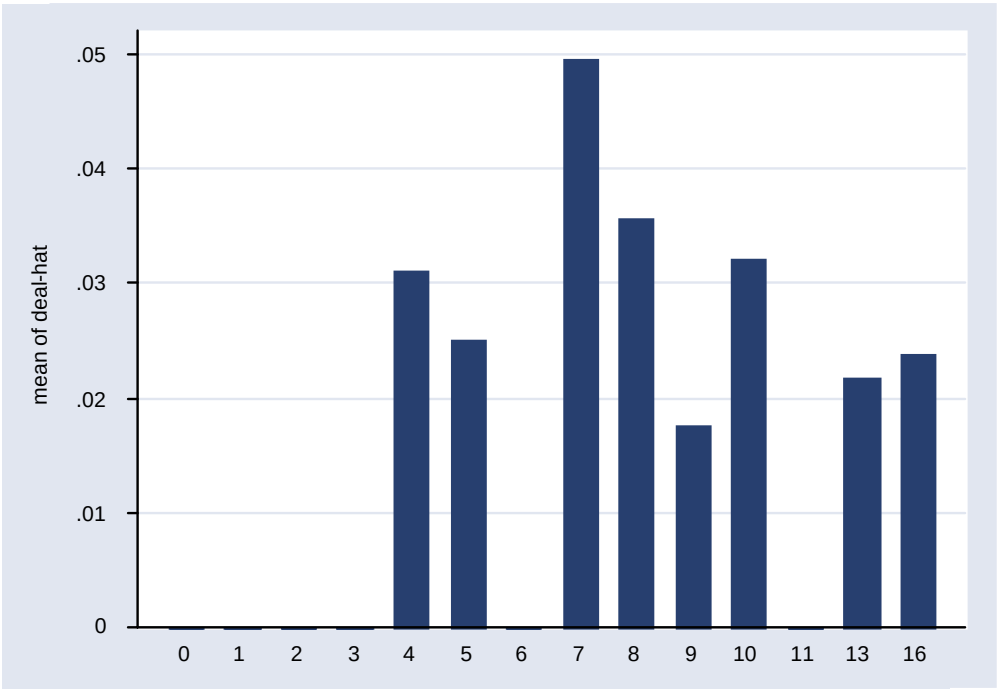


Figure A-10
Observed (sample) Retirements by CEO-Owner Tenure

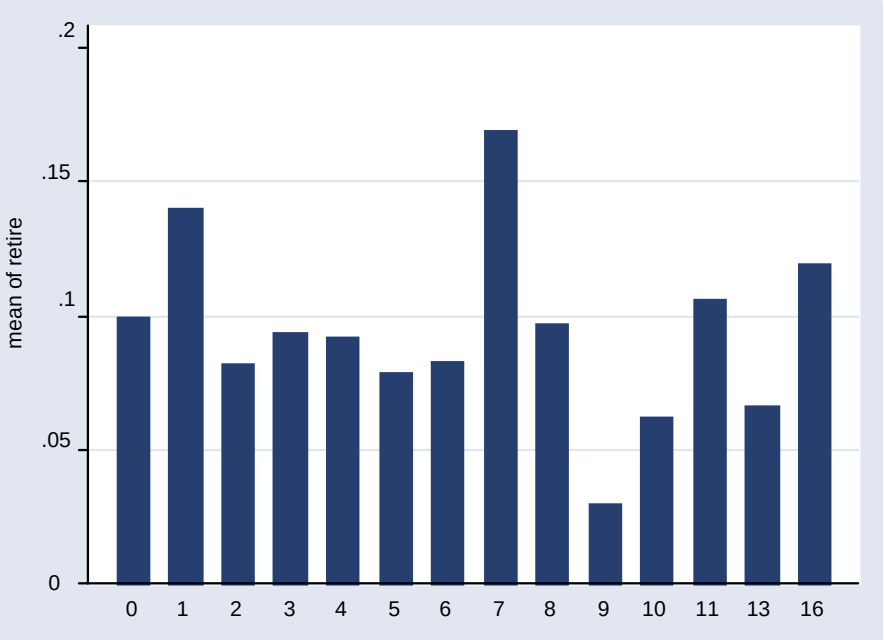
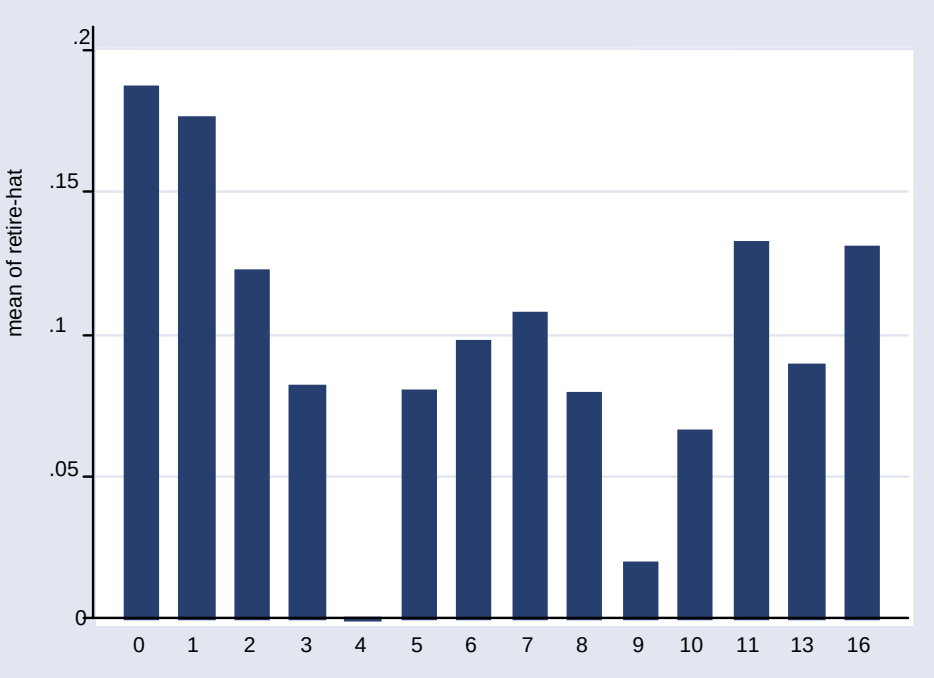


Figure A-11
Predicted Retirements from Basic Two-Outcome Model, by CEO-Owner Tenure



Appendix Tables

Index

Presentation Notes

Tables A-2 through A-7 provide multinomial logistic regression models of CEO exit from S&P 500 firms in either a two-outcome model, via either a deal (the acquisition of the firm) (Panel A) or the retirement (CEO turnover unrelated to a deal) (Panel B) — or, alternatively, in Tables A-3 and A-5, in a three-outcome model, via Resign (Panel A), Fired (Panel B) or Deal (Panel C).

The sample period extends from 1992 through 2004. Table A-1 lists, defines, and, where relevant, gives summary statistics for all of the independent variables used in the multivariate regressions.

Tables A-2 and A-3 provide basic models of CEO exit for the full sample of firms, as well as for the subset of firms in which CEOs own less than 1% of the firm's stock (MANAGER-CEOs) and CEOs own 1% or more of their firms shares (OWNER-CEOs). Table A-3 also includes a basic model for companies that were listed on the S&P 500 as of 1993. Models A-4 through A-7 are based only on the subsample of firms with MANAGER-CEOs, regardless when they were first listed on the S&P 500.

We control for industry effects with two-digit Fama/French industry dummies in all regressions. We also control for time trends with year dummies. Coefficients for industry and year dummies are not reported. Robust standard errors are reported next to the coefficients associated with the remaining independent variables. Statistically significant results are in bold typeface; significance levels are "*" = <.05; "**" = < .01, and "***" = < .001.

Table A-1

Definitions, Means, and Medians of the Right-Hand Variables Included in the Multinomial Logit Models

Variable	Description	Mean	Median
LEVERAGE	Book value debt/book value equity	23.6	72.1
SHARPCT	CEO's percentage of outstanding shares	1.50	0.15
LOGSHARVAL	Log of value of CEO shares	16.2	16.1
LOGOPTVAL	Log of exercise value of CEO options	13.5	15.4
LOGTDC	Log of CEO's total annual compensation	15.2	15.2
AGE	CEO age in years	55.6	56.0
RETIREZONE	A measure weighting for CEO peak retirement years: 61yrs =1, 62yrs=2, 63yrs =3, 64 & 65yrs =5 (RETIREZONE = 0 for all other CEO ages).	0.465	0
TENURE	CEO years on the job	6.91	5
BLOCKSCORE	Balance of inside/outside blocks: 1 – most insider through 5 – most outsider. BLOCKSCORE = "1" if a trust or family foundation holds 5+% of a firm's voting power, "2" if the CEO holds shares with 5+% voting power, "4" if two or more institutional shareholders hold 5+% voting power, and "5" if another business corporation or other independent entity holds 5+% voting power. BLOCKSCORE = "3" if there are no blockholders with 5%+ shares, or if there is only a single institutional blockholder.	3.27	3
RELATIVEQ	Tobin's q /Industry median q, adjusted for year and Fama-French industries	1.17	1.00
REL_TRS1YR	One-year share returns/industry median share returns, calculated by year	1.62	1.00
ADJ_SALECHG	Difference between firm & industry median change in sales, by year	4.20	0.00
LNASS	Log of book value of assets	22.7	22.6
LOGSIZE	Log of book value of liabilities + market value of equity	23.3	23.2
RISK	Black-Scholes volatility	.339	.301
TERM2	CEO in tenure years 5 – 9	0.27	
TERM3	CEO in tenure years 10 or higher	0.25	
Tenure1	CEO in tenure year 0 or 1	0.195	
Tenure2	CEO in tenure year 2	0.105	
Tenure3	CEO in tenure year 3	0.096	
Tenure4	CEO in tenure year 4	0.087	
Tenure5	CEO in tenure year 5	0.072	
Tenure6	CEO in tenure year 6	0.060	
Tenure7	CEO in tenure year 7	0.053	
Tenure8	CEO in tenure year 8	0.044	
Tenure9	CEO in tenure year 9	0.039	
Tenure10	CEO in tenure year 10	0.033	
Tenure11	CEO in tenure year 11-12	0.054	
Tenure13	CEO in tenure year 13-15	0.055	
Tenure16	CEO in tenure year 16 or higher	0.108	

Table A-2: Basic Model
Multinomial Logit: Retire vs. Deal

	ENTIRE SAMPLE			MANAGERS ONLY			OWNERS ONLY		
	Relative risk ratio	**Std. Err.**		**Relative risk ratio**	**Std. Err.**		**Relative risk ratio**	**Std. Err.**	
	RETIRE			**RETIRE**			**RETIRE**		
leverage	**0.998**	**0.001**	**	0.998	0.001		0.999	0.001	
logsharval	**0.877**	**0.028**	***	0.918	0.041		0.810	0.143	
logoptval	**0.959**	**0.009**	***	**0.953**	**0.011**	***	0.979	0.022	
logtdc	**0.773**	**0.053**	***	**0.764**	**0.068**	**	**0.766**	**0.099**	*
age	**1.088**	**0.012**	***	**1.082**	**0.014**	***	**1.087**	**0.026**	***
retirezone	**1.398**	**0.050**	***	**1.513**	**0.068**	***	0.993	0.094	
blockscore	1.101	0.074		1.089	0.095		1.088	0.202	
relativeq174	**1.146**	**0.072**	*	1.053	0.084		1.235	0.188	
rel_trs1yr	1.003	0.002		**1.007**	**0.003**	*	1.018	0.013	
adj_salechg	0.996	0.003		0.997	0.003		0.996	0.005	
lnass	**1.374**	**0.080**	***	**1.381**	**0.101**	***	1.075	0.245	
risk	**3.622**	**1.663**	**	**6.597**	**3.276**	***	0.174	0.254	
_Itenure16_1	1.451	0.440		0.538	1.420		0.701	-0.290	
_Itenure16_2	1.400	0.443		1.593	0.553		0.837	0.748	
_Itenure16_3	1.240	0.401		1.327	0.473		0.554	0.548	
_Itenure16_4	**2.021**	**0.628**	*	**2.395**	**0.815**	**	**0.000**	**0.000**	***
_Itenure16_5	**2.668**	**0.823**	***	**2.968**	**1.016**	***	0.563	0.603	
_Itenure16_6	**2.387**	**0.773**	**	**2.620**	**0.938**	**	0.679	0.642	
_Itenure16_7	**4.089**	**1.277**	***	**4.671**	**1.617**	***	1.683	1.392	
_Itenure16_8	**4.035**	**1.305**	***	**4.849**	**1.730**	***	0.678	0.721	
_Itenure16_9	**4.143**	**1.395**	***	**5.335**	**1.987**	***	0.216	0.249	
_Itenure1~10	**2.676**	**1.006**	**	**2.883**	**1.259**	*	0.921	0.793	
_Itenure1~11	**4.932**	**1.557**	***	**5.657**	**2.014**	***	1.751	1.386	
_Itenure1~13	**3.246**	**1.095**	**	**4.103**	**1.577**	***	0.925	0.742	
_Itenure1~16	**2.293**	**0.749**	*	**2.399**	**0.924**	*	1.376	1.003	
	DEAL			**DEAL**			**DEAL**		
leverage	**1.002**	**0.001**	***	**1.002**	**0.001**	***	1.008	0.006	
logsharval	0.890	0.056		0.899	0.068		**12.345**	**13.861**	*
logoptval	0.978	0.017		0.974	0.019		0.843	0.106	
logtdc	**1.452**	**0.138**	***	**1.387**	**0.152**	**	1.205	0.886	
age	1.033	0.018		**1.045**	**0.022**	*	0.927	0.078	
retirezone	**1.154**	**0.084**	*	0.099	2.020		1.240	0.631	
blockscore	**1.443**	**0.187**	**	**1.472**	**0.213**	**	**14.754**	**16.429**	*
relativeq174	**0.491**	**0.122**	**	**0.548**	**0.137**	*	**0.000**	**0.000**	***
rel_trs1yr	0.999	0.003		0.999	0.003		**1.452**	**0.197**	**
adj_salechg	**0.987**	**0.005**	**	**0.988**	**0.006**	*	**0.925**	**0.031**	*
lnass	**0.572**	**0.064**	***	**0.572**	**0.071**	***	**0.016**	**0.024**	**
risk	2.131	1.466		2.406	1.806		265638.900	1815871	
_Itenure16_1	1.038	0.428		1.045	0.438		0.000	0.000	
_Itenure16_2	0.880	0.370		0.872	0.371		0.000	0.000	
_Itenure16_3	1.224	0.490		1.219	0.491		0.000	0.000	

_Itenure16_4	**2.309**	**0.869**	*	**2.160**	**0.835**	*	2.52e+09	4.84e+10
_Itenure16_5	1.149	0.520		1.073	0.505		9.8e+10	1.97e+12
_Itenure16_6	0.697	0.374		0.721	0.394		0.000	0.000
_Itenure16_7	1.415	0.664		1.475	0.715		10.7e+12	2.15e+13
_Itenure16_8	0.864	0.511		0.587	0.423		2.50e+13	5.09e+14
_Itenure16_9	1.154	0.640		1.137	0.687		8.32e+10	1.65e+12
_Itenure1~10	0.915	0.568		0.799	0.545		2.66e+12	5.69e+13
_Itenure1~11	0.544	0.346		0.672	0.431		0.000	0.000
_Itenure1~13	0.682	0.373		0.708	0.422		7.36e+08	1.41e+10
_Itenure1~16	0.615	0.320		0.352	0.230		5.96e+10	1.14e+12
N firm-years		5460			4514			946
N firms		665			604			190
N retire		588			501			90
N deal		161			146			15
R2		0.186			0.203			0.335

Table A-3: Basic Model
Multinomial Logit: Resign vs. Fired vs. Deal

	ENTIRE SAMPLE			MANAGERS ONLY			MANAGERS 1993 COHORT FIRMS		
	Relative risk ratio	Std. Err.		Relative risk ratio	Std. Err.		Relative risk ratio	Std. Err.	
	RESIGN			**RESIGN**			**RESIGN**		
leverage	1.000	0.001		1.000	0.001		1.000	0.001	
logsharval	0.931	0.036		0.987	0.058		0.995	0.067	
logoptval	0.978	0.012		0.980	0.016		0.977	0.017	
logtdc	**0.695**	**0.059**	***	**0.677**	**0.075**	***	**0.651**	**0.081**	***
age	**1.113**	**0.016**	***	**1.124**	**0.020**	***	**1.131**	**0.022**	***
retirezone	**1.426**	**0.058**	***	**1.537**	**0.080**	***	**1.492**	**0.078**	***
blockscore	1.083	0.087		1.023	0.106		1.017	0.112	
relativeq174	**1.263**	**0.082**	***	**1.160**	**0.084**	*	**1.302**	**0.147**	*
rel_trs1yr	1.003	0.002		1.005	0.004		1.005	0.005	
adj_salechg	0.997	0.003		0.998	0.003		0.996	0.004	
lnass	**1.378**	**0.098**	***	**1.397**	**0.122**	***	**1.329**	**0.127**	**
risk	3.529	2.331		**8.589**	**6.548**	**	**7.331**	**7.377**	*
_Itenure16_1	1.323	0.534		1.095	0.462		0.707	0.331	
_Itenure16_2	1.196	0.538		0.991	0.452		0.751	0.370	
_Itenure16_3	1.046	0.460		0.760	0.352		0.786	0.369	
_Itenure16_4	2.021	0.821		1.759	0.727		1.715	0.724	
_Itenure16_5	**3.216**	**1.262**	**	**2.512**	**1.017**	*	**2.373**	**0.993**	*
_Itenure16_6	**2.521**	**1.043**	*	1.926	0.828		1.853	0.820	
_Itenure16_7	**4.377**	**1.758**	***	**3.878**	**1.578**	***	**3.928**	**1.647**	**
_Itenure16_8	**4.774**	**1.937**	***	**4.077**	**1.705**	***	**3.682**	**1.604**	**
_Itenure16_9	**5.136**	**2.174**	***	**4.884**	**2.138**	***	**5.336**	**2.411**	***
_Itenure1~10	**2.868**	**1.332**	*	2.009	1.032		1.658	0.914	
_Itenure1~11	**4.510**	**1.821**	***	**3.386**	**1.422**	**	**3.528**	**1.538**	**
_Itenure1~13	**2.773**	**1.174**	*	**2.410**	**1.094**	*	2.461	1.163	
_Itenure1~16	2.196	0.912		1.377	0.641		1.353	0.651	
	FIRED			**FIRED**			**FIRED**		
leverage	0.995	0.002	*	0.995	0.002		0.997	0.002	
logsharval	**0.749**	**0.055**	***	**0.813**	**0.070**	*	**0.782**	**0.072**	**
logoptval	**0.906**	**0.018**	***	**0.894**	**0.019**	***	**0.885**	**0.022**	***
logtdc	0.734	0.126		**0.660**	**0.138**	*	**0.579**	**0.144**	*
age	0.993	0.023		0.985	0.030		1.020	0.040	
retirezone	0.820	0.184		0.886	0.219		0.748	0.212	
blockscore	**1.480**	**0.295**	*	1.367	0.294		1.264	0.324	
relativeq174	0.813	0.255		0.875	0.274		0.991	0.384	
rel_trs1yr	0.998	0.002		1.000	0.004		0.999	0.004	
adj_salechg	**0.988**	**0.006**	*	0.991	0.007		0.996	0.007	
lnass	**2.207**	**0.371**	***	**1.983**	**0.364**	***	**2.122**	**0.444**	***
risk	**217.516**	**259.481**	***	**245.352**	**344.679**	***	**4948.650**	**8947.134**	**
_Itenure16_1	3.075	2.175		**5.131**	**4.214**	*	9.515	11.277	
_Itenure16_2	**5.137**	**3.534**	*	**7.862**	**6.351**	**	**17.433**	**20.817**	*
_Itenure16_3	2.316	1.831		3.557	3.208		4.962	6.351	
_Itenure16_4	2.264	1.871		3.406	3.153		6.102	7.873	

_Itenure16_5	**7.566**	**5.692**	**	**12.057**	**10.408**	**	**16.012**	**20.304**	*
_Itenure16_6	2.557	2.592		4.254	4.634		3.878	6.309	
_Itenure16_7	**11.433**	**9.042**	**	**13.513**	**12.722**	**	**32.000**	**42.479**	**
_Itenure16_8	**5.914**	**5.050**	*	**11.005**	**10.370**	**	**26.179**	**33.767**	**
_Itenure16_9	**8.308**	**7.802**	*	**15.199**	**16.087**	**	24.345	40.512	
_Itenure1~10	1.945	2.791		4.222	6.733		**0.000**	**0.000**	***
_Itenure1~11	**10.475**	**8.960**	**	**20.094**	**19.296**	**	**27.583**	**40.155**	*
_Itenure1~13	**15.329**	**12.454**	***	**27.783**	**26.288**	***	**59.804**	**81.239**	**
_Itenure1~16	4.144	4.229		1.835	3.330		3.205	5.997	
	DEAL			**DEAL**			**DEAL**		
leverage	**1.002**	**0.001**	***	**1.002**	**0.001**	***	**1.002**	**0.001**	***
logsharval	0.937	0.065		0.948	0.081		0.968	0.089	
logoptval	0.980	0.019		0.974	0.022		0.976	0.024	
logtdc	**1.438**	**0.152**	***	**1.353**	**0.166**	*	1.391	0.200	
age	1.039	0.021		**1.054**	**0.026**	*	1.048	0.030	
retirezone	**1.168**	**0.090**	*	**1.200**	**0.108**	*	1.177	0.114	
blockscore	**1.574**	**0.229**	**	**1.574**	**0.259**	**	**1.493**	**0.265**	*
relativeq174	**0.383**	**0.104**	***	**0.436**	**0.123**	**	**0.501**	**0.157**	*
rel_trs1yr	1.000	0.003		0.998	0.004		0.996	0.005	
adj_salechg	**0.987**	**0.006**	*	0.988	0.007		**0.979**	**0.006**	***
lnass	**0.549**	**0.069**	***	**0.560**	**0.078**	***	**0.530**	**0.083**	***
risk	3.567	3.664		4.933	5.894		6.605	9.859	
_Itenure16_1	0.977	0.424		0.977	0.436		1.193	0.586	
_Itenure16_2	0.590	0.267		0.576	0.266		0.654	0.341	
_Itenure16_3	0.898	0.382		0.871	0.375		1.100	0.513	
_Itenure16_4	2.108	0.824		1.918	0.779		2.254	1.026	
_Itenure16_5	1.073	0.499		1.000	0.487		1.120	0.610	
_Itenure16_6	0.648	0.359		0.669	0.379		0.862	0.514	
_Itenure16_7	1.333	0.644		1.458	0.729		1.778	0.972	
_Itenure16_8	0.749	0.460		0.514	0.385		0.612	0.480	
_Itenure16_9	0.647	0.396		0.577	0.400		0.729	0.541	
_Itenure1~10	0.608	0.417		0.470	0.370		0.572	0.463	
_Itenure1~11	0.221	0.182		0.258	0.214		0.323	0.281	
_Itenure1~13	0.316	0.200		0.272	0.202		0.442	0.335	
_Itenure1~16	0.431	0.231		**0.240**	**0.163**	*	0.252	0.193	
N Firm years	4248			3459			3100		
N Firms	637			566			454		
N Resign	385			315			292		
N Fired	73			67			56		
N Deals	138			124			108		
Pseudo R2	0.221			0.242			0.259		

Table A-4
Performance-Tenure Interaction Models
Binomial Logistic: Retire

	Relativeq-term Interact		**Rel_trs1yr-term Interact**		**Adj_Salechg-term Interact**	
	Odds ratio	Std. Err.	Odds ratio	Std. Err.	Odds ratio	Std. Err.
RETIRE						
leverage	**0.998**	**0.001***	**0.998**	**0.001***	**0.998**	**0.001***
logsharval	**0.917**	**0.039***	**0.916**	**0.039***	**0.914**	**0.039***
logoptval	**0.957**	**0.011*****	**0.957**	**0.011*****	**0.958**	**0.011*****
logtdc	**0.770**	**0.063*****	**0.771**	**0.064***	**0.767**	**0.064*****
age	**1.082**	**0.013*****	**1.083**	**0.013*****	**1.082**	**0.013*****
retirezone	**1.509**	**0.063*****	**1.511**	**0.063*****	**1.511**	**0.063*****
blockscore	1.033	0.087	1.031	0.087	1.027	0.086
relqcentered	1.068	0.108				
reltrscentered			**1.008**	**0.004***		
adjsalechgcentered					1.119	0.090
relativeq			1.066	0.084	**1.007**	**0.003***
rel_trs1yr	**1.007**	**0.003***			**0.989**	**0.005***
adj_salechg	0.997	0.003	0.997	0.003		
lnass	**1.322**	**0.092*****	**1.319**	**0.092*****	**1.321**	**0.093*****
risk	**4.171**	**2.047****	**4.065**	**1.989****	**3.940**	**1.922****
term2	**2.329**	**0.292*****	**2.418**	**0.307*****	**2.350**	**0.312*****
term3	**2.115**	**0.352*****	**2.077**	**0.346*****	**2.096**	**0.375*****
relqcterm2	0.991	0.147				
relqcterm3	1.010	0.200				
reltrscterm2			1.039	0.039		
reltrscterm3			0.994	0.015		
reltrscsqterm2			0.999	0.001		
reltrscsqterm3			1.000	0.000		
adjsalecterm2					1.006	0.006
adjsalecterm3					1.000	0.008
adjsalecsqterm2					**1.000**	**0.000****
adjsalecsqterm3					1.000	0.000
N firm-yrs	4557		4557		4557	
N firms	604		604		604	
N retire	498		498		498	
N deals	146		146		146	
Pseudo R2	0.0180		0.0182		0.0185	

Table A-5
Performance-Tenure Interaction Models
Binomial Logistic: Deal

	Relativeq				Rel_trs1yr				Adj_Salechg			
	Odds ratio	Std. Err.	Odds ratio	Std. Err.	Odds ratio	Std. Err.	Odds ratio	Std. Err.	Odds ratio	Std. Err.	Odds ratio	Std. Err.
DEAL												
leverage	**1.00**	**0.00*** **	**1.00**	**0.00*** **	**1.00**	**0.00*** **	**1.00**	**0.00*** **	**1.002**	**0.00*** **	**1.00**	**0.00*** **
logsharval	0.86	0.06*	0.88	0.06	**0.86**	**0.059***	0.88	0.06	0.863	0.06*	0.88	0.06
logoptval	0.99	0.02	0.99	0.02	0.99	0.019	0.99	0.02	0.987	0.02	0.99	0.02
logtdc	**1.43**	**0.15*** **	**1.44**	**0.15*** **	**1.42**	**0.15*** **	**1.42**	**0.15*** **	**1.435**	**0.15*** **	**1.44**	**0.16*** **
age	1.02	0.02	1.03	0.02	1.02	0.02	1.03	0.02	1.022	0.02	1.03	0.02
retirezone	1.07	0.08	1.08	0.08	1.07	0.08	1.08	0.08	1.069	0.08	1.08	0.08
blockscore	**1.41**	**0.20***	**1.41**	**0.20*** **	**1.41**	**0.20***	**1.41**	**0.20***	**1.402**	**0.20***	**1.41**	**0.20***
relqcentered	**0.54**	**0.14***	0.36	0.19								
reltrscentered					0.99	0.00	0.99	0.01				
adjsalechgcentered									0.990	0.01	**0.98**	**0.01*** **
relativeq					**0.51**	**0.13** **	**0.50**	**0.13** **	**0.493**	**0.13** **	**0.49**	**0.13** **
rel_trs1yr	0.99	0.00	1.00	0.00					0.998	0.00	1.00	0.00
adj_salechg	**0.99**	**0.01***	**0.99**	**0.01***	**0.99**	**0.01***	**1.00**	**0.00***				
lnass	**0.59**	**0.07*** **	**0.57**	**0.07*** **	**0.59**	**0.07*** **	**0.57**	**0.07*** **	**0.583**	**0.07*** **	**0.57**	**0.07*** **
risk	1.79	1.30	1.83	1.34	1.78	1.30	1.77	1.31	1.681	1.22	1.73	1.26
tenure4	**2.05**	**0.59***	**2.69**	**0.90*** **	**2.28**	**0.52*** **	**2.81**	**0.75*** **	**1.996**	**0.52** **	**2.58**	**0.78*** **
relqctenure4	0.61	0.44	0.89	0.78								
reltrsctenure4					1.01	0.01	1.01	0.01				
adjsalectenure4									0.983	0.01	0.99	0.01
pretenure4			**1.69**	**0.45***			1.49	0.36			**1.66**	**0.41***
relqcpretenure4			2.13	1.25								
reltrscpretenure4							0.99	0.01				
adjsalecpretenure4											1.02	0.01
N firm-yrs	4396		4396		4396		4396		4396		4396	
N firms	604		604		604		604		604		604	
N retire	498		498		498		498		498		498	
N deals	146		146		146		146		146		146	
Pseudo R2	0.161		0.165		0.161		0.164		0.162		0.168	

Table A-6
Multinomial Logit: Retire vs. Deal
Young vs. Old (58 or Older) CEOs

	CEOs Under 58		CEOs Over 57	
RETIRE	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
leverage	-0.002	0.002	-0.002	0.001
logsharval	-0.034	0.069	**-0.142**	**0.062***
logoptval	**-0.112**	**0.017*****	-0.005	0.017
logtdc	**-0.266**	**0.132***	**-0.329**	**0.122****
age	**0.100**	**0.025*****	**0.104**	**0.027*****
retirezone			**0.407**	**0.047*****
blockscore	0.140	0.127	0.088	0.116
lnass	**0.338**	**0.122****	**0.396**	**0.100*****
risk	**2.811**	**0.673*****	0.203	0.958
relativeq	-0.068	0.120	0.122	0.151
rel_trs1yr	0.007	0.004	0.002	0.003
adj_salechg	-0.003	0.004	-0.003	0.003
tenure16_1	0.686	0.464	0.337	0.540
tenure16_2	**0.991**	**0.470***	-0.050	0.559
tenure16_3	0.491	0.527	0.087	0.545
tenure16_4	**1.244**	**0.529***	0.510	0.521
tenure16_5	**1.533**	**0.521****	0.799	0.516
tenure16_6	**1.500**	**0.564****	0.620	0.526
tenure16_7	**2.120**	**0.539*****	**1.180**	**0.522***
tenure16_8	**2.418**	**0.547*****	**1.053**	**0.540***
tenure16_9	**2.347**	**0.620*****	**1.296**	**0.536***
tenure1~10	**1.941**	**0.682****	0.596	0.609
tenure1~11	**2.414**	**0.593*****	**1.261**	**0.512***
tenure1~13	**2.460**	**0.619*****	0.889	0.541
tenure1~16	0.041	0.897	0.733	0.529
DEAL				
leverage	**0.002**	**0.001*****	0.002	0.001
logsharval	-0.091	0.093	-0.202	0.175
logoptval	-0.038	0.030	-0.020	0.031
logtdc	**0.396**	**0.146****	0.187	0.208
age	0.046	0.035	**0.115**	**0.058***
retirezone			**0.205**	**0.097***
blockscore	0.150	0.189	**0.920**	**0.262***
lnass	**-0.535**	**0.156*****	**-0.780**	**0.263*****
risk	1.061	0.845	0.188	1.790
relativeq	**-0.672**	**0.305***	-0.343	0.494
rel_trs1yr	-0.003	0.004	0.005	0.005
adj_salechg	-0.009	0.009	**-0.019**	**0.009***
_Itenure16_1	0.550	0.542	-1.023	0.981

_Itenure16_2	-0.122	0.606	0.053	0.706
_Itenure16_3	0.619	0.536	0.062	0.691
_Itenure16_4	**1.556**	**0.500****	-0.210	0.759
_Itenure16_5	0.687	0.610	-0.529	0.794
_Itenure16_6	0.245	0.755	-1.050	0.923
_Itenure16_7	0.600	0.720	0.273	0.775
_Itenure16_8	0.176	0.947	-1.375	1.208
_Itenure16_9	0.705	0.828	-0.346	0.995
_Itenure1~10	-0.128	1.186	-0.228	0.967
_Itenure1~11	0.235	0.870	-1.090	0.945
_Itenure1~13	0.683	0.813	-1.385	0.908
_Itenure1~16	**-35.220**	**0.603*****	**-1.921**	**0.862***
N firm years	2774		1740	
N firms	544		398	
N retire	161		337	
N deals	90		56	
Pseudo R2	0.216		0.214	

Table A-7
Multinomial Logit: Retire vs. Deal
Retirezone by Tenure

	0-4 yrs CEO tenure		4+ yrs CEO tenure	
	Coef.	Std. Err.	Coef.	Std. Err.
RETIRE				
leverage	-0.001	0.001	-0.002	0.001
logsharval	-0.077	0.068	-0.056	0.058
logoptval	**-0.051**	**0.019****	**-0.039**	**0.016***
logtdc	-0.012	0.158	**-0.382**	**0.103*****
age	**0.101**	**0.020*****	**0.061**	**0.016*****
retirezone	**0.498**	**0.098*****	**0.432**	**0.053*****
blockscore	0.052	0.129	0.076	0.117
lnass	0.091	0.125	**0.402**	**0.094*****
risk	**1.617**	**0.700***	**1.815**	**0.820***
relativeq	-0.091	0.156	0.050	0.109
rel_trs1yr	0.006	0.004	**0.005**	**0.002***
adj_salechg	-0.009	0.005	-0.002	0.003
DEAL				
leverage	**0.003**	**0.001*****	0.002	0.001
logsharval	-0.013	0.098	**-0.483**	**0.131*****
logoptval	-0.035	0.028	0.001	0.031
logtdc	**0.348**	**0.135****	**0.454**	**0.212***
age	0.037	0.026	0.055	0.036
retirezone	0.333	0.134	0.103	0.105
blockscore	**0.426**	**0.192***	0.300	0.229
lnass	**-0.588**	**0.161*****	**-0.567**	**0.235***
risk	1.103	0.834	-0.379	1.610
relativeq	-0.341	0.218	**-1.085**	**0.445***
rel_trs1yr	-0.004	0.004	**0.006**	**0.003***
adj_salechg	-0.011	0.010	**-0.015**	**0.007***
N firm yrs	2491		2105	
N firms	546		473	
N retire	159		352	
N deal	91		55	
Pseudo R2	0.224		0.200	

Table A-8
Predicted Turnover by Age and Tenure with the Company Prior to Becoming CEO (SUB_TENURE)

Predicated annual probabilities of CEO turnover (retire and deal), by CEO age and pre-CEO tenure, for two-outcome model, with bootstrapped standard errors in parentheses, based on 500 randomly drawn samples with replacement.

				CEO AGE	
			10th percentile	average	90th percentile
			47	56	63
			RETIRE		
	10th percentile	0	7.5% (1.3%)	9.9% (0.8%)	11.3% (1.3%)
SUB_TENURE	average	13	5.3% (1.0%)	10.5% (0.5%)	13.6% (1.0%)
	90th percentile	30	3.1% (1.0%)	10.9% (0.8%)	16.2% (1.6%)
			DEAL		
	10th percentile	0	2.5% (0.7%)	3.5% (0.5%)	4.5% (1.0%)
SUB_TENURE	average	13	2.3% (0.6%)	3.1% (0.3%)	4.2% (0.7%)
	90th percentile	30	2.3% (1.1%)	2.9% (0.0%)	3.9% (1.0%)