

# Out-of-the-Money CEOs: How Do Proxy Contests Affect Insider Option Exercises<sup>☆</sup>

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## Out-of-the-Money CEOs:

### How Do Proxy Contests Affect Insider Option Exercises

#### **Abstract**

When a proxy contest is looming, the rate at which CEOs exercise options in order to sell (hold) the resulting shares slows down by 80% (accelerates by 60%), consistent with their desire to maintain or strengthen voting rights when facing control challenges. Such deviations are closely aligned with features unique to proxy contests, e.g., the record dates and nomination status. Moreover, a contest triples the probability that an insider exercises options out-of-the-money, an irrational strategy under conventional models. The various distortions suggest that incumbents (with private benefits of control) value their stocks 5% – 20% higher than the market price.

## 1. Introduction

On August 13, 2010, Leonard Riggio, Chairman of the Board and former CEO of the New York-based bookseller Barnes & Noble, Inc (ticker: BKS) exercised option to acquire 990,740 shares at a price of \$16.96 a piece. The stock's closing price on that day was \$14.46, and the daily high was \$15.00. That is, Riggio paid a premium of at least \$1.96 for each share or 13.1% over the then market value for the purchase. Moreover, the expiration date of this option package was eight months away. Why? Apparently the company was facing a proxy battle from Ronald Burkle, an activist investor. Riggio was one of the current directors up for re-election and the extra 1.7% of the votes could matter in an expected close contest. Riggio held a stake of 29.9% in the company, including vested options; Burkle was the second largest shareholder of the company with a 19.2% stake.

The incidence exposes an intriguing phenomenon: A CEO's (or other insiders with control power) option exercises could be affected by a desire to maintain control, which in turn reflects a "private control premium," broadly defined as the incremental value of shares perceived by the insider relative to that by the investor public when the shares entail the voting rights needed to reinforce control. From Riggio's decision to acquire shares via an option exercise, we can infer that his willingness to pay (i.e., private valuation) was at least as high as the exercise price of the option, while the market valued the stock no more than \$15.00 on that day (and did not go above \$15 in the following days). Therefore, 13.1% is a lower-bound estimate for the valuation wedge between Riggio (who enjoys the private control premium) and the investor public.

The case described above might appear extreme, but it exemplifies how challenges to control distort insiders' option exercise behavior because they drive a spread in the firm's valuation to insiders and outsiders. Under the hypothesis that some CEOs assign a value premium for the shares in their own companies when their control is under contest, they will exercise vested in-the-money options in a way that is different from the value that

benchmark models without private control premium would predict. After controlling for the standard variables prior literature has shown to affect early exercises, we find that the presence of proxy contests reduces the frequency of exercise and sell transactions by 80%, and increases the frequency of exercise and hold transactions by about 60%. Both phenomena are two sides of the same coin: Because she values the shares higher than the market, an insider is less willing to sell shares at the market price, keeping constant other motives to sell such as liquidity needs and diversification. A weakened incentive to sell reduces the number of option exercises for the purpose of selling the resulting shares. In contrast, the insider is more likely to exercise an option early with an intention to hold the stock because the voting rights which could help defend the contest serve the equivalent role of a lumpy dividend.

Several additional tests help to affirm a connection between deviation from normal exercises by CEOs and proxy contests. First, we show that the demonstrated deviations from normal exercises are indeed driven by circumstances (i.e., proxy contests) rather than by unobserved firm or CEO characteristics (such as CEO overconfidence<sup>1</sup>). We confirm that the qualitative and quantitative nature of the relation between option exercises and proxy contests is preserved with the inclusion of a CEO/firm fixed effect. Moreover, the rate of exercise-and-sell drops by the same amount during proxy fight seasons for a subsample of “overconfident” CEOs using the same classification algorithm as the prior literature. Therefore, the force that we uncover is clearly distinct from CEO overconfidence or any other CEO inherent traits.

Second, we show that deceleration (acceleration) of exercise-and-sell (exercise-and-hold) is more pronounced before the initial record date (the date used to determine which shareholders are entitled to the voting rights). Equally interestingly, unusually high rates of

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<sup>1</sup>Previous literature (Malmendier and Tate, 2005a,b) argues that overconfident CEOs are reluctant to exercise-and-sell — a pattern observationally equivalent to their behavior under proxy contests.

exercise-and-hold by CEOs mostly stop at the record date — is, CEOs attempt to acquire shares precisely for the additional voting rights. On the other hand, the unusually low rates of exercise-and-sell continue beyond that point but in waning magnitude until the outcome date (in the form of an actual vote, a settlement, or withdrawal by the dissident). Thus, CEOs attempt to gain additional votes just in time and to maintain the option to acquire more voting rights as long as the proxy contest is still looming. The third test follows Fos and Tsoutsoura (2013) and exploits firms with staggered board structure and shows that the deceleration of exercise-and-sell is more pronounced for CEOs who are nominated for re-election. A staggered board structure introduces pre-determined heterogeneity in the exposure of incumbent directors to proxy contests, allowing us to establish a link between abnormal option exercise patterns and control challenges. These two tests show that exercise patterns are closely entwined with the evolution of individual proxy events, leaving contest defense to be the most plausible explanation for CEOs’ deviation from their “normal” option exercises.

Last, we conduct a systematic analysis of all recorded out-of-the-money option exercises by insiders between 1996 and 2012. Any option model that assumes a common valuation of the underlying security prescribes that out-of-the-money options never be exercised. For this reason, out-of-the-money option exercises by executives have not been empirically analyzed. The Riggio/Barnes & Noble story turns out to be a recurring theme among the “out-of-the-money” CEOs: we find that the presence of a proxy contest during the current year triples the probability of out-of-the-money exercises. In fact, the concurrence of a proxy contest is the single most powerful explanatory variable for out-of-the-money exercises among the usual list of firm and CEO characteristics variables including CEO/firm fixed effects. To the extent that a valuation wedge between the insider and the outside market is a necessary condition for out-of-the-money exercise to occur in a rational model, such extreme form of deviation from normality provides a unique identification for the private

control premium.

This paper contributes to several strands of literature. First, the paper builds on and extends the literature on the private value of corporate control and the value of voting rights. Several studies have estimated the value of voting rights in the U.S. using dual class shares (Lease et al., 1983; Zingales, 1995; Nenova, 2003), controlling block sales (Barclay and Holderness, 1989; Albuquerque and Schroth, 2010), security lending (Christoffersen et al., 2007; Aggarwal et al., 2012), and put-call-parity violations (Kalay et al., 2014). International evidence also abounds (Levy, 1983; Zingales, 1994; Dyck and Zingales, 2004; Hauser and Lauterbach, 2004). Our estimates isolate the private value accrued to agents in control that is incremental to the “fair market value” where the latter could contain the value of voting rights to the outside shareholders. That is, rather than identifying the value of control for the marginal trader in the market — which tends to be small and may not bear a direct relation to that of the insiders’ — this study provides initial evidence on insiders’ private valuation of the stocks from their option exercises. Calibrated to option valuation models, the abnormal patterns (from decelerating the exercise-and-sell of in-the-money options to exercising out-of-the-money options) suggest that insiders value the shares above the stock price by 5% to over 20%.

Second, this study expands our understanding of the motives underlying option exercises by executives. A full understanding of the mechanism is crucial in designing efficient incentive schemes given the importance of options grants in executive compensation.<sup>2</sup> Prior work has explored the diversification motive based on the utility theory (e.g., earlier work by Huddart and Lang (1996, 2003); Hall and Murphy (2002), and more recent work by Carpenter et al. (2010)), behavioral factors such as CEO overconfidence (Heath et al., 1999; Malmendier and Tate, 2005a,b), and inside information about future stock

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<sup>2</sup>Data from Execucomp indicate that option grants accounted for about half of the total CEO compensation in the 1990s and early 2000s. The percentage decreased in mid-2000s but continued to be significant at about one-quarter by 2011. See Frydman and Jenter (2010) for a review on CEO compensation.

returns (Carpenter and Remmers, 2001; Bartov and Mohanram, 2004; Cicero, 2009). Klein and Maug (2011) conducted a thorough empirical study nesting all of these hypotheses. However, none of these earlier studies has considered the impact of private benefits of control either theoretically or empirically, despite that option compensation is meant to be an important mechanism to align the executives' interest with that of the shareholders. Our analysis also justifies certain exercising behaviors that were deemed to be irrational by previous studies (e.g., Poteshman and Serbin, 2003).

Third, the paper contributes to the corporate governance literature in general and in particular the sub-literature on shareholder activism in the form of proxy contests. Our study indicates that proxy contests exert real pressure on the insiders, confirming the findings from earlier studies (e.g., Fos, 2013; Fos and Tsoutsoura, 2013). Moreover, the price that insiders are willing to pay (implied by the distortion of insider option exercise) for maintaining control suggests that dissidents indeed target companies with meaningful private benefits of control, supporting the view that aggressive shareholder activism serves an important role as market-based corporate governance.

## **2. Hypotheses Development**

### *2.1. General Setup*

We follow the standard settings and notations. A CEO receives packages of American call options on the firm's stock as a form of compensation.  $S_t$  is stock price at time  $t$ ,  $T$  is the expiration date of the option,  $X$  is the exercise price of the option, and  $C(S_t, T - t, X)$  is the value of the option. Under these assumptions and in a perfect market, it is not profitable to exercise the option prior to maturity. Thus, the value of the option is equal to the value of the European call option with the same parameters if the stock pays no dividends.

Under more realistic assumptions fitted to the CEO (or other key insiders of the firm) setting, a CEO should exercise options before expiration when they are sufficiently in the

money (Detemple and Sundaresan, 1999; Hall and Murphy, 2002; Sircar and Xiong, 2007). Conditions contributing to the early exercise include CEOs' lack of diversification due to concentrated exposure in their own companies, and the fact that they can only reduce exposure by selling shares resulting from exercise, rather than from selling options directly. We take the optimal exercise without private control premium as given.

We now introduce proxy contests and isolate their incremental impact on option exercises. In a proxy contest, dissident shareholders challenge the control by incumbents by seeking the right to vote other shareholders' shares in favor of the directors nominated by the dissident group. When the control of a firm is under contest, there might be a date  $\tau$  by which an extra share of ownership brings the CEO additional control premium in the amount of  $b$ . One can think about the following situation: By staying in her position, a CEO derives private benefits of control equivalent to a pecuniary benefit of  $B$ .<sup>3</sup> If her control is not challenged, she can continue to receive the benefit without distorting her option exercises and shareholdings. However, when her control is under contest and the outcome depends on shareholder votes, then additional shares held could increase the probability that the incumbents win the proxy contest by  $\lambda$ . Under such parameterization,  $b$  is just proportional to  $\lambda B$ . The date  $\tau$  naturally corresponds to the record date for shareholder voting, but is not necessarily limited to a particular fixed date. This is because a proxy contest often lasts beyond the first set meeting date (Kalay et al., 2014); and because a proxy contest represents only one form of the challenges to an incumbent's control.

Under this scenario, the insider's valuation of the stock is higher than the market price (which is the value of the stock to the marginal trader) by an amount of  $b$ . Note that stock price  $S_t$  may already embed a control premium as perceived by outside blockholders (Barclay and Holderness, 1989; Dyck and Zingales, 2004) or to the marginal trader in

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<sup>3</sup>We interpret the private benefits broadly to include both financial (e.g., high compensation and perks) and non-financial gains (e.g., stature and the satisfaction from carrying out one's own agenda).

the market for whom the value of votes may also increase when control is under contest (Kalay et al., 2014; Aggarwal et al., 2012). In contrast to the previous studies, we focus on the incremental control premium accrued to the incumbent relative to the outsiders. This becomes our Condition 1.

*Condition 1.* The CEO’s valuation of the stock is  $S_t^* = S_t + b$ , where  $b > 0$  is the per-share value the insider assigns as the private benefits of control.

Moreover, there is a probability  $0 < \eta \leq 1$  that the insider is restricted from trading shares of the company in the open market. Such restrictions are quite common for insiders during informationally sensitive periods, such as announcement of earnings and events of material importance (e.g., M&As). Even outside these restricted windows, insiders bear potential legal risk if their transactions (that were not pre-committed) coincide with large imminent stock price movements. Given that proxy contests are highly informationally sensitive events, it is reasonable to assume that insiders face additional restrictions in trading compared to times of “peace.” We model the restriction that the insider is prohibited from acquiring additional shares from the open market with a positive probability.

In contrast, exercise of vested options by insiders incurs little restrictions. The most important insider trading rule — Section 16 of the Securities Exchange Act of 1934 (and its most recent important amendment under the Sarbanes-Oxley Act of 2002) — has lenient exemptions for transactions that involve a grant or award. Specifically, option exercises by insiders are exempt from the rule as long as the exercise is not accompanied by an imminent sale of shares. The basic rationale behind the exemption is that shares acquired due to option exercises are purchased from the corporation as opposed to the shareholding public. The case law and SEC rule recognize that there is no insider trading violation when the counterparty (here, the corporation) has equal knowledge. This becomes our

Condition 2.

*Condition 2.* The insider is restricted from purchasing shares of the stock in the open market around date  $\tau$  with a positive probability  $\eta$ . However, the insider is not restricted from exercising her vested options during the same time.

Based on the setup, we make predictions regarding option exercises that serve as hypotheses for testing. On the surface, the behavior might be construed as a takeover defense in that the CEO takes an action in order to maintain control. Then it begs the question whether manipulating option exercises is as cost effective as popular takeover defenses such as poison pills. There is a subtle but substantive difference between the two: while they can deter a change in majority control, the conventional takeover defenses are not necessarily effective in fending off aggressive shareholder activism often aiming at minority board representation.<sup>4</sup> For example, a poison pill effectively puts a limit on a dissidents stock ownership, but does not increase the votes supporting an incumbent. Similarly, while a staggered board structure can prevent dissidents from seeking board control, it cannot shield a particular incumbent from being voted out. This is why strategic option exercises by insiders enhance incumbent voting power in a way not accomplishable by the common takeover defenses.

## *2.2. Hypotheses about early exercises*

Private benefits of control affect a CEO's incentive to exercise options prior to maturity. We consider two types of early exercises: an early exercise with an intention to sell the resulting shares and an early exercise with an intention to hold the resulting shares.

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<sup>4</sup>Most proxy contests are not control contests but rather "short slate" contests. In a short slate contest dissident shareholders nominate an alternative slate of directors that competes with the incumbent slate for board seats. It is called "short" if the number of dissident nominees is smaller than the number of seats required to control the board.

We relegate the formal proofs to Appendix A, but explain the intuitions following each hypothesis.

**Hypothesis 1.** *When control is under contest, a CEO who enjoys private benefits of control is less likely to exercise an option and sell the shares.*

The main intuition underlying Hypothesis 1 is that a CEO will not find it profitable to sell the shares at the market price if his personal valuation of the stock exceeds the market price (Condition 1).

**Hypothesis 2.** *A CEO who enjoys private benefits of control is more likely to exercise an option with an intention to hold the stock prior to the date  $\tau$  (when voting rights are needed) with an intention to hold the stock if  $\tau < T$  (the maturity date).*

Hypothesis 2 suggests that if a CEO expects to receive a payoff in the form of voting rights that help to maintain private benefits of control, she is more likely to exercise the option early in order to hold the stock. The intuition here is similar to exercising an option prior to the rationale for a dividend record date.

### *2.3. Hypotheses about out-of-the-money exercises*

We next consider the unusual case of an out-of-the-money exercise because this represents unambiguously irrational behavior under any conventional model that rules out trading frictions and private valuation. As we described in the example in the Introduction, an out-of-the-money exercise may occur when the insider values the stock more than the investing public.

**Hypothesis 3.** *A CEO might exercise a call option out-of-the-money when control is under contest. Moreover, such exercise should happen either at option maturity  $T$  or right before the date  $\tau$  (when voting rights are needed).*

A CEO can find it profitable to exercise a call option out-of-the-money if her private valuation exceeds the market stock price (Condition 1) and if she faces restrictions on

purchasing shares in the open market (Condition 2). Condition 1 implies that although paying the exercise price in excess of the market price is not profitable for market participants, the options may well be in-the-money relative to the insider’s private valuation. Condition 2 implies that in some states of the world the insider is not able to purchase shares in the open market hence exercising the options is the only way to obtain shares. In the absence of the second condition, the CEO would always prefer to purchase shares in the open market.

We next consider a situation in which a stock pays a discrete dividend prior to the maturity date of the option. We show that if a stock pays a dividend, it makes an out-of-the-money exercise even more likely in the presence of a proxy contest.

**Hypothesis 4.** *The CEO is more likely to exercise a call option out-of-the-money prior to maturity if the dividend record date is prior to the maturity date of the option.*

If the difference between the CEO’s own valuation and the market price of the stock is sufficiently large (Condition 1), the option may well be in-the-money relative to the insider’s private valuation. In this case the CEO will exercise the option if the dividend exceeds the option’s time value. Condition 2 is necessary because otherwise the CEO would instead purchase shares at the market price.

### **3. Option Exercises and Proxy Contests: Empirical Evidence**

This section provides empirical evidence on distortions in option exercises by CEOs in firms undergoing proxy contests. The main analysis is conducted at the option package-month level to examine how proxy contests affect CEOs’ propensity to exercise their vested options.

#### *3.1. Data overview*

Our analysis builds on five main data sources. First, information about CEO options and their exercises comes from the Thomson Reuters Insider Filings Data (“TIF” henceforth),

accessible through WRDS. The data source captures all U.S. insider trading activities as reported on Forms 3, 4, 5, and 144.<sup>5</sup> Due to the coverage of the TIF database, we restrict our sample to 1996 and beyond. Form 4 is the most important document for our purpose because it contains information on both stock (or non-derivative) transactions and on derivative securities including options.<sup>6</sup> When options are exercised, filers must report the type of option involved, number of shares involved, strike price (how much it costs the insider to exercise each option), date the options vest, date the options expire, and holdings resulting from exercising the series of options.

For our research purpose, we focus exclusively on CEOs, and the unit for analysis is an option package belonging to a CEO at a given month between vesting and expiration. The construction of the data mostly follows the methods in Klein and Maug (2011). An option package is defined as options awarded to a CEO with the same vesting and expiration dates. For all 14,014 option packages vested between 1995 and early 2013, we track their exercise status from the vesting date (which is the starting date for our hazard analysis) to the date of exercise, expiration, or the end of the sample period (January 2013). The end date of a package is either the first date on which at least three-quarters of the options in the package have been exercised (which is the exit date in the hazard analysis), the date of expiration, or the last month of our sample period if more than a quarter remain unexercised (which is the censoring date in the hazard analysis). This results in 997,034 observations. The average in-sample duration of an option package is about 71 months.

We analyze two key action variables and relate them to proxy contests as well as firm/CEO characteristics. We first define *Exercise* as an exercise of at least a quarter

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<sup>5</sup>Form 3 records initial beneficial ownership for all officers. Form 4 reports changes in an insider's ownership position due to purchase, sale, option grant/exercise, gift, or any other transactions. Form 5 is the annual statement of changes in beneficial ownership which includes exempt transactions not required on a Form 4. Finally, Form 144 reports proposed sales of restricted stock.

<sup>6</sup>We include the following derivative securities as "options:" Employee stock option (TIF coding: EMPO), non-qualified stock option (NONQ), warrants (WT), call options (CALL), rights (RIGHTS), incentive stock options (ISO), directors' stock options (DIRO), and convertible preferred (CVP).

of an option package. The one-quarter filter follows the default parameter used in Klein and Maug (2011), although the results are not sensitive to the exact magnitude chosen. The first action variable is *Exercise&sell*, defined as an exercise followed by a sale of at least 25% of the initial amount of shares within the ensuing three months. Again, results are consistent if we alter the 25% filter used in our "sale" classification. The second variable, *Exercise&hold* is an exercise that is not followed by such a sale. Unconditionally, the probability of exercise-and-sell is 0.46%, and that of exercise-and-hold is 0.28%, both at the package-month level. These figures are on par with those in Cicero (2009).

Second, information about the key independent variable of interest, proxy contests, was hand-collected from SEC filings PREC14C (a preliminary proxy statement in connection with contested solicitations) and DEFC14A (a definitive proxy statement in connection with contested solicitations) from EDGAR. This piece of data is updated from Fos (2013), which contains more details about the institutional background about proxy contests as well as the construction of the event variables. There are 1,029 announced proxy contests between 1996 and 2012, with annual incidences range from 33 (in 1996) to 89 (in 2008). We construct a dummy variable *Contest* equal to one if there was a proxy contest announcement during the current or past 12 months. At monthly frequency, the sample average of *Contest* is 0.42%.

Among the dissidents, a slight majority (51%) are hedge funds. The next biggest players are corporations (19%) and individual shareholders (16%). Fos (2013) documents that dissident shareholders in the 1980s relied more on hostile tender offers, during the last decade they have instead generally resorted to proxy contests in order to exert control or influence. The widespread adoption of antitakeover provisions and the enactment of state-level antitakeover laws sheltering management have increased the cost of hostile tender offers and have therefore contributed to the decrease in the frequency of hostile tender offers (Karpoff and Malatesta, 1989; Bertrand and Mullainathan, 2003; Cremers and Ferrell,

2010). In contrast, the 1992 proxy reform, which allowed independent shareholders to more freely engage in communication without a heightened legal risk, played an important role in the increasing frequency of proxy contests (Sharara and Hoke-Witherspoon, 1993; Bradley et al., 2010; Fos, 2013).

Third, the transactions from TIF are matched to the CRSP/Compustat merged databases for standard stock and company level information. The following variables are imputed at the monthly level with the corresponding values recorded at the previous year-end or during the previous year: *Market cap*, the market capitalization of a company (which enters regressions in log values); *Book/market*, the book to market ratio of equity; *Growth*, the average annual sales growth for the last three years (or for as many years as available during the three-year period); *Idiosyncratic vol* is the stock's annualized residual return from a regression of daily stock returns on the Fama-French three factors; *Dividend yld* is the ratio of common dividends to market capitalization; *Dividend record month* is a dummy variable equal to one if the month contains a dividend record date; and *Illiquidity* is the Amihud (2002) illiquidity measure, or the yearly average of the daily square root of  $(Price \times Volume)/|Return|$ . The following variable is recorded at the monthly level: *Stock ret* is the twelve-month stock return on the monthly rolling window using data from the past 12 months.

Fourth, we match our sample to the Execucomp database to retrieve and construct CEO characteristics, compensation, and wealth, some of which serve as proxies for their risk aversion and incentives to diversify. The granular information comes at the cost of losing about three-quarters of the sample. More specifically, we construct the following variables at the annual frequency (and impute to the monthly frequency): *CEO tot wealth* is the proxy for the CEO's total wealth, which is estimated using the procedure pioneered by Dittmann and Maug (2007) based on the previous years' compensation reported in Execucomp; *% CEO wealth in firm* is the percentage of total wealth that is in the form

of unsold shares and unexercised options (including both vested and unvested); *CEO age* is the age of the CEO. Finally, *% Own top 5* is the percentage of outstanding shares held by the top five executives. The following variables are constructed at the monthly level: *Earnings month* is a dummy variable equal to one if the firm announces quarterly earnings during the month. Corporate insiders are restricted from trading stocks during some informationally sensitive time windows (the “blackout period”), of which earnings announcement is a premier example. *New grant* is a dummy variable equal to one if the CEO receives new option or stock grants in the month. A CEO who targets a particular level of company exposure should be motivated to exercise and sell some vested options when they receive new grants (which are usually not vested). The last two variables are identified by Klein and Maug (2011) as important determinants for CEO option exercises.

Finally, we obtain data on takeover defenses from RiskMetrics in order to analyze the interaction between option exercises and managerial entrenchment. The takeover defense that is most relevant for proxy contests is a staggered board, which we single out in our analysis. Moreover, we consider the E-Index, a summary score of six components<sup>7</sup> that are considered by Bebchuk et al. (2009) to be the most effective in deterring takeovers and most exemplary of managerial entrenchment.

Definitions of the main variables are listed in Appendix B. The summary statistics for option, firm, and CEO variables at the option package-month level (the unit for most regression analyses) are reported in Table 1. The table encompasses two panels corresponding to the CRSP/Compustat merged sample and the Execucomp sample as our main analyses will be conducted separately on the two samples with the trade-off between sample coverage and additional CEO information.

[Insert Table 1 here]

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<sup>7</sup>The six components are staggered boards, two limits to bylaw amendments, poison pills, golden parachutes, and super-majority rule.

### 3.2. Hazard analysis with competing risk

This section develops an empirical strategy to study the effect of proxy contests on option exercise policy. Given the nature of the data structure (records of option packages over their “lifetime”) and the research question (what motivate CEOs to exercise their options before maturity), the appropriate estimation method is a hazard analysis, for which the Cox proportional hazards model is among the most popular in such a setting (e.g., Klein and Maug, 2011) due to its flexibility on the base hazard functions. We make two major changes from Klein and Maug (2011) framework. First, we incorporate proxy contests as an explanatory variable of key interest. Second, we explicitly differentiate exercise-and-sell from exercise-and-hold because they are driven by different motives when control is at stake. As a result, each option package is subject to two types of “risk” of “exiting” before expiration: exercise in order to sell the stocks and exercise in order to hold the shares. Moreover, taking one exit “impedes” the other. That is, the two exit strategies are mutually exclusive but are not necessarily independent from each other (and if they are dependent, the sign of their dependence is *a priori* unclear). The right model for such a situation is the Cox proportional hazards model with competing risks developed by Fine and Gray (1999).<sup>8</sup>

The Fine and Gray (1999) model allows us to estimate the “subdistribution hazards” which is the instantaneous risk of exiting to exercise-and-sell (or exercise-and-hold) given that the option package has not been exercised for the purpose of holding (or selling) the resulting shares. Most relevantly, the coefficient on the  $j$ -th regressor  $X^j$  measures the effect of increasing the  $j$ -th covariate by an infinitesimal amount on the log ratio of subdistribution hazard rates associated with the covariates after and before the perturbation. For ease of interpretation and following the common practice, we report in tables the exponentiated

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<sup>8</sup>The key difference between a regular hazard model and a competing risk model in our setting is that when a CEO exercises an option package and holds the resulting shares, the standard model analyzing exercise-and-sell would record the observation as being censored. In contrast, the competing risk model keeps the observation in the “risk set” and treats it as being censored only at the end of the sample.

coefficients  $e^{\beta_j}$ , which represent the multiples of the hazard rates, or the hazard ratios, associated with a one-unit change in the covariate  $X^j$ .

Given that neither the direction nor the extent of dependence between *Exercise&sell* and *Exercise&hold* is ex ante clear, the relation between *Exercise&sell* and the explanatory variables is not informative about the latter’s relation to *Exercise&hold*. We thus first estimate the relation between the subdistribution hazard rates and covariates for *Exercise&sell* as the main risk and *Exercise&hold* as competing risk, and then we reverse the order.

There is one last technical issue. *Exercise* is defined as an exercise of at least 25% of the shares in an option package. Therefore, a package could incur up to four exercises in its life. Because of the “repeated risks,” we let an option package “start anew” right after a major but partial exercise until less than 25% of the original grant remains.

### 3.3. Determinants of exercise-and-sell

Most models analyzing the frictions in option exercises by insiders implicitly assume the insider intends to sell the resulting shares. The abnormal patterns in exercise-and-sell due to proxy contests thus uncover a determinant of CEO option exercise that is distinct from the other forces studied in the literature. Section 2 presents a hypothesis predicting that proxy contests should have a negative impact on the probability that a CEO will exercise his options early in order to sell the resulting shares. This section tests this hypothesis.

Results from the competing risk model are reported in Table 2. We conduct regressions on three decreasingly nested samples: (1) the universe of public companies covered by the TIF that award CEOs options; (2) a sub-sample of (1) with non-missing firm characteristic variables; and (3) a sub-sample of (2) that are covered by the Execucomp database so as to have CEO personal and wealth information. All regressions include yearly dummies and report exponentiated coefficients or hazard ratios. The neutral value of a hazard ratio is one, which indicates that the variation in the covariate does not

change the rate at which options are exercised. Due to the small value of unconditional exercise probabilities at the monthly frequency, hazard rates are indistinguishable from the instantaneous probabilities. The  $t$ -statistics are associated with the difference between the original (unexponentiated) coefficients and zero, and are indicative of whether the reported hazard ratios are significantly different from unit. The  $t$ -statistics are based on standard errors clustered at the option package level.

[Insert Table 2 here]

The pattern revealed in Table 2 is highly consistent across specifications. First and foremost, proxy contests significantly deter exercise-and-sell. The coefficients are stable with progressive inclusion of control variables. The presence of a proxy contest during the past 12 months reduces the instantaneous probability (i.e., the monthly rate) of exercise-and-sell to about one-fourth (0.20 to 0.30) of the normal level. The original hazard coefficients are significantly different from zero at the 1% level for the CRSP/Compustat samples and at the 10% level for the much smaller Execucomp sample. The results from the exercise-and-sell indicate that proxy contests motivate CEOs to maintain the option to acquire more shares.

Second, the coefficients on the control variables are mostly consistent with standard theories predicting option exercises. Table 2 shows that *Idio volatility* is associated with significantly lower incidences of option exercise-and-sell due to the high time value of options. On the other hand, the variable that proxies for higher fundamental value (*Stock ret*) predicts significantly more exercises. *%CEO firm wealth* is significantly and negatively related to exercise-and-sell. The relations are exactly the opposite of the predictions from diversification motives. We should interpret the results to mean that some CEOs desire to accumulate shares in their firms, and that such traits are highly persistent.

Finally, *Earnings month* and *New grant* have the expected effects. Due to prevalent blackout periods for insider trading around the earnings announcement window, CEOs

reduce their exercise-and-sell during the earnings announcement month by about one quarter (corresponding to the hazard ratio of 0.74-0.76 in columns (2) and (3) in Table 2), and reduction is significant at the 1% level. New grants prompt CEOs to exercise more (significant at the 1% level), presumably to maintain a target portfolio of unexercised options. The hazard ratio associated with new grants is 15-17 times, raising the exercise probability of 0.44% in a typical month to 7-8% during a month with new grants. Such actions suggest that CEOs have a target level of option holdings, which provides support for the diversification motivation.

#### *3.4. Attributing exercise behavior to proxy contests*

The previous section shows that the probability of an option exercise with the purpose of selling the resulting shares decreases during a proxy contest. This section provides several pieces of evidence in order to establish that the proxy contest is the most plausible explanation for the deviation from CEOs' "normal" option exercises.

##### *3.4.1. Does unobserved CEO heterogeneity drive the results?*

The specification in Table 2 pools cross-sectional and time-series relations. A primary concern impeding a causal interpretation is abnormal exercises and proxy contests could both be influenced by a common cause. One possibility for such a common cause is a CEO-specific inherent trait. For example, the results might be driven by CEO overconfidence. In fact, overconfidence has been a leading explanation for CEOs' reluctance to reduce their personal exposure to company-specific risk. In fact, a popular CEO overconfidence measure (Malmendier and Tate, 2005a) is constructed based on a lower-than-normal level of exercise-and-sell, an outcome observationally equivalent to our finding. The same literature documents that CEO overconfidence leads to suboptimal capital structure and over investment, and that the resulting inefficiencies could also attract shareholder activism (Brav, Jiang, Partnoy, and Thomas, 2008; Fos, 2013).

To demonstrate that the force of a proxy contest is distinct from CEO overconfidence in affecting option exercises, we augment the regressions with CEO fixed effects. Unfortunately, the existent competing risk models do not deliver consistent estimates when fixed effects are incorporated. We thus resort to the conditional logit model with fixed effects which identifies how the variance in characteristics affect different outcomes within the same fixed-effect cohort. In our context, the method addresses the question of whether the same CEO is less likely to exercise-and-sell right after a proxy contest announcement, compared to the “peaceful” period of her own reign. By design, only observations associated with CEOs that ever experience a proxy contest and those that exercise options at least once are included in the analysis.

The logit model is different from the hazard model with competing risk in the following different ways. First, we treat each firm-month as a parallel observation without incorporating the information of its conditional “survival.” Second, in the logit model, all exercise-and-buy observations are excluded from the analysis for exercise-and-sell, rather than treated as competing risk with unknown correlations. Needless to say, the hazard model with competing risk is better specified for the situation, but the logit model allows us to identify relations between proxy contests and the propensity to exercise-and-sell from within-CEO variations. Results are reported in Table 3, where the reported numbers are exponentiated coefficients representing odds ratios (i.e.,  $Pr(E\&S)/[1 - Pr(E\&S)]$ ). Due to the very small unconditional probability of  $Pr(E\&S)$  at the monthly frequency, the odds ratios are indistinguishable from the simple probabilities, i.e.,  $Pr(E\&S)$ . To make sure that the results are comparable across specifications, we repeat the analysis in Table 2 using the logit model, and then compare the results from the fixed effect model.

[Insert Table 3 here]

To ensure that any different inferences from the fixed effects models are not driven by model specification, columns (1)–(2) more or less replicate the results in columns (2)–(3) of

Table 2. The coefficients on *Contest* are highly consistent between the hazard model and the logit model, that is, the presence of a contest reduces the probability of exercise-and-sell to one-fourth of its normal level. Once we incorporate the CEO fixed effects, results in columns (3)-(4) indicate that the effects of a proxy contest, as well as some of the key firm/stock level characteristics, are very close to those from the corresponding sample but without fixed effects. This suggests that the determinants for exercise operate cross-sectionally and within CEO in very similar ways due to the common economic motives. Most importantly, the relation between option exercises and proxy contests is clearly driven by circumstances, rather than by CEO inherent traits.

With CEO fixed effects included, *CEO tot wealth* becomes significantly positive, suggesting that when a CEO accumulates more wealth, she also becomes more prone to exercising. This is consistent with the diversification motive. Moreover, *%CEO wealth in firm* loses its significance when analyzed within-CEO, indicating that the same CEO's propensity to exercise is not related to her existing exposure to the firm. Comparing this with the significantly negative relation between firm-specific exposure and exercise-and-sell in the cross section (see Table 2), we learn that some CEOs desire to maintain and accumulate high exposure in their own companies and that this desire is highly persistent. The heterogeneity comes from the cross-section and not from within a CEO.

To reconcile the effects of proxy contests and overconfidence on CEO option exercises more directly, we analyze the relation between option exercises and proxy contests on a focused sample where CEOs exhibit “overconfidence” as classified by the established measure. We define an “overconfidence” sample to include package-month observations where the options are at least 67% in the money and are at least five years old from the vesting date,<sup>9</sup> following Malmendier and Tate (2005) who classify overconfident CEOs by a

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<sup>9</sup>This set of parameters represent benchmark conditions, established by Hall and Murphy (2002), that should trigger option exercises under reasonable assumptions of CEO risk aversion and exposure to firm-specific risk.

lack of exercises under such parameterized circumstances. We find that this subsample has an average exercise-and-sell rate of 46 basis points, about 20% higher than the full sample average (due to the high moneyness of the options). However, when firms are experiencing proxy contests, the incidence of exercise-and-sell in this sample of old and deeply-in-the-money options goes down to zero. Therefore, while CEO overconfidence contributes an important cross-sectional pattern in option exercises, we are able to show that our key result relating a lack of exercise-and-sell to proxy contests holds within a subsample of potentially overconfident CEOs. Thus, defending control challenges appears to be a factor that is distinct from overconfidence.

#### *3.4.2. Option exercises along proxy contest evolution*

The previous section shows that time-invariant CEO characteristics are not driving the results. There is still the possibility that some time-varying unobservable firm or CEO specific characteristics causes both the abnormal exercise patterns and proxy contests. We next explore the dynamics of proxy contests in order to form a sharper connection between two phenomena.

First, we study option exercises before and after the record date. Proxy contests typically occur in connection with the companies' annual meeting of stockholders, in which case the record date is the company's pre-determined official date before which one must be an owner on record in order to participate in the annual meeting and corporate elections. In other cases, the manner of fixing a record date is determined by the bylaws of a corporation. The typical time interval between a record and meeting dates is around 50 days. Given that the significance of ownership as actual voting power is more relevant before the record date, we expect the exercise patterns documented in Section 3.3 to be more pronounced in the pre-record date period if they are driven by control contests.<sup>10</sup>

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<sup>10</sup>Kalay et al. (2014) found that record dates may be subject to change. We use the first record date so as to alleviate endogeneity concerns.

We repeat the analysis in Table 2 with the same firm-level controls except we replace the single variable *Contest* with a pair of disjoint variables: *Contest \* Before Record Date* and *Contest \* After Record Date*. The results are reported in Panel A of Table 4. We report only the coefficients on these new variables because the coefficients on the control variables are nearly identical to those in Table 2 and do not add insights.

[Insert Table 4 here]

Results in Panel A of Table 4 are highly informative. Indeed, the deceleration of exercise-and-sell is more pronounced before the record date. The differences in the before-and-after exercise behavior is significant (see the “Test of equality” toward the bottom of the table which tests the equality of the coefficients associated with *Contest \* Before Record Date* and *Contest \* After Record Date*). Exercise-and-sell virtually comes to a halt before the record date (as indicated by the coefficient of zero). However, although the unusually low rates of exercise-and-sell last beyond the record date, the difference between the actual and normal frequency of exercise-and-sell transactions becomes far less extreme. A lack of exercise-and-sell allows CEOs under contest to maintain the option to acquire more voting rights when needed. As long as the proxy contest is still looming, a CEO could still act defensively and avoid selling shares from option exercises even beyond the record date. In our sample, 20% of the event companies were repeated proxy contest targets; moreover, dissidents may well continue to seek board representation or influence through non-contested routes after the initial confrontation.

Next we consider the sub-sample of firms with a staggered board structure, which allows us to explore directors’ differential vulnerability to contests due to their nomination status. Conditional on a proxy contest against a staggered board, some incumbent directors are up for re-election because their term has expired. Other directors may continue to serve as they wish simply because they are not up for re-election. Fos and Tsoutsoura (2013) show that nominated directors experience significantly more negative career consequences when

the firm is a target in a proxy contest relative to non-nominated directors. As a result, the heterogeneity in the exposure of incumbent directors to proxy contests should be reflected in their option exercises under our hypotheses. That is, nominated CEOs should refrain from exercise-and-sell even more than non-nominated CEOs, conditional on a proxy contest.

To test the hypothesis, we follow a similar specification as in Panel A of Table 4 breaking the key variable *Contest* into the following pair of disjoint variables: *Contest \* Nominated* and *Contest \* Not nominated*. The results, reported in Panel B of Table 4, indicate that while both nominated and non-nominated CEOs are less likely to exercise-and-sell when the company is involved in a proxy contest, the effect is significantly stronger for nominated CEOs (see the “Test of equality”). We thus conclude that deceleration in option exercise-and-sell is more pronounced among CEOs who are more directly exposed to proxy contests.

It is important to note that the first record date and a staggered term are both pre-determined variables that neither a CEO nor a dissident can impact. The fact that the exercise patterns are closely entwined with these features indicates that CEOs manipulate option exercises in response to the evolvment of individual contesting events — rendering proxy contests the most plausible explanation for CEOs’ deviation from “normal” option exercise patterns.

### *3.4.3. Option exercises and takeover defenses*

Given our motivation to uncover private benefits of control from option exercises, it is natural to ask how our results interact with managerial entrenchment or corporate governance, which are usually measured by takeover defenses in the literature (Gompers et al., 2003). We again follow the specification in Table 4 with the following pair of disjoint variables: *Contest \* Entrenched* and *Contest \* Not Entrenched*.

We adopt two measures to proxy for the level of takeover defenses or CEO entrenchment. First, we classify firms into two groups using the Bebchuk et al. (2009) E-Index, which

counts the number of six key anti-takeover provisions.<sup>11</sup> Firms with E-Index values higher than the sample median in a given year (the all sample median is 2) are considered “entrenched” and the complement set are “not entrenched.”<sup>12</sup> Second, we classify firms into two groups depending on whether the boards are staggered. Firms with a staggered board structure are classified as “entrenched” (“not entrenched”). We single out staggered boards because the provision is specifically designed to defend incumbent control in proxy contests. The results are reported in Table 5.

[Insert Table 5 here]

Results indicate that the deceleration of exercise-and-sell is more pronounced for “Entrenched” CEOs — that is, CEOs who are already equipped with more defenses against dissidence. The differences in the *Entrenched* and *Not Entrenched* exercise behavior is significant (see the “Test of equality”). Interestingly, option exercises serve as complements, rather than substitutes, for other defenses. The apparent complementarity provides two pieces of insights. First, CEOs who receive greater benefits from control are likely to take advantage of all available options. Second, the voting rights associated with option exercises could be more effective in fending off non-control-aiming aggressive dissidence, which is not deterred by the conventional takeover defenses (see the discussion in Section 2.1).

### 3.5. Determinants of exercise-and-hold

Models of option exercises usually do not predict exercise-and-hold for either diversification or liquidity motives. Instead, exercise-and-hold is usually predicted to be driven by other motives such as taxation.<sup>13</sup> In this section, we analyze the effect of proxy contests

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<sup>11</sup>We use the E-index rather than the G-index (Gompers et al., 2003), which is based on 24 takeover defenses, because the former has more data availability.

<sup>12</sup>We sort the E-index by year because the values after 2006 are not comparable (within or cross firms) to those before 2006.

<sup>13</sup>Most option grants are “non-qualified” for tax purposes. For such option grants, the exercise premium is taxed at the ordinary income level while the ensuing gains are taxed as capital gains. As such, CEOs who are privately informed about positive news about the stock should exercise the options and hold the stocks for the duration of price appreciation in order to minimize taxes (Cicero, 2009).

on exercise-and-hold.

Results from the competing risk model are reported in Table 6. The specifications are the same as in Table 2 except that exercise-and-hold is now the main risk and exercise-and-sell becomes the competing risk. Consistent with the hypotheses presented in Section 2, the probability of exercise-and-hold increases considerably by about 50% (significant at the 10% level) in the full sample. However, the change is not significant for the Execucomp sample. Thus, CEOs of smaller firms accelerate option exercises in order to own more shares, but the effect does not prevail among firms in Execucomp, which includes only firms in the S&P 1500 Index.

[Insert Table 6 here]

Table 6 shows that variables that indicate high time value of options (*Year to maturity* and *Idio volatility*) are associated with lower incidences of exercise-and-hold. Additionally, our proxy for higher fundamental value (*Stock ret*) predicts fewer exercises. *%CEO firm wealth* is significantly and positive related to exercise-and-hold. This relation is exactly opposite to the predicted outcome from diversification motives. As before, we interpret the results as suggesting that some CEOs persistently accumulate shares in their firms. The earnings month has no effect on exercise-and-hold, presumably because no open-market transaction is involved. New grants prompt CEOs to exercise more (significant at the 1% level), presumably to maintain a target portfolio of unexercised options.

The effect of proxy contests on exercise-and-hold is consistent with the analysis in Section 2. This motive to exercise-and-hold has not been analyzed before. To form a sharper connection between exercise-and-hold and proxy contests, we explore the dynamics of a proxy contest for two important dates: the record date and the outcome date. First, given that the significance of ownership as actual voting power is more relevant before the record date, we expect the exercise-and-sell patterns to be more pronounced in the pre-record date period.

The second milestone is the outcome date where we define an outcome to be one of the following: the date of an actual vote (about 45% the events), the date of a settlement between the dissidents and incumbents (about 20% of the events), the date of withdrawal by the dissidents (about 15%), and other (about 20%).<sup>14</sup> The outcome date signifies the resolution of the contest for the season, though it does not necessarily bring the battle to an end.

We repeat the analyses in Table 6 with the same firm-level controls except we replace the single variable *Contest* with a pair of disjoint variables: *Contest \* Before record (outcome) date* and *Contest \* After record (outcome) date*. In Table 7, we report only the coefficients on these new variables because the coefficients on the control variables are nearly identical to those in Table 6 and do not add insights.

[Insert Table 7 here]

Results in Table 7 conform nicely to our hypotheses. Indeed, the acceleration of exercise-and-hold is more pronounced before a proxy contest reaches a resolution, especially before the record date where the differences in the before-and-after exercise behavior is significant (see the “Test of equality” which tests the equality of the coefficients associated with *Contest \* Before record (outcome) date* and *Contest \* After record (outcome) date*). Equally interestingly, unusually high rates of exercise-and-hold by CEOs mostly stop at the record date, consistent with the needs to have shares by that time in order to boost actual voting power. It thus appears that exercise-and-hold is about acquiring actual voting rights.

### 3.6. Out-of-the-money exercises

Motivated by the Riggio/Barnes & Noble story introduced at the beginning of the paper, we conduct a systematic analysis of out-of-the-money option exercises. Any option model

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<sup>14</sup>Examples of “other” outcomes are proxy contests that are terminated when firms are delisted or taken over.

that assumes a common valuation of the underlying security prescribes that out-of-the-money options never be exercised because the same shares could be acquired at the fair market price which is lower than the strike price of the options. For this reason, out-of-the-money option exercises by insiders epitomize the valuation wedge between insiders and the outside market. This section analyzes the relation between out-of-the-money exercises and proxy contests at the firm-year level.

### *3.6.1. Data on out-of-the-money exercises*

The main data source to analyze out-of-the-money exercise remains the Thomson Reuters Insider Filing database. To identify out-of-the-money exercise, we do not exclusively rely on the transaction code in TIF — where “O” is coded for exercise of out-of-the-money derivative securities defined by the SEC — because the coding severely under-classifies the frequency of these transactions. In order to link option exercise with the resulting simultaneous stock purchase, we require both a “Disposition” coding of the options (in Table 2 of Form 4) and an “Acquisition” coding of the stocks (in Table 1 of Form 4), with matched prices and number of shares.<sup>15</sup> Our baseline definition of out-of-the-money exercise is that the strike price exceeds the daily high price so as to be on the conservative side. The results are robust to using daily close price as the market price, or requiring the price spread to be at least 1% of the market close price.

For the initially identified out-of-the-money exercise cases, we cross-check the strike price recorded in TIF with the original records in Form 4, and the stock price recorded in CRSP with another source such as Yahoo Finance or Bloomberg. We declassify a case if any information source indicates that the exercise was in the money, or if there is a stock split around the time. Moreover, we further require a minimum exercise of 100 shares and the stock price to be below \$200. Using these filters, we uncover 1,497 out-of-the-money

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<sup>15</sup>This procedure is to avoid misclassification due to coincidence, for example, when a CEO is awarded options while at the same time buys the same amount of stocks at the same price.

option exercises between 1996 and 2012. We compute the negative exercise premium to be the difference between the exercise price and the daily high price, scaled by the latter. The median (average) premium is 13% (37%), and the interquartile range is 4% to 43%.

### 3.6.2. Determinants of out-of-the-money option exercise

This section explores the determinants of out-of-the-money option exercises. The firm/CEO variables are defined in the same way as in Section 3.1 except they are now recorded at the firm-year level. Two dependent variables capture the intensity of such events in a firm-year. The first, *OTM*, is a dummy variable for the occurrence of any out-of-the-money option exercises. We use the logit model for this specification. The second dependent variable, *#OTM*, is the number of such incidences during the firm-year, which is a non-negative count number. Hence we use the negative binomial model, which is suitable for count data with unidentified correlation.

The key independent variable is *Contest*, a dummy variable equal to one if there is an announcement of a proxy contest for the same firm-year. Control variables include firm and CEO characteristics. As in Table 2, we examine the relations using three nested samples with varying coverage by CRSP/Compustat and Compustat. The two by three sorting yields six specifications, the results of which are reported in Table 8.

[Insert Table 8 here]

In columns (1) to (3) of Table 8, we report the exponentiated coefficients, which represent multiples of “odds ratios” associated with a one-unit change in an independent variable. More specifically, the coefficient on *Contest* indicates by how many times the odds ratio  $\Pr(OTM)/[1 - \Pr(OTM)]$  will multiply when there is a proxy contest for the firm in the same year, relative to the odds ratio in a non-contest firm-year. Given that  $\Pr(OTM)$  is unconditionally very small (0.4% for the full sample), the odds ratio is virtually indistinguishable from  $\Pr(OTM)$ . Hence, for simplicity we will just interpret this coefficient

as how the probability of out-of-the-money exercise will multiply when the control for the firm is under contest. The results in the first two columns of Table 8 indicate that the probability of out-of-the-money exercise increases by 2.6-2.8 times (i.e., from about 0.4% to 1.1%). The effect is stable when including firm-level controls, and is significant at the 1% level in both specifications. When limited to the sample covered by Execucomp, the coefficient on *Contest* increases to 3.5, and is significant at the 5% level. Overall, proxy contests are positively and significantly associated with the incidences of out-of-the-money option exercises.

Moreover, most firm and CEO characteristics do not predict out-of-the-money exercises. This is not surprising as the conventional model would predict no such events regardless of the conditions of the firm and the CEO. Section 2 points out that trading frictions could make out-of-the-money (with moderate negative premium) exercises rational if buying shares from the spot market incurs high transaction costs or is restricted due to insider trading rules. Therefore, a priori we expect out-of-the-money exercises to be more likely among the less liquid stocks. Somewhat surprisingly, the Amihud illiquidity measure (*Amihud illiq*) is not significant. *Amihud illiq* turns out to be highly correlated (with a correlation coefficient of 0.6) with idiosyncratic volatility (*Idiosyncratic vol*), but *Amihud illiq* remains insignificant even when we exclude *Idiosyncratic vol* from the regression. Therefore, trading restrictions, rather than the conventional transaction cost of buying shares from the stock market, is more likely to be a factor in prompting out-of-the-money exercises.

On the other hand, *Idiosyncratic vol* is significant at the 5% level with an economically meaningful magnitude: An interquartile change in the variable leads to a 1.2 – 1.7 times increase in the probability of out-of-the-money exercise (imputed from the coefficients reported in columns (2) and (3)). Given that high idiosyncratic volatility indicates a higher need for the CEO to diversify, such a CEO should be discouraged from acquiring more

shares, especially at an unfavorable price. Another proxy for the diversification motive is the proportion of a CEO's wealth that is tied to the firm (*CEO % wealth in firm*). The coefficient on the variable is significantly negative in one (column (6)) out of six specifications. These two facts combined suggest that the diversification motive does not play a clear role in explaining out-of-the-money exercises.

In addition, none of the other CEO characteristics, such as CEO wealth (estimated), CEO age, and total ownership by the top five executives, explain out-of-the-money exercises with any significance. In sum, the presence of a proxy contest is, by far, the dominant determinant for out-of-the-money exercises. For the next strongest predictive variable, *Idiosyncratic vol*, it would require a four standard-deviation change to generate the same effect on the odds ratio as a proxy contest.

The second dependent variable we analyze, *#OTM*, is the number of incidences of out-of-the-money exercises for the firm-year, which is a non-negative integer number. The appropriate estimation model is the negative binomial model, which assumes that the count variable is generated by Poisson processes with dispersed mean arrival rates that are proportional to an exponentiated linear function of the covariates. Columns (4)–(6) of Table 8 report estimates of the negative binomial model. The key coefficient on *Contest*, ranging between 2.49 and 3.40, indicates the magnitude of semi-elasticity, or  $\partial \ln(\#OTM) / \partial Contest$ . Approximately, the number of out-of-the-money exercises more than doubles (in the Compustat sample) or even triples (in the Execucomp sample) the normal incidences when proxy contests are looming (all significant at the 1% level). The magnitude of the coefficient is in close synchronicity with that from the logit analysis (columns (1) to (3)). Therefore, we conclude that proxy contests are positively and significantly associated with the number of out-of-the-money option exercises.

In this context, a reverse causality — that is, shareholders are more likely to launch proxy contests when the insiders acquire shares out-of-the-money — is implausible.

However, it is possible that some unobserved factors (such as CEO characteristics) could drive both option exercise patterns and the firm’s vulnerability to proxy contests. To assess the importance of this hypothesis, we re-estimate the models in columns (1) to (3) of Table 8 using the conditional logit model with CEO (or firm) fixed effects to filter out firm/CEO specific traits. Results are reported in Table 9. In the first two columns, we use firm fixed effects to approximate CEO traits because data on CEOs are not available for most CRSP/Compustat firms. In the third column, we limit the analysis to those firms included in Execucomp and apply CEO fixed effects. The odds ratios associated with *Contest*, around 4.4-4.5, are stable across three specifications, and are even stronger than the coefficients in Table 8 (all significant at the 10% level or better).<sup>16</sup> We therefore infer from Table 9 that circumstances, rather than unobserved personal (or firm) characteristics, lead to out-of-the-money exercises.

[Insert Table 9 here]

Needless to say, the majority of the out-of-the-money exercises do not have proxy contests in sight. Other explanations for out-of-the-money exercises include data recording errors, funding of the exercise prices by the firm, and a tax motive.<sup>17</sup> Importantly, we establish a significant and robust relation between proxy contests and the propensity of CEOs to exercise out-of-the-money options — the probability of the latter increases from an unconditional 0.4% (at the firm-year level) to about 1.2% conditional on proxy contests. Moreover, we also verify that the tax motive does not apply to the out-of-the-money exercises concurrent with proxy contests because the average post exercise stock return is negative for this subsample. Overall, results in Table 9 suggest that the incumbents may resort to out-of-the-money exercise to defend their control of the firm.

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<sup>16</sup>If CEO fixed effects are used in the first two columns, restricting the sample to Execucomp coverage, the odds ratios associated with *Contest* are 3.93 and 3.33, comparable to the numbers reported in columns (1) and (2).

<sup>17</sup>Data recording errors include simple clerical errors and incidences of option repricing that were not properly updated in the filings. The tax motive is analogous that explained in Footnote 12.

#### 4. The Premium Insiders Pay for Control: Inferences from Option Exercises

The previous sections demonstrated robust patterns of option exercise anomalies when proxy contests are in sight. Given the exercise distortions reported in this study, a natural following question asks how large of a price premium insiders pay for control. In this section, we calibrate CEOs' private valuation of the stocks based on the observed behavior.

##### *4.1. Calibrating insider loss from deceleration of exercise-and-sell*

Our results indicate that the presence of a proxy contest is associated with a reduction in the annual rate of exercise-and-sell from a normal level of 5.3% to close to zero (0.8%). The Hypothesis 1 discussed in Section 2.2 indicates that a deceleration of exercise-and-sell could be generated by a valuation wedge between the insider and the market place.

To calibrate the implied parameter  $b$  (the incremental private valuation), we apply the certainty equivalent approach adopted in Hall and Murphy (2002).<sup>18</sup> To start with, we estimate the value of an option for a risk averse insider assuming the insider exercises the option optimally. We then impose an exogenous no-exercise window (“delay”) of various length and reassess the value of the option for the insider. By construction, the value of the call option to the insider under the constrained exercise policy is lower than under an optimal exercise policy. Finally, we calculate the reduction in the stock value under the unconstrained regime needed to equate the option values under the two regimes. The reduction in the stock valuation is an estimate for the price insiders pay for delaying exercise-and-sell when facing proxy contests.

Consider a call option with the following characteristics: the exercise price ( $X$ ) is \$30, time-to-maturity ( $T$ ) is four years, and the option is currently 50% in the money in proportion to the current stock price. These parameters are set to reflect the conditions of a typical option package in our sample. Following Hall and Murphy (2002), we assume

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<sup>18</sup>Because these models implicitly assume that insiders exercise options for the sole purpose of selling, we do not have a structural procedure to infer the private valuation premium from accelerated exercise-and-hold.

the insider’s utility over wealth is  $U(W) \equiv (1/(1-\rho))W^{1-\rho}$ , where  $\rho$  is the constant relative risk aversion (CRRA) coefficient. We adopt the Capital Asset Pricing Model (CAPM) and assume that the distribution of stock prices in  $T$  years is lognormal with volatility  $\sigma$  and that the expected return is equal to  $(r_f + \beta(r_m - r_f) - \sigma^2/2)T$ , where  $\beta$  is the firm’s systematic risk loading and  $r_m$  is the return on the market portfolio. We assume that the stock pays no dividends,  $\beta = 1$ ,  $r_f = 6\%$ ,  $\sigma = 30\%$ ,  $r_m - r_f = 6.5\%$  (a detailed description of the approach can be found in Section 4.1 of Hall and Murphy (2002)). The calibration results are reported in Table 10.

[Insert Table 10 here]

Table 10 presents three variations in time to maturity (4, 2, and 8 years in Panels A, B, C), two variations in relative risk aversion ( $\rho = \{2, 3\}$ ), and two variations in CEO wealth in the firm (50% and 75%). These are the standard permutations adopted in the literature. Our benchmark is “no delay” ( $Delay = 0\%$ ) where we report the option value to the insider and the implied reduction in stock valuation (0%). We then calibrate the insider option values with delays in exercise equal to 25%-100% of the options’ remaining life. For example, for an option with four years to expiration, this corresponds to a forced delay of 1-4 years in exercise.

Our key interest lies in the numbers in the “Discount” columns in Table 10, which reflect the equivalent reduction in stock valuation to the insider under the unconstrained regime that would equate the option values with delays in exercise to those under the optimal exercise policy. Suppose our default benchmark is an insider with a CRRA coefficient of 3 and with two-thirds of her wealth in the firm who exercises options optimally given his diversification needs but without any control motives. Imposing a one-year “no exercise” window on an option with four years to expiration will cause a loss to the insider equivalent to 4.81% of stock valuation, and the number quickly rises to 9.58% if the delay is for two years. In other words, it is as if the insiders value the stocks about 5-10% above the market

so that they exhibit the same delay in exercise in the absence of a control motive. The many permutations in Table 10 indicate that the equivalent reduction in stock valuation increases with the extent of delay, risk aversion, and option time to maturity (if the delay is kept proportional to time to maturity).

#### *4.2. Inferring insider private valuation from out-of-the-money exercises*

The inferred valuation spread from exercise-and-sell deceleration is modest because it is probably the least costly way for the CEO to defend a proxy contest. On the other hand, exercising options out-of-the-money is probably the most costly (among all distortions to option exercises). Therefore, we expect the value premium implied by the latter to be higher.

To form an estimate, we adopt the same regressions as in Table 8 except we change the dependent variable to *Premium*, the negative of the out-of-the-money exercise premium, that is,  $(\text{Strike price} - \text{Daily high price}) / \text{Daily high price}$ , averaged over all out-of-the-money exercise incidences in the firm-year. If there is no such incidence, we record *Premium* as zero. The tobit model is adopted for the last specification. Results reported in Table 11 indicate that the premium increases by 23-26 percentage points when a proxy contest takes place. The coefficient encompasses both the increasing probability to exercise out-of-the-money and the negative premium paid conditional on exercise. The effect is stable when including firm-level and executive-level controls, and is significant at the 5% (10%) level in the first two (third) specifications. Overall, proxy contests are positively and significantly associated with the out-of-the-money exercise premium, suggesting a sizable private control premium among the cases where insiders resort to this costly way for voting rights.

[Insert Table 11 here]

## 5. Conclusion

This study explores how CEOs' (and insiders') private benefits of control are reflected in their option exercise behavior. We document two salient patterns. First, we show that CEOs are significantly less (more) likely to exercise options in order to sell (hold) the resulting shares when a proxy contest is looming, i.e., when voting rights are needed. Second, the presence of a proxy contest triples the probability that an insider exercises call options out-of-the money, a strategy deemed unambiguously irrational under the conventional models that do not include a valuation wedge between the insiders and the market.

These findings are consistent with the hypothesis that CEOs' valuation of their stocks exceed that of the market price by a range of 5% to over 20%. When private benefits of control are at risk, combined with some restrictions on trading in stocks by insiders, CEOs distort their option exercises in order to boost their voting power. Such incidences allow us to infer both the existence and the magnitude of the private control premium.

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## Appendix A. Proofs for Hypotheses Development

Assume the following standard setting and notation:  $S_t$  is stock price at time  $t$ ,  $T$  is the expiration date of an American call option,  $X$  is the exercise price of the option, and  $C(S_t, T - t, X)$  is the value of option. The stock pays no dividends. The two Conditions are the same as those stated in Section 2.1.

We first show formally how the private benefits of control affect an insider's incentive to exercise in-the-money options prior to maturity. We consider two types of early exercises: an early exercise with an intention to sell the stock and an early exercise with an intention to hold the stock.

**Proposition 1.** *If the insider's personal valuation ( $S_t^*$ ) is higher than the market price of the stock ( $S_t$ ), the insider is less likely to exercise an option in order to sell the stock.*

*Proof.* If the insider holds the stock, his personal valuation of the stock is higher than the market price,  $S_t^* > S_t$ . Therefore, the insider finds selling the stock not profitable.  $\square$

Proposition 1 leads to Hypothesis 1.

On the other hand, the proxy contest record date might trigger an early exercise of a call option, and so does the dividend record date. Below we provide two propositions that can facilitate early exercises of call options for the purpose of holding the resulting shares.

**Proposition 2.** *Under Condition 1, the insider is more likely exercise an option prior to maturity with an intention to hold the stock if the stock pays a constant dividend yield  $q_d > 0$ , compared to the situation in which the private control premium is zero ( $b = 0$ ).*

*Proof.* When a stock pays a constant dividend yield, an early exercise takes place if the stock price exceeds a threshold. A positive private benefit ( $b > 0$ ) has a positive impact on the insider's valuation and therefore makes an early exercise more likely.  $\square$

**Proposition 3.** *Under Conditions 1 and 2, the insider is more likely to exercise an option prior to maturity with an intention to hold the stock, compared to the situation in which  $b = 0$ .*

*Proof.* Holding the stock delivers a convenient yield  $q_c > 0$  because it reduces the potential constraint the insider faces when open market purchases are prohibited. The effect of the convenient yield  $q_c$  on the early exercise policy is similar to the effect of the dividend yield. □

Propositions 2 and 3 lead to Hypothesis 2.

We next discuss the conditions under which an insider exercises an option out-of-the-money.

**Proposition 4.** *If Conditions 1 and 2 are satisfied, the insider might exercise a call option out-of-the-money at maturity. The insider might also exercise a call option out-of-the-money prior to maturity if date  $\tau$  is prior to the maturity date of the option ( $\tau < T$ ), and the insider assigns a positive value (from voting rights) to holding the shares on date  $\tau$  (e.g., the proxy contest record date).*

*Proof.* If the insider exercises a call option at maturity, his payoff is  $S_T^* - X > S_T - X$  (Condition 1). If  $b$  is sufficiently large,  $S_T^* - X > 0 > S_T - X$ . That is, the insider can find it profitable to exercise a call option out-of-the-money. Condition 2 is necessary because if  $S_T - X < 0$ , the insider prefers to purchase shares in the open market at cost  $S_T$  instead of paying the exercise price  $X$ .

Let  $G$  be the value the insider assigns to holding a share of the stock on date  $\tau$ , the value  $G$  is related to the private benefits of control  $b$  because the voting rights from holding the shares help to defend the control. The insider will exercise a call option out-of-the-money (i.e.,  $S_\tau - X < 0$ ) if  $S_{\tau+}^* + G - X > C(S_{\tau+}^*, T - \tau +, X)$ . Therefore, an out-of-the-money exercise is possible for a sufficiently high  $G$ . Because a call option's delta is less than unit,

the effect of  $b$  on  $S_{\tau+}^*$  is larger than its effect on  $C(S_{\tau+}^*, T - \tau+, X)$ , making early exercise more likely. Again Condition 2 is necessary because the insider would otherwise prefer to purchase shares in the open market at cost  $S_{\tau+}$  instead of paying the exercise price  $X$ .  $\square$

Proposition 4 leads to Hypothesis 3. Last, we show that if a stock pays a dividend, it makes an out-of-the-money exercise even more likely in the presence of a proxy contest.

**Proposition 5.** *The insider is more likely to exercise a call option out-of-the-money prior to maturity if Conditions 1 and 2 hold and the dividend record date is prior to the maturity date of the option.*

*Proof.* On the dividend record date, the insider will exercise a call option out-of-the-money ( $S_{\tau+} + D - X < 0$ ) if  $S_{\tau+}^* + D - X > C(S_{\tau+}^*, T - \tau+, X)$ . Higher  $b$  will make option exercises more likely because its impact on  $S_{\tau+}^* + D - X$  is higher than its impact on the time value because the delta of a call option is below unity. Condition 2 is necessary because the insider would otherwise prefer to purchase shares in the open market at cost  $S_{\tau+} + D$  instead of paying the exercise price  $X$ .  $\square$

Proposition 5 leads to Hypothesis 4.

## Appendix B. Variable Definitions

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Variable	Definition
<i>Exercise</i>	An indicator of an exercise of at least 25% of an option package.
<i>Exercise&amp;sell</i>	An indicator that following exercise the executive sold at least 25% of the amount exercised within the ensuing three months.
<i>Exercise&amp;hold</i>	An indicator that following exercise the executive did not sell at least 25% of amount exercised within the ensuing three months.
<i>Contest</i>	A dummy variable equal to one if there was a proxy contest announcement during the current or past 12 months.
<i>Years to maturity</i>	The number of years between the current month and option expiration.
<i>Market cap</i>	The firm's market capitalization at the last year-end.
<i>BM</i>	The firm's equity market-to-book ratio at the last year-end.
<i>Growth</i>	The average annual sales growth for the last three years (or for as many years as available during the three-year period).
<i>Stock ret</i>	Twelve-month stock return on the monthly rolling window using data from the past 12 months.
<i>Idiosyncratic vol</i>	The stock's annualized residual return from a regression of daily stock returns on the Fama-French three factors during the past year.
<i>Illiquidity</i>	The Amihud (2002) illiquidity measure, or the yearly average of the daily square root of (Price x Volume)/ Return .
<i>Dividend yld</i>	The ratio of common dividends to market capitalization.
<i>Dividend record month</i>	A dummy variable equal to one if there was a dividend record date during the month.
<i>Earnings month</i>	A dummy variable equal to one if the firm announces quarterly earnings during the month.
<i>New grant</i>	A dummy variable equal to one if the CEO receives new option or stock grants in the month.
<i>CEO age</i>	The age of the CEO.
<i>CEO tot wealth</i>	The proxy for a CEO's total wealth, as estimated using Execucomp data and following the procedure of Dittmann and Maug (2007).
<i>% CEO wealth in firm</i>	The percentage of total wealth that is in the form of unsold shares and unexercised options (including both vested and unvested).
<i>% Own top 5</i>	The percentage of outstanding shares held by the top five executives.

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Table 1: **Summary statistics.** This table reports summary statistics for option, firm, and CEO variables recorded at the option package-month level (the unit of observation for our main regression analysis). All variables are defined in Appendix B, and are presented separately for the full Compustat/CRSP and the Execucomp samples. All potentially unbounded variables are pre-winsorized at the 1% and 99% extremes. Columns (1) and (2) report the mean and standard deviation of each variable. Columns (3)–(5) report their values at the 25th, 50th, and 75th percentiles.

	Mean (1)	Std Dev (2)	25% (3)	Median (50%) (4)	75% (5)
<b>Full Sample</b>					
<i>Exercise&amp;sell</i>	0.0046	0.0679	0.0	0.0	0.0
<i>Exercise&amp;hold</i>	0.0027	0.0524	0.0	0.0	0.0
<i>Contest</i>	0.0042	0.0648	0.0	0.0	0.0
<i>Years to maturity</i>	3.94	2.62	1.75	3.67	5.92
<i>Market cap (\$ mil)</i>	4,180	11,129	184	705	2,672
<i>BM</i>	0.51	0.41	0.25	0.42	0.66
<i>Growth</i>	0.20	0.35	0.04	0.12	0.24
<i>Stock ret</i>	0.14	0.60	-0.20	0.04	0.32
<i>Idiosyncratic vol</i>	0.45	0.26	0.26	0.37	0.56
<i>Illiquidity</i>	0.33	0.36	0.04	0.16	0.61
<i>Dividend yld</i>	0.02	0.04	0.00	0.00	0.03
<i>Dividend record month</i>	0.12	0.33	0.00	0.00	0.00
<i>Earnings month</i>	0.33	0.47	0.00	0.00	1.00
<i>New grant</i>	0.01	0.09	0.00	0.00	0.00
<b>Execucomp Sample</b>					
<i>Exercise&amp;sell</i>	0.0055	0.0742	0.0	0.0	0.0
<i>Exercise&amp;hold</i>	0.0018	0.0426	0.0	0.0	0.0
<i>Contest</i>	0.0041	0.0637	0.0	0.0	0.0
<i>Years to maturity</i>	3.66	2.46	1.58	3.33	5.42
<i>Market cap (\$ mil)</i>	5,149	12,583	285	1,011	3,646
<i>BM</i>	0.50	0.39	0.25	0.42	0.65
<i>Growth</i>	0.17	0.30	0.03	0.11	0.21
<i>Stock ret</i>	0.15	0.57	-0.17	0.05	0.31
<i>Idiosyncratic vol</i>	0.41	0.24	0.25	0.35	0.50
<i>Illiquidity</i>	0.21	0.33	0.02	0.06	0.24
<i>Dividend yld</i>	0.03	0.04	0.00	0.01	0.04
<i>Dividend record month</i>	0.18	0.38	0.00	0.00	0.00
<i>Earnings month</i>	0.33	0.47	0.00	0.00	1.00
<i>New grant</i>	0.01	0.10	0.00	0.00	0.00
<i>CEO age</i>	55.26	6.79	51.00	55.00	60.00
<i>CEO tot wealth (\$ mil)</i>	10.71	1.35	9.78	10.70	11.63
<i>% CEO wealth in firm</i>	0.58	0.27	0.37	0.58	0.81
<i>%OwnTop5</i>	0.14	14.83	0.01	0.03	0.12

Table 2: **Exercise & Sell and proxy contests: Hazard model with competing risk.** Results in this table illustrates the determinants of CEO option exercises for the purpose of selling at the option package-month level using the Cox proportional hazards model with competing risks (Fine and Gray, 1999). The empirical methodology is described in Section 3.2. We estimate the relation between the subdistribution hazard rates and covariates for *Exercise&sell* as the main risk and *Exercise&hold* as competing risk. All independent variables are defined in Section 3.6.1 and Table 1. All regressions include yearly dummies. The table reports exponentiated coefficients or hazard ratios. The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported odds ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Contest	0.2254*** [-3.07]	0.2034*** [-3.35]	0.3063* [-1.76]
Year to maturity		0.9963 [-0.35]	1.0246* [1.70]
Market Cap		1.0446** [2.49]	0.9644 [-1.14]
B/M		0.8241*** [-2.58]	0.8466 [-1.56]
Growth		0.9354 [-1.00]	1.1967* [1.79]
Stock ret		1.9254*** [23.76]	2.1131*** [19.14]
Idio volatility		0.3487*** [-6.90]	0.3212*** [-4.90]
Illiquidity		0.5054*** [-5.18]	0.0410*** [-4.27]
Dividend yld		0.2667** [-1.99]	0.4397 [-1.01]
Dividend record month		1.2154*** [3.18]	1.2666*** [3.16]
Earnings month		0.7577*** [-5.33]	0.7371*** [-4.56]
New grant		14.7853*** [37.00]	17.1961*** [32.84]
CEO age			1.0025 [0.54]
CEO tot wealth			1.0277 [1.01]
% CEO wealth in firm			0.6098*** [-4.21]
Year Dummies	Yes	Yes	Yes
# option package series	19,058	14,133	8,384
# option package months	1,024,673	643,958	356,882

Table 3: **Exercise & Sell: Logit and conditional logit with CEO fixed effects.** This table reports estimates of logit and conditional logit (with CEO fixed effects) regressions, analyzing the determinants of CEO option exercises at the package-month level. The conditional logit model relies on within-CEO variations and include only observations associated with those CEOs who ever experience a proxy contest and exercise options. The dependent variable is *Exercise&sell*. All independent variables are defined in Section 3.6.1 and Table 1. The reported coefficients are odds ratios (or exponentiated coefficients). The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported odds ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Contest	0.2355*** [-2.96]	0.2517** [-2.44]	0.2071*** [-2.96]	0.2088** [-2.53]
Year to maturity	0.9529*** [-6.50]	0.9721*** [-3.07]	0.9081*** [-8.81]	0.9191*** [-6.18]
Market Cap	1.0505*** [3.52]	0.9587* [-1.87]	1.2717*** [4.57]	1.1878** [2.00]
B/M	0.8268*** [-3.18]	0.8158** [-2.56]	0.6618*** [-3.46]	0.8995 [-0.61]
Growth	1.0743 [1.27]	1.2578** [2.43]	1.3607*** [2.95]	1.5857** [2.49]
Stock ret	1.9487*** [26.89]	2.1750*** [22.65]	2.1836*** [25.20]	2.3286*** [19.08]
Idio volatility	0.4069*** [-6.67]	0.2697*** [-6.64]	0.4562*** [-3.84]	0.2764*** [-4.06]
Illiquidity	0.5318*** [-5.25]	0.0724*** [-4.67]	0.3931*** [-4.60]	0.0299*** [-3.65]
Dividend yld	0.4838 [-1.44]	0.6221 [-0.77]	0.1502*** [-2.99]	0.1865** [-2.21]
Dividend record month	1.2335*** [4.80]	1.1606*** [2.86]	1.2859*** [5.13]	1.2089*** [3.26]
Earnings month	0.8446*** [-4.46]	0.8440*** [-3.59]	0.8501*** [-4.14]	0.8473*** [-3.39]
New grant	38.2279*** [84.78]	43.4929*** [74.71]	46.7947*** [79.32]	53.2327*** [69.28]
CEO age		1.0063* [1.77]		1.0162** [2.42]
CEO tot wealth		1.0134 [0.62]		1.1788*** [3.47]
% CEO wealth in firm		0.7329*** [-3.33]		1.0400 [0.26]
CEO FE	No	No	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	651,829	360,878	385,668	240,737
Pseudo $R^2$	14.3%	16.4%	–	–

Table 4: **Exercise & Sell and the dynamics of proxy contests.** This table follows the same regression specifications as in Table 2 except that the key variable *Contest* is broken down into a pair of disjoint variables. In Panel A, *Contest* is broken down into *Contests \* Before record date* and *Contests \* After record date* to indicate whether the current month (associated with a proxy contest) is before or after the date of ownership record that entitles the holder to voting rights at the upcoming meeting. In Panel B, the sample is limited to firms with a staggered board structure. *Contest* is broken down into *Contests \* Nominated* and *Contests \* Not Nominated* to indicate whether the announced proxy contest is against a board in which the CEO is nominated for re-election at the upcoming meeting. In Panel B the sample is limited to firms with a staggered board structure. Firm-level control variables and yearly dummies are included in the regressions but not reported. “Test of joint significance” tests the joint significance of the two coefficients while “Test of equality” tests their equality, both using chi-tests. The table reports exponentiated coefficients or hazard ratios. The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported hazard ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

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<b>Panel A: Record date</b>	
Contest * Before Record Date	0.0000*** [-34.94]
Contest * After Record Date	0.2420*** [-2.95]
Firm Controls	Yes
# option package series	14,133
# option package months	643,958
Test of joint significance (p-val)	0.000***
Test of equality (p-val)	0.000***
<b>Panel B: Nominated CEOs</b>	
Contest * Nominated	0.0000*** [-77.83]
Contest * Not nominated	0.0712*** [-3.39]
Firm Controls	Yes
# option package series	5,381
# option package months	237,290
Test of joint significance (p-val)	0.000***
Test of equality (p-val)	0.000***

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Table 5: **Exercise & Sell, proxy contests, and takeover defenses.** This table follows the same regression specifications as in Table 2 except that the key variable *Contest* is broken down into a pair of disjoint variables, *Contests \* Entrenched* and *Contests \* Not Entrenched*. In column 1, *Entrenched* indicates that the firm has a greater number of E-Index provisions (Bebchuk et al., 2009) than the annual median of all sample firms. In column 2, *Entrenched* indicates that the firm has a staggered board structure. The sample is limited to firms with RiskMetrics coverage. Firm-level control variables and yearly dummies are included in the regressions but not reported. “Test of joint significance” tests the joint significance of the two coefficients while “Test of equality” tests their equality, both using chi-tests. The table reports exponentiated coefficients or hazard ratios. The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported hazard ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Entrenchment Measure	E-Index >Annual Median (1)	Staggered Board (2)
<i>Contests * Entrenched</i>	0.0000*** [-82.17 ]	0.0692*** [-3.33]
<i>Contests * Not Entrenched</i>	0.2087** [-2.31]	0.5376 [-1.04]
Firm Controls	Yes	Yes
# option package series	8,897	8,993
# option package months	410,460	411,505
Test of joint significance (p-val)	0.000***	0.002***
Test of equality (p-val)	0.000***	0.040**

Table 6: **Exercise & Hold and proxy contests: Hazard model with competing risk.** Results in this table illustrate the determinants of CEO option exercises for the purpose of holding at the option package-month level using the Cox proportional hazards model with competing risks (Fine and Gray, 1999). The empirical methodology is described in Section 3.2. We estimate the relation between the subdistribution hazard rates and covariates for *Exercise&hold* as the main risk and *Exercise&sell* as competing risk. All independent variables are defined in Section 3.6.1 and Table 1. All regressions include yearly dummies. The table reports exponentiated coefficients or hazard ratios. The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported hazard ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Contest	1.6031*	1.7318*	0.5342
	[1.86]	[1.84]	[-0.63]
Year to maturity		0.8817***	0.9036***
		[-11.02]	[-5.46]
Market Cap		0.7505***	0.8163***
		[-10.33]	[-3.85]
B/M		0.8260**	1.1832
		[-2.19]	[0.93]
Growth		1.5959***	1.6203***
		[7.52]	[2.94]
Stock ret		0.9366	0.8140**
		[-1.32]	[-2.00]
Idio volatility		1.0763	0.7329
		[0.46]	[-0.77]
Illiquidity		0.9935	1.7182
		[-0.06]	[1.00]
Dividend yld		0.1861*	0.0232**
		[-1.93]	[-2.53]
Dividend record month		1.4199***	1.2151
		[4.19]	[1.56]
Earnings month		1.0603	1.1591
		[0.90]	[1.41]
New grant		8.7289***	7.6156***
		[21.70]	[14.27]
CEO age			0.9977
			[-0.30]
CEO tot wealth			1.0847
			[1.52]
% CEO wealth in firm			3.4119***
			[5.27]
Year Dummies	Yes	Yes	Yes
# option package series	19,058	14,133	8,384
# option package months	1,024,673	643,958	356,882

Table 7: **Exercise & Hold: When votes are needed.** This table follows the same regression specifications as in Table 6 except that the key variable *Contest* is broken down into a pair of disjoint variables. In panel A, *Contest* is broken down into *Contests \* Before record date* and *Contests \* After record date* to indicate that the current month (associated with a proxy contest) is before or after the date of ownership record that entitles the holder to voting rights at the upcoming meeting. In panel B, *Contest* is broken down into *Contests \* Before outcome date* and *Contests \* After outcome date* to indicate that the current month (associated with a proxy contest) is before or after the proxy contest outcome date. Firm-level control variables and yearly dummies are included in the regressions but not reported. “Test of joint significance” tests the joint significance of the two coefficients while “Test of equality” tests their equality, both using chi-tests. The table reports exponentiated coefficients or hazard ratios. The *t*-statistics are associated with the original (unexponentiated) coefficients, and are indicative of whether the reported hazard ratios are significantly different from unit. The *t*-statistics are based on standard errors clustered at the option package level. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

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<b>Panel A: Record date</b>	
Contest * Before Record Date	5.0098***
	[4.56]
Contest * After Record Date	1.1054
	[0.21]
Firm Controls	Yes
Observations	643,958
Test of joint significance (p-val)	0.000***
Test of equality (p-val)	0.017**
<b>Panel B: Outcome date</b>	
Contest * Before Outcome Date	2.9097***
	[3.00]
Contest * After Outcome Date	0.8510
	[-0.24]
Firm Controls	Yes
Observations	643,958
Test of joint significance (p-val)	0.011**
Test of equality (p-val)	0.117

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Table 8: **Determinants of out-of-the-money (OTM) exercise.** This table reports determinants of out-of-the-money exercise with three specifications at the firm-year level. All independent variables are defined in Section 3.6.1 and Table 1. In columns (1)–(3) the dependent variable is OTM — a dummy variable for the occurrence of out-of-the-money option exercises, and the columns report odds ratios from the logit model and the  $t$ -statistics associated with the original (unexponentiated) coefficients, which are indicative of whether the reported odds ratios are significantly different from unit. In columns (4)–(6), the dependent variable is #OTM — the number of occurrences of out-of-the-money option exercises for the firm-year, and the columns report estimated coefficients from the negative binomial model and the corresponding  $t$ -statistics. The coefficients represent the change in  $\ln(\#OTM)$  associated with a unit change in a covariate. All  $t$ -statistics in this table are calculated using heteroscedasticity robust standard errors and are clustered by firm. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

model	Logit	Logit	Logit	Negative Binomial	Negative Binomial	Negative Binomial
VARIABLES	OTM	OTM	OTM	# of OTMs	# of OTMs	# of OTMs
	(1)	(2)	(3)	(4)	(5)	(6)
Contest	2.6450*** [2.68]	2.7851*** [2.81]	3.4840** [2.09]	2.4859*** [3.79]	2.6612*** [3.88]	3.4032*** [4.65]
log(Market cap)		0.9578 [-0.85]	1.0156 [0.11]		0.0115 [0.15]	-0.0571 [-0.50]
Book-to-Market		1.0392 [0.35]	0.9554 [-0.26]		0.2788* [1.87]	-0.8589** [-2.40]
Growth		1.1264 [1.16]	0.2873* [-1.72]		0.0071 [0.06]	-2.4525*** [-3.27]
Stock return (Size decile adj)		1.0812 [0.07]	0.6396 [-0.19]		-1.8594 [-1.25]	1.7641 [0.42]
Idiosyncratic volatility		1.5380** [2.39]	3.3490** [2.11]		0.8263*** [2.79]	1.9022** [2.27]
Illiquidity		0.8475 [-1.30]	0.9140 [-0.11]		-0.0939 [-0.48]	0.0338 [0.03]
CEO total wealth			1.1267 [1.02]			0.1290 [1.11]
% CEO firm wealth			0.5298 [-1.18]			-1.5842*** [-2.74]
CEO Age			1.0004 [0.02]			0.0161 [0.83]
% Own Top 5			0.4153 [-0.40]			-0.9684 [-0.53]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	90,341	83,834	25,594	90,341	83,834	25,594
Pseudo $R^2$	0.88%	1.02%	3.52%	–	–	–
E(Y)	0.37%	0.38%	0.31%	0.0133	0.0133	0.0097

Table 9: **Out-of-the-money exercises: Conditional logit with CEO/firm fixed effects.** The dependent variable is OTM — a dummy variable for the occurrence of out-of-the-money option exercises in a firm-year. All independent variables are defined in Section 3.6.1. We use the conditional logit model with firm (columns (1) and (2)) or CEO (column (3)) fixed effects. The table reports odds ratios and the  $t$ -statistics associated with the original (unexponentiated) coefficients, which are indicative of whether the reported odds ratios are significantly different from unit. The  $t$ -statistics are calculated using heteroscedasticity robust standard errors and are clustered by firm. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	OTM (1)	OTM (2)	OTM (3)
Contest	4.4005*** [3.16]	4.5251*** [3.20]	5.4833* [1.72]
log(Market cap)		0.9474 [-0.42]	0.5502 [-1.40]
Book-to-Market		0.8794 [-0.87]	1.0635 [0.12]
Growth		1.1010 [0.71]	0.3611 [-1.25]
stock return (Size decile adj)		1.0330 [0.02]	5.5923 [0.37]
Idiosyncratic volatility		1.1638 [0.48]	8.2129* [1.86]
Illiquidity		0.8599 [-0.85]	0.3428 [-0.52]
CEO total wealth			1.4847 [1.25]
% CEO firm wealth			1.2281 [0.22]
CEO Age			1.0126 [0.20]
% Own Top 5			1.4285 [0.07]
Year dummies	Y	Y	Y
Firm/CEO fixed effects	Firm	Firm	CEO
Pseudo $R^2$	0.0276	0.0258	0.147
E(Y)	0.103	0.106	0.136
Observations	3,238	2,922	509

**Table 10: Stock valuation with delay in exercise-and-sell.** This table reports the values of stock options with an exercise price of \$30 and moneyness that is 50% of the market price using the Hall and Murphy (2002) method. The option value is estimated as the grant-date cash award that yields the same expected utility to the insider as receiving the option. The insider executive is assumed to have a constant relative risk aversion (CRR.A) utility with an initial wealth of \$5 million split between riskless cash and company stock. The stock price is log-normal and returns follow the Capital Asset Pricing Model (CAPM). We assume the stock pays no dividends,  $\beta = 1$ ,  $r_f = 6\%$ ,  $\sigma = 30\%$ ,  $r_m - r_f = 6.5\%$ . Panels A to C provides variations in time to maturity (4, 2, and 8 years). In each panel, the forced delay in exercise ranges from 25% to 100% of the time to maturity. “Discount” is the equivalent reduction in stock price under the unconstrained regime that equates the value of the option with the delay in exercise to that under the optimal exercise policy.

CRR.A coef. (1)	% of wealth in stock (2)	Optimal Exercise				Delay=25%		Delay=50%		Delay=75%		No early exercise Delay=100%	
		Insider Option Value (3)	Discount (4)	Insider Option Value (5)	Discount (6)	Insider Option Value (7)	Discount (8)	Insider Option Value (9)	Discount (10)	Insider Option Value (11)	Discount (12)		
Panel A: time to maturity 4 years, moneyness 50%													
2	0.5	32.77	0.00%	32.72	0.15%	32.39	1.18%	31.74	3.15%	30.82	5.95%		
2	0.5	32.77	0.00%	32.72	0.08%	32.39	0.68%	31.74	1.84%	30.82	3.51%		
2	0.67	30.54	0.00%	30.04	0.89%	28.95	2.84%	27.53	5.40%	25.89	8.40%		
3	0.5	30.37	0.00%	29.59	1.35%	28.12	3.97%	26.27	7.30%	24.14	11.17%		
3	0.67	30.00	0.00%	27.11	4.81%	24.24	9.58%	21.33	14.44%	18.37	19.64%		
Panel B: time to maturity 2 years, moneyness 50%													
2	0.5	30.96	0.00%	30.94	0.03%	30.80	0.28%	30.54	0.72%	30.18	1.34%		
2	0.67	30.00	0.00%	29.52	0.80%	28.84	1.94%	28.06	3.27%	27.20	4.74%		
3	0.5	30.00	0.00%	29.20	1.31%	28.26	2.90%	27.18	4.69%	26.01	6.64%		
3	0.67	30.00	0.00%	27.90	3.49%	25.94	6.76%	24.01	9.97%	22.09	13.18%		
Panel C: time to maturity 8 years, moneyness 50%													
2	0.5	36.61	0.00%	36.51	0.29%	35.73	2.40%	34.17	6.68%	31.91	12.84%		
2	0.67	32.60	0.00%	32.00	1.84%	30.18	7.43%	27.60	15.35%	24.51	24.81%		
3	0.5	32.38	0.00%	31.55	2.55%	29.25	9.66%	26.07	19.48%	22.32	31.05%		
3	0.67	30.20	0.00%	27.43	9.16%	23.49	22.21%	19.25	36.27%	14.93	50.55%		

Table 11: **Out-of-the-money (OTM) exercise and private control premium.** This table reports determinants of the out-of-the-money exercise premium at the firm-year level. All independent variables are defined in Section 3.6.1 and Table 1. The dependent variable is *Premium* — the negative of the out-of-the-money exercise premium, that is,  $(\text{Strike price} - \text{Daily high price})/\text{Daily high price}$ , averaged (using value weights) over all out-of-the-money exercises in the firm-year. If there is no such incidence, Premium is recorded as zero. The table reports estimated coefficients from the tobit model and the corresponding *t*-statistics. All *t*-statistics in this table are calculated using heteroscedasticity robust standard errors and are clustered by firm. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Contest	0.2399** [2.32]	0.2291** [2.33]	0.2624* [1.84]
log(Market cap)		0.0150 [1.46]	0.0088 [0.43]
Book-to-Market		-0.0114 [-0.47]	-0.0193 [-0.52]
Growth		0.0224 [0.93]	-0.0999 [-1.49]
stock return (Size decile adj)		-0.0326 [-0.14]	0.2609 [0.62]
Idiosyncratic volatility		0.1863*** [4.16]	0.2284* [1.69]
Illiquidity		-0.0709** [-2.36]	-0.1474 [-0.78]
CEO total wealth			0.0139 [0.80]
% CEO firm wealth			-0.0329 [-0.42]
CEO Age			-0.0017 [-0.60]
% Own Top 5			-0.3019 [-0.97]
Year dummies	Yes	Yes	Yes
Observations	90,341	83,834	25,594
Pseudo $R^2$	0.52%	1.02%	2.20%
E(Y)	0.15%	0.15%	0.13%