The Role of Deferred Equity Pay in Retaining Managerial Talent*

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ABSTRACT

We examine the extent to which deferred vesting of stock and option grants (deferred pay) helps firms retain executives. To the extent an executive forfeits all deferred pay if they leave the firm, deferred vesting will increase the cost (to the executive) of an early exit. The impact of deferred pay on executive retention, a key ingredient for firms to create shareholder value is hence an important empirical issue. Using pay duration proposed in Gopalan et al. (2014) as a measure of the extent of deferred equity, we find that CEOs and non-CEO executives with longer pay duration are less likely to leave the firm voluntarily. The talent retention role of deferred pay is mitigated by performance-vesting provisions and signing bonuses offered by industry peers. Moreover, we also find that voluntary turnover is less sensitive to pay duration for executives who are perceived to be more talented and have more firm-specific skills. Overall, our study highlights a strong link between compensation design and turnover of top executives. It suggests that firms take into account the need for retaining managerial talent in designing executive compensation.

Keywords: executive compensation, pay duration, talent retention, management turnover, turnover-performance sensitivity

Rôle de la rénumération en actions différée pour le maintien en poste des talents

RÉSUMÉ

Nous vérifions dans quelle mesure l'octroi différé d'actions et d'options sur actions (rémunération différée) aide les entreprises à garder en poste leurs dirigeants. Dans la mesure où un dirigeant renonce à la totalité de sa rémunération différée s'il quitte l'entreprise qui l'emploie, ce type de rémunération fait augmenter les coûts (pour le dirigeant) associés à un départ précoce. L'impact de

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la rémunération différée sur le maintien en poste des dirigeants, lequel est un ingrédient clé permettant aux entreprises de créer de la valeur pour leurs actionnaires, constitue donc un important enjeu empirique. Utilisant le concept d'horizon de la rémunération proposé par Gopalan et coll. (2014) pour mesurer l'importance de la rémunération en actions différée, nous montrons que les PDG et les autres dirigeants ayant un horizon de rémunération prolongé sont moins susceptibles de quitter l'entreprise de leur propre gré. Le rôle de la rénumération différée en ce qui a trait au maintien en poste des talents est atténué par les clauses de primes de rendement et les primes à la signature offertes par les pairs du secteur d'activités. En outre, nous établissons que le roulement volontaire est en moins grande partie motivé par l'horizon de la rémunération dans le cas des dirigeants perçus comme plus talentueux et possédant un grand nombre de compétences pertinentes pour leur entreprise. Dans l'ensemble, notre étude met en lumière un lien solide entre la structure de la rémunération et le roulement des hauts dirigeants. Elle donne à penser que les entreprises prennent en compte le maintien en poste des talents lorsqu'elles conçoivent la rémunération des dirigeants.

Mots-clés : rémunération des dirigeants, horizon de la rémunération, maintien en poste des talents, roulement du personnel de direction, sensibilité du rendement au roulement

1. Introduction

Retaining and motivating talented executives is a key ingredient for firms to create shareholder value. In practice, firms use a number of implicit and explicit contractual features to retain talented executives; chief among the explicit (and legal!) contractual features is deferred equity pay. To the extent that an executive forfeits all deferred equity pay if they leave the firm, deferred pay will increase the executive's early exit costs. On the other hand, despite the prevalence of deferred equity pay in executive compensation, talent poaching and voluntary turnover do occur. Thus, the extent to which deferred equity pay helps firms retain executives is ultimately an important empirical question. Furthermore, contractual features (e.g., signing bonuses and performance-vesting provisions) and executive characteristics (e.g., perceived talent and firm-specific skills) may moderate the role of deferred pay in talent retention. We explore these issues in this paper.

Despite their importance, these questions have received limited research attention. This is mainly because of the lack of comprehensive data on the extent of deferred equity pay. In this paper, we use information on the vesting provisions of stock and option grants for a sample of S&P 1500 firms to study the role of deferred stock and option grants (hereafter, "deferred pay") on executive turnover. We focus on the top five highest-paid executives of the firm, both because of availability of detailed data on deferred pay and also because the highest-paid executives are likely to be among the most valuable employees of the firm and their retention should be of utmost importance to the firm.

A typical compensation package for a top executive includes both the cash (salary and bonus) and the stock component (restricted stock and stock options). Firms typically defer the stock component of pay. Every stock and option grant is associated with a vesting schedule and the manager is not allowed to exercise, sell, or hedge the grant until it vests. A manager who voluntarily or involuntarily leaves the firm typically forfeits all the unvested grants.[1] The retention incentives provided by a stock or option grant depends on both the *size* of the grant and the *length* of the remaining vesting schedule. All else equal, a larger grant and one with a longer vesting schedule will provide greater retention incentives. To capture these twin effects, we employ the measure of executive pay duration (*Duration*), introduced by Gopalan et al. (2014), to quantify the extent of long-term retention incentives provided by an incentive contract. *Duration* is the weighted average of the vesting periods of all four components of pay (salary, bonus, restricted stock, and stock options), with each component's weight being the fraction of that component in

1. Dahiya and Yermack (2008) find that, among S&P 500 firms, the forfeiture, vesting, and expiration provisions on company stock option plans are more stringent for managers in companies that are fast growing, more dependent on skilled human capital, and facing more competition in the product market.

the executive's total compensation. Note that unvested stock and option grants from prior years are included to capture all deferred pay that an executive receives at a point in time.

The above discussion provides our first hypothesis that managers with longer pay *Duration* are less likely to leave the firm voluntarily. Consistent with our hypothesis, we find that senior executives with longer pay *Duration* are less likely to experience voluntary turnover. This is true both for CEOs and for other senior executives. The effects that we document are economically very large. We find that a one standard deviation increase in *Duration* (an increase of 0.85 years) is associated with a decrease in the probability of voluntary CEO turnover by 1.19 percentage points, a 62.96% decrease from the unconditional mean annual probability of voluntary CEO turnover of 1.89% in our sample. While the effect for other senior executives is slightly smaller, it remains substantial in absolute magnitude.[2]

In further analysis, we decompose pay *Duration* into two components—*Vesting time* (length of the remaining vesting schedule) and *Grant size* (size of the unvested grant)—and find that both are negatively related to the probability of voluntary managerial turnover. We also find a concave relationship between *Duration* and the probability of voluntary turnover. That is, the incremental retention role of *Duration* becomes weaker for longer duration pay.

A negative correlation between pay *Duration* and voluntary executive turnover may not imply a causal effect of deferred pay on turnover as both pay and turnover are endogenously determined. To overcome this endogeneity issue, we conduct three tests as follows. First, we identify years in which large prior-year equity grants, awarded more than two years prior, vest (*Large vesting*). We use these vesting episodes as instances that shock pay duration and estimate their effect on executive turnover. To the extent that these grants were awarded in the distant past, their vesting is unlikely to be correlated with (time-varying) firm- and executive-level omitted variables. We find that voluntary turnover significantly increases following *Large vesting* episodes.

Second, we employ an instrumental variables (IV) approach and instrument for *Duration* by exploiting the difference between two types of multi-year option grant plans in executive compensation packages: fixed-number versus fixed-value. While the value of the grant and consequently *Duration* is likely to increase with firm stock returns for a fixed-number plan, this is not likely for a fixed-value plan. We thus instrument pay *Duration* with an interaction term between a dummy variable that identifies fixed-number plans and industry returns, which we use as an exogenous proxy for firm stock returns.[3] A similar identification strategy is adopted by Shue and Townsend (2017). Our results from this IV approach are consistent with our OLS estimates.

In further robustness tests, we use the recognition (or rejection) of the inevitable disclosure doctrine (IDD) by US state courts as a shock to other means of employee retention and explore its interaction with pay *Duration*. The IDD empowers state courts to prevent employees from working for the firm's competitor.[4] To the extent this reduces employees' outside options, it is likely to reduce their incentives to jump ship. We therefore expect *Duration* to play a weaker role in retention in firms located in states that have adopted IDD. We find evidence in support of this expectation.

We perform a number of cross-sectional tests to identify the contractual, firm, and executive characteristics that are likely to moderate the retention role of pay *Duration*. We first investigate how other compensation contractual features, such as signing bonuses and performance-vesting provisions in equity grants, affect the effectiveness of pay duration in talent retention. We expect signing bonuses to reduce the cost of voluntary turnover, consistent with Fee and Hadlock (2003)

2. Specifically, a one standard deviation increase in *Duration* (an increase of 0.78 years) is associated with a reduction of 0.55 percentage points in the probability of a non-CEO executive jumping ship. This amounts to a 45.1% decrease from the unconditional mean of 1.22% in our sample.
3. To account for the possibility that industry returns can affect executive turnover, executives on fixed-value plans are included as a control group.
4. The recognition of the IDD in a state is thus shown to have significantly reduced the mobility of executives who have access to a firm's trade secrets (Klasa et al. 2018).

who show that hiring grants are correlated with the equity position forfeited at the prior employer, and performance-vesting provisions to introduce uncertainty about the vesting of long-term pay. To this extent, we expect both features, if present, to moderate the retention role of pay *Duration*. We obtain consistent evidence. Specifically, the turnover-duration sensitivity is significantly weaker for executives in industries that tend to pay a higher signing bonus and for executives with a greater share of performance-vesting equity grants in their total pay.

We next study the moderating role of firm and executive characteristics on the turnover-duration sensitivity. We focus on two factors that have been shown to be related to voluntary turnover—managerial ability and firm-specific knowledge. We expect executives' outside options to increase in attractiveness with their perceived ability. Indeed, Fee and Hadlock (2003) find that superior stock performance of a firm increases the likelihood of its executives' jumping ship. On the other hand, jumping ship is likely to be less attractive for executives with more firm-specific knowledge. Consistent with firm-specific knowledge being valued less outside the firm, Fee et al. (2018) show that CEOs who are more closely attached to their old employers fare significantly worse in the outside labor market. Thus, we expect *Duration* to play a weaker retention role for executives perceived to be more talented and for those with more firm-specific knowledge. We find supportive evidence for both expectations. To summarize, the above findings help us identify the contractual, firm, and executive characteristics that moderate the retention role of pay *Duration*. These also help us understand the prevalence of voluntary turnover along with long-vesting pay contracts in our sample.

In our last set of tests, we extend our analysis and examine a number of testable implications of our talent-retention hypothesis on involuntary executive turnover. To the extent longer pay *Duration* captures a firm's intention to retain the executive because of the importance of the executive talent to the firm, we expect pay *Duration* and the likelihood of forced executive turnover to be negatively related. Moreover, the board may be reluctant to fire CEOs with longer pay *Duration* either because of their perceived ability or because of the need for long-term commitment for the firm; that is, the executives may not be immediately fired for poor stock performance. This may result in a low sensitivity of forced CEO turnover to firm performance, an important puzzle in the empirical corporate governance literature.[5] Our results support both conjectures.

Our paper makes a number of contributions to the empirical compensation literature. We are the first to use detailed information on vesting schedules of equity pay to estimate the effect of deferred pay on executive turnover. Prior research relates the *level* of stock-based pay or total pay to managerial and rank-and-file employee voluntary turnover (e.g., Aldatmaz et al. 2017; Balsam and Miharjo 2007; Fee and Hadlock 2003; Hasenhuttl and Harrison 2002; Mehran and Yermack 1997; Oyer and Schaefer 2005, 2006).[6] In comparison, our duration measure accounts for both the *level* and the *vesting period* of stock-based pay and thus better captures the cost that managers incur when they leave the firm.[7] Erkens (2011) finds that R&D-intensive firms offer

5. Taylor (2010, 2062) predicts that the turnover-performance sensitivity should be weaker if the board has access to a more precise signal of CEO ability than the stock price. Boards with such precise signals of CEO talent may use that information to design the compensation contract. Specifically, they may offer a longer-duration pay contract to retain the CEO. If so, this would suggest a lower forced CEO turnover-performance sensitivity among firms that offer a longer-duration pay contract to their CEOs.

6. Cadman et al. (2013) find that firms with better operating performance grant options with longer vesting periods, which they interpret as intended to retain well-performing CEOs. Carter and Lynch (2004) examine the impact of option repricing and find it to be negatively correlated with overall employee turnover but not with executive turnover.

7. To illustrate, we present two examples, in which two executives have the same grant size of equity pay and the total pay, but contrastingly different pay *Duration*. First, on October 4, 2018, Electronics For Imaging Inc. (EFI) announced William D. Muir, Jr. as the new CEO, who was then COO of Jabil Inc. Mr. Muir's compensation in Jabil prior to the jump was $11.8 million with $11.1 million in stock and options, but his pay duration was only 0.18. Second, in contrast, Michael C. Lukemire (COO of Scotts Miracle-Gro Co.) had exactly the same size of both total and equity pay as Mr. Muir in the same year. However, Mr. Lukemire's pay duration was 1.68 and he did not leave the firm at that point in time. Hence, these examples illustrate the importance of considering both the level and the vesting time of pay.

executive option grants with longer vesting periods, and those executives with larger unvested equity holdings are less likely to jump ship. In comparison, we focus on vesting schedules of both options and equity shares and study a broader and a more representative set of industries.

Second, our contribution is also methodological as we exploit various identification strategies to establish the causal effect of deferred pay on executive voluntary turnover. Our detailed vesting data allow us to design sharper tests to strengthen our inferences. Third, we also contribute to the literature by examining the extent to which other compensation contractual features and firm- and executive-level factors moderate the retention role of deferred pay. Fourth, unlike prior studies, in addition to voluntary turnover, we also examine the implication of deferred equity pay on forced managerial turnover and the turnover-performance sensitivity.[8] Lastly, our paper contributes to the burgeoning literature that studies the impact of employees' voluntary turnover risk on a firm's compensation policy (e.g., Bereskin and Cicero 2013; Gao et al. 2015; Qiu and Wang 2017).[9]

In a related study, Jochem et al. (2018) document an increase in executive turnover following acceleration of stock option vesting in a sample of 723 firms in response to the regulatory change, FAS 123-R. The authors use this evidence to argue that equity pay serves a retention role. While the conclusion of their paper is similar to ours, there are some very important differences between the two papers. First, while their local average treatment effect estimates are relevant for the 723 firms they study, given the unique nature of these firms, the generalizability of the findings is not obvious. While hundreds of firms voluntarily expensed options at fair value before FAS 123-R was proposed, some firms changed their fiscal year between 2004 and 2006, probably to delay compliance with FAS 123-R and thus circumvent the impact of the regulatory change. More critically, consistent with acceleration being endogenously determined, Choudhary et al. (2009, 125) show that firms that chose to accelerate the vesting of options to avoid recording a stock option expense under FAS 123-R are systematically different from other firms in almost every firm characteristic (panel A of their table 3). In comparison, our sample is very representative of the universe of large US public firms. Second and probably more importantly, in theory, it is pay duration, but not lumpy vesting (the change of it), that affects executive turnover; lumpy vesting is likely to impact executive turnover only through its effect on pay duration. The impact of lumpy vesting on turnover depends on whether—and the extent to which—firms replenish a large equity grant to executives that will vest soon. Therefore, our study tests a more general effect of incentive length on executive turnover.

2. Data and variables

Data and sample

Data on the grants of restricted stock and stock options to executives are from Equilar Consultants (hereafter, Equilar) for the years 2006–2012 and ISS Incentive Lab (hereafter, Incentive Lab) for the years 2013–2018.[10] Like S&P (provider of ExecuComp), Equilar and Incentive Lab collect and process executive compensation data from firms' proxy statements. For each grant, we obtain its grant date, vesting schedule, and present value, and also identify whether and how its size or vesting schedule is contingent on certain performance measures of the firm. Data on other components of executive compensation, including salary, bonus, and accumulated pension

8. Prior literature shows that, in contrast to what economic theories predict, the sensitivity of forced CEO turnover to firm performance is rather modest (e.g., Coughlan and Schmidt 1985; Denis et al. 1997; Huson et al. 2001; Warner et al. 1988; Weisbach 1988). We find that pay *Duration* has an important moderating role on the turnover-performance relationship. This suggests that the additional signals of CEO ability and/or the switching cost reflected in the board's determination of a CEO's pay *Duration* may go towards explaining the weak turnover-performance relationship.
9. In a study with a focus on forced turnover risk from the perspective of employees, Peters and Wagner (2014) examine CEOs' dismissal risk under volatile industry conditions and find a dismissal risk premium in CEO compensation.
10. We use Incentive Lab for later years because our access to Equilar data ends in 2012.

benefits and supplementary executive retirement plan (if any), are from ExecuComp. We use firm tickers and executive names to manually match Equilar/Incentive Lab with ExecuComp. To ensure the consistency of data from various data sets, we cross-check the total number of options granted to each executive in our sample during the year and ensure they are the same across Equilar/Incentive Lab and ExecuComp.

We identify executive turnovers from ExecuComp and classify the turnover as voluntary or involuntary using information from BoardEx, news reports, and other public sources. We obtain data on the composition of the Board of Directors from RiskMetrics and, whenever needed, supplement it with data from BoardEx. Our data on block holders are from the Thomson Reuters Institutional Holdings (13f) database. Stock returns and firm accounting data are from CRSP and Compustat, respectively.

Our final sample consists of the executives covered by Equilar, Incentive Lab, and ExecuComp for the time period 2006–2018. This results in 19,103 firm-years involving 2,434 firms, 5,825 CEOs, and 20,081 other senior executives.

Key variables

Pay Duration

We follow Gopalan et al. (2014) to construct our measure of pay duration (*Duration*). Specifically, it is the weighted average of the lengths of the vesting periods of the four pay components—salary, bonus, restricted stocks, and stock options; the weight for each component is the fraction of that component in the executive's total dollar value of compensation. If the stocks and options are granted with a cliff vesting schedule, we calculate pay duration as follows:

$$Duration = \frac{(Salary + Bonus) \times 0 + \sum_{si=1}^{S} Stock_{si} \times t_{si} + \sum_{oi=1}^{O} Option_{oi} \times t_{oi}}{Salary + Bonus + \sum_{si=1}^{S} Stock_{si} + \sum_{oi=1}^{O} Option_{oi}},$$

where *Salary* and *Bonus* are the dollar values of salary and bonus as of the year end. Since salary and bonus are paid out in full by the end of the year, they have a vesting period of zero in the above formula. Hence, the magnitude of the calculated pay duration depends on the vesting periods of stock options and restricted stocks, and their relative weights in the total compensation. $Stock_{si}$ and $Option_{oi}$ are the dollar value of restricted stock grant *si* and stock option grant *oi*, which have a final vesting period of t_{si} and t_{oi} years, respectively. We estimate the value of a restricted stock grant as the product of the stock price on the grant date (or the end of the year) and the number of stocks granted. The value of a stock option grant is estimated using the Black-Scholes option pricing model. Note that all unvested stock and option grants from prior years are included. Thus, *S* is the sum of the number of stock grants during the year and the number of unvested stock grants from prior years, and *O* is the sum of the number of option grants during the year and the number of unvested option grants from prior years.[11] Under the graded vesting

11. By definition, all vested stocks and stock options awarded in prior years are assigned a vesting period of 0. For all unvested grants that were awarded prior to 2006, we estimate their vesting schedule using the detailed information provided in ExecuComp on the total outstanding unvested stocks and stock options as of each year end. The procedure of estimating the vesting schedule of unvested pre-2006 grants is described as follows. For stock options, we first isolate the unvested pre-2006 grants by subtracting the unvested post-2006 grants (aggregated from Equilar/Incentive Lab) from the total outstanding unvested grants obtained from ExecuComp. To do so, we merge Equilar/Incentive Lab and ExecuComp using both exercise price and expiration date of the grants in addition to executive identity and year. Then, assuming the unvested pre-2006 grants vest at the end of 2011, we back out their vesting schedule from the year-on-year change in them. For restricted stocks, we do not need such an assumption since there is no expiration date or exercise price for restricted stocks. We follow the same procedure in the estimation of restricted stocks' vesting schedule except that we merge Equilar/Incentive Lab and ExecuComp using executive identity and year only.

schedule where the stock and option grants vest equally over the vesting periods, we replace t_{si} (t_{oi}) with $\frac{t_{si}+1}{2}$ $\left(\frac{t_{oi}+1}{2}\right)$. Note that in the case of grants that are contingent on performance, we use the performance measurement period as the vesting period.[12]

As indicated earlier, while other types of deferred pay such as pension benefits, long-term bonus plans, and other deferred compensation may be important in talent retention because of their long-term incentive provision, we focus on deferred equity pay because the vesting schedules of those other benefits are not available to us. Furthermore, to the extent we exclude a significant portion of incentives, our duration measure is likely to be a less precise measure of long-term pay. Notwithstanding this possibility, our subsequent empirical analysis shows that *Duration* is strongly associated with the likelihood of voluntary turnover.

Management turnover

In this section, we describe the methodology employed to identify turnover of a named executive of the firm. We start by identifying changes in executive designations as documented in ExecuComp.[13] We then search Factiva, LexisNexis, and BoardEx for news reports coincidental with the change in designation to identify the causes for the change. From our list of potential turnovers, we drop instances that are due to misclassification in ExecuComp, takeovers or spinoffs, interim positions, sudden death of the manager, and mandatory or planned retirement. Our final sample includes 2,083 management turnovers, of which 585 involve a CEO.

For turnovers involving a CEO, we start by using the criteria in Parrino (1997) to classify the turnover as voluntary or involuntary. First, if a CEO is reported to be fired or forced out, or departs due to disagreement with the board, the turnover is classified as forced. For the rest of turnovers where the departing CEOs are under age 60, they are classified as forced if either (i) the departure is not due to death, health issues, or joining other firms or accepting another position within the firm (e.g., chair of the board),[14] or (ii) the departure is reported as a retirement but without disclosure of the retirement plan at least two months prior. We then complement these criteria with two of our own.[15] We reclassify a forced turnover (identified using the steps described above) as voluntary if either (i) according to BoardEx and Marquis Who's Who publications, the CEO obtained a comparable position elsewhere upon turnover or shortly afterwards (within a month), or (ii) there are convincing reports suggesting that some personal or business reasons, previously undisclosed but not relevant to the firm's activities, lead to the departure. All CEO turnovers not classified as forced, or age-related mandatory or planned retirements, are classified as voluntary.[16]

For turnovers involving other senior executives, there are fewer detailed press reports about the circumstances involving their departure. Hence, it is difficult to employ the same criteria as

12. Cadman and Sunder (2014) develop a similar measure of pay duration without taking into account grants made in prior years, which they refer to as *Compensation Duration*. The main difference is that *Compensation Duration* also includes other annual cash components of the annual compensation (othann in ExecuComp) in the denominator in addition to salary, bonus, and values of stock and option grants. The inclusion of othann does not affect the numerator because its duration is also assumed to be zero as is the case for cash and bonuses.
13. The earlier literature identifies the samples of CEO turnovers using Forbes annual compensation surveys (e.g., Borokhovich et al. 1996; Huson et al. 2004; Huson et al. 2001; Parrino 1997). More recent studies (e.g., Jenter and Kanaan 2015) use the changes in the CEO position in ExecuComp to classify CEO turnovers.
14. In case of health being a reported reason for the departure, we track backward the press reports about the CEO's health status, and ensure that the departure is indeed due to the health problem. Otherwise, we still treat the departure as being forced.
15. A clear identification of the nature of CEO turnover is notoriously difficult. See Fee et al. (2017) for evidence and related discussions.
16. Therefore, if firms grant shorter-duration pay to retiring executives in anticipation of their impending mandatory retirement, it is unlikely to affect our estimates. Among CEOs who depart voluntarily in our sample, 71 join other firms as CEOs. Given the small number of them, we do not conduct a separate analysis of them from the overall group of voluntary turnovers.

those for CEOs to distinguish between forced and voluntary turnovers. We thus employ an alternative classification. We first try to identify if a departing executive takes a position in a new firm. Specifically, we classify an executive turnover as a voluntary "jump-ship" (employing the terminology in Fee and Hadlock 2003) if either (i) the press reports that the executive is leaving to join another firm, or (ii) the employment record of the executive as obtained from BoardEx and Marquis Who's Who publications indicates that the executive took a position in a new firm within three months of departure from the old firm, and there is no convincing evidence in the press that the executive was ousted by the old firm. All other senior executive turnovers except those involving mandatory retirements are classified as involuntary.

Summary statistics

Table 1 presents summary statistics of the key variables we use in our analysis. All continuous variables are winsorized at the 1% and 99% levels to mitigate the potential impact of outliers. Detailed definitions of these variables (except pay duration and management turnover that are discussed earlier) are provided in the Appendix. Panel A summarizes the data for CEOs, while panel B summarizes the data for non-CEOs. From panel A, we find that the average *Duration* for CEOs in our sample is 0.89 years. The median CEO is 55 years old, has spent 6 years in the current position, and holds about 0.4% of the firm's equity. We also find that about 45% of the CEOs in our sample are also the chair of their board as seen from the mean value of *Duality*.

TABLE 1
Summary statistics

Panel A: CEOs

	N	Mean	SD	P25	Median	P75
Duration	19,103	0.889	0.846	0.127	0.635	1.533
Age	19,103	55.344	7.541	50	55	60
Tenure	19,103	8.788	8.827	2.679	6	11.953
Stock holding	19,103	0.017	0.032	0.001	0.004	0.015
Duality	19,103	0.447	0.497	0	0	1

Panel B: Other non-CEO executives

	N	Mean	SD	P25	Median	P75
Duration	62,330	0.927	0.782	0.246	0.791	1.490
Age	62,330	52.194	7.038	47	52	57
Tenure	62,330	10.596	10.193	3	8	15
Stock holding	62,330	0.003	0.011	0	0.001	0.002

Panel C: Firm characteristics

	N	Mean	SD	P25	Median	P75
Stock return	19,103	0.120	0.419	−0.121	0.090	0.310
Volatility	19,103	0.100	0.057	0.060	0.096	0.123
Firm size	19,103	7.911	1.751	6.654	7.816	9.032
Blockholder	19,103	0.342	0.474	0.000	0.000	0.000

Notes: This table presents the descriptive statistics of our sample. Panels A and B present characteristics of CEOs and other non-CEO executives, respectively. Panel C presents firm characteristics. *Duration* is the measure of executive pay duration discussed in section 2. All other variables are defined in the Appendix.

From panel B of Table 1, we find that the mean value of *Duration* for non-CEOs in our sample is 0.93 years. The non-CEOs have an average age of 52 years, have spent over 10 years in the firm, and hold about 0.3% of the firm's equity. Note that while *Tenure* for CEOs indicates the number of years the executive has been the CEO, for non-CEOs, *Tenure* refers to the number of years the executive has been with the firm.

In panel C of Table 1, we present the summary statistics of the characteristics of the firms in our sample. We use annual stock return (*Stock return*) as our main measure of firm performance.[17] We find that, on average, firms in our sample have an annual return of 12%. The average *Volatility* of the firms in our sample is 10%. The firms in our sample are on average large, as seen from a mean value of 7.91 for *Firm size*. In comparison, the average value for all firms in Compustat during the same sample period is 5.69.

In panel A of Table 2, we classify the CEO-years in our sample into firm-years before a voluntary CEO turnover ("turnover years"), non-turnover years both in the full sample (columns (3)–(5)), and in the turnover sample (columns (6)–(8))—that is, among firms that experience a voluntary CEO turnover. We then provide the average CEO and firm characteristics across the different subsamples. We have 360 voluntary CEO turnover events during our sample period. The average value of *Duration* of CEOs in the year before they voluntarily leave the firm is 0.52, significantly below the average value of *Duration* for CEOs during non-turnover years both in the full sample (0.90) and in the turnover sample (0.95). We also find that firm-years with a voluntary CEO turnover have lower stock returns as compared to the non-turnover years in both the full sample and the turnover sample. CEOs who voluntarily leave their firm are less likely to be the chair of their board.

In panel B of Table 2, we classify the non-CEO executive years in our sample into those before a non-CEO executive jumps ship ("turnover years") and all other executive-years in the full sample (columns (3)–(5)) and the subsample of firms that experience a non-CEO executive voluntary turnover (columns (6)–(8)) and present the average executive and firm characteristics.[18] We have 762 instances where a non-CEO executive leaves the firm for another firm. We find that the average value of *Duration* of non-CEO executives in the year before they "jump ship" is 0.72, which is significantly below the average value for non-CEO executives both in the full sample, 0.93, and among the turnover sample, 1.00. Similar to the case for CEOs, firm-years with a voluntary non-CEO turnover have significantly lower stock returns relative to non-turnover years in the full and turnover samples. Also, non-CEO executives who voluntarily leave their firm, not surprisingly, have shorter tenures with their firm as compared with non-CEO executives in other firms. In our regressions that explore the effect of *Duration* on voluntary executive turnover, we include these variables as controls to ensure that they do not bias our conclusions.

To summarize, our univariate evidence indicates that executives (both CEOs and non-CEOs) with longer pay duration are less likely to voluntarily leave their firms.

3. Pay duration and voluntary turnover: Baseline analyses and robustness tests

In this section, we discuss the results of our multivariate tests that study the effect of pay duration on voluntary executive turnover. In particular, we employ multiple identification strategies to address the issue of endogeneity of pay duration. We also examine the extent to which grant size and vesting time independently affect the executive turnover.

17. In the regressions, we use industry-year fixed effects to account for the impact of industry on firm performance. Our main findings hold for alternative measures of firm performance, namely, two-year industry adjusted stock returns, industry adjusted returns using Fama-French 49 industry classification, and an industry-adjusted performance measure used by Jenter and Kanaan (2015). The latter is estimated as the annualized residual obtained from regressing the monthly return on the firm's stock on the return of the value-weighted index of all firms in the same industry.

18. We focus on the year before the executive jumps ship because executive pay information is usually not available in the proxy statements if the executive leaves in the middle of a year.

TABLE 2
Univariate evidence on pay duration and turnover

Panel A: Voluntary CEO turnover

	Turnover years		Non-turnover years (full sample)			Non-turnover years (turnover subsample)		
	(1) *N*	(2) Mean	(3) *N*	(4) Mean	(5) Diff (2)–(4)	(6) *N*	(7) Mean	(8) Diff (2)–(7)
Duration	360	0.516	18,743	0.896	−0.380***	2,924	0.945	−0.429***
Stock return	360	0.061	18,743	0.122	−0.061***	2,924	0.106	−0.045*
Age	360	54.914	18,743	55.352	−0.438	2,924	54.609	0.305
Tenure	360	7.416	18,743	8.814	−1.398***	2,924	7.111	0.305
Stock holding	360	0.008	18,743	0.017	−0.009***	2,924	0.013	−0.005***
Duality	360	0.292	18,743	0.450	−0.158***	2,924	0.349	−0.057**

Panel B: Voluntary non-CEO executive turnover

	Turnover years		Non-turnover years (full sample)			Non-turnover years (turnover subsample)		
	(1) *N*	(2) Mean	(3) *N*	(4) Mean	(5) Diff (2)–(4)	(6) *N*	(7) Mean	(8) Diff (2)–(7)
Duration	762	0.724	61,568	0.930	−0.206***	19,479	0.999	−0.275***
Stock return	762	0.079	61,568	0.122	−0.043***	19,479	0.121	−0.042***
Age	762	51.633	61,568	52.201	−0.568**	19,479	51.851	−0.218
Tenure	762	7.849	61,568	10.630	−2.781***	19,479	9.748	−1.899***
Stock holding	762	0.002	61,568	0.003	−0.001	19,479	0.002	0

Notes: This table presents the univariate relationship between pay duration and executive turnover. Panel A focuses on voluntary CEO turnover, while panel B focuses on voluntary non-CEO turnover. *Duration* is the measure of executive pay duration discussed in section 2. All other variables are defined in the Appendix. In each panel, the sample is further segmented into three groups: turnover years, non-turnover years (full sample), and non-turnover years (turnover subsample). The turnover-years group consists of firm-years (or executive-years) before a CEO (non-CEO executive) turnover. The non-turnover-years (full sample) group consists of all other firm-years (executive-years) in the sample. The non-turnover-years (turnover subsample) group consists of all other firm-years (executive-years) within firms that experience a CEO (non-CEO executive) turnover during the sample period. *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively.

Baseline analysis and robustness checks

In Table 3, we examine the effect of pay *Duration* on the likelihood of voluntary turnover. Following prior literature (e.g., Hazarika et al. 2012; Jenter and Kanaan 2015), we employ both the Cox proportional hazard model (Cox 1972) and the linear probability model to conduct our test.[19] The hazard model accounts for both the occurrence and timing of turnover and allows for the inclusion of time-varying covariates. The dependent variable is a dummy variable that identifies years when the firm experiences a voluntary executive turnover. Our key independent variable is *Duration*, which is predicted to have a negative coefficient. The standard errors we estimate are robust to heteroskedasticity and clustered at the 3-digit SIC code level.[20]

19. We repeat all analyses using a logit model and find that the results, not reported for brevity, are robust.
20. The main results are robust if we cluster the standard errors at the firm level.

TABLE 3
Pay duration and voluntary managerial turnover

Panel A: Voluntary CEO turnover

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Cox			OLS		
Duration	−0.710***	−0.775***	−0.825***	−0.010***	−0.012***	−0.013***	−0.014***
	(0.098)	(0.103)	(0.116)	(0.001)	(0.002)	(0.002)	(0.002)
Stock return			−0.268**			−0.007**	−0.007**
			(0.132)			(0.003)	(0.003)
Volatility			0.749			0.028	0.030
			(1.176)			(0.028)	(0.032)
Firm size			−0.088			−0.002*	−0.004
			(0.055)			(0.001)	(0.003)
Blockholder			−0.172*			−0.003	−0.001
			(0.101)			(0.002)	(0.003)
Ln(Tenure)			0.007			−0.001	0.007***
			(0.069)			(0.002)	(0.002)
Age			0.006			0.000	−0.000
			(0.007)			(0.000)	(0.000)
Stock holding			−23.965***			−0.224***	−0.272***
			(5.070)			(0.032)	(0.055)
Duality			−0.222*			−0.004**	−0.001
			(0.122)			(0.002)	(0.004)
Constant				0.028***	0.029***	0.045***	0.056*
				(0.002)	(0.001)	(0.011)	(0.029)
Observations	19,103	19,103	19,103	19,103	19,103	19,103	19,103
Adjusted R^2 or pseudo R^2	0.014	0.038	0.077	0.005	0.020	0.023	0.025
Fixed effects	Year	Industry×Year	Industry×Year	Year	Industry×Year	Industry×Year	Firm and Year

(The table is continued on the next page.)

TABLE 3 (continued)

Panel B: Voluntary non-CEO executive turnover

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Cox			OLS		
Duration	−0.387***	−0.424***	−0.556***	−0.004***	−0.005***	−0.006***	−0.007***
	(0.084)	(0.089)	(0.094)	(0.001)	(0.001)	(0.001)	(0.001)
Stock return			−0.332**			−0.004**	−0.003*
			(0.148)			(0.002)	(0.001)
Volatility			2.671**			0.038**	0.015
			(1.061)			(0.016)	(0.014)
Firm size			0.253***			0.003***	0.005**
			(0.030)			(0.000)	(0.002)
Blockholder			−0.112			−0.001	−0.003**
			(0.083)			(0.001)	(0.001)
Ln(Tenure)			−0.239***			−0.003***	−0.002***
			(0.037)			(0.000)	(0.001)
Age			−0.010*			−0.000*	−0.000
			(0.005)			(0.000)	(0.000)
Stock holding			−0.149			0.002	0.041
			(4.032)			(0.042)	(0.053)
CEO turnover			−1.014**			−0.008***	−0.004*
			(0.419)			(0.002)	(0.002)
External hire			1.270***			0.013***	0.013***
			(0.468)			(0.005)	(0.005)
Constant				0.016***	0.017***	0.002	−0.012
				(0.001)	(0.001)	(0.005)	(0.017)
Observations	62,330	62,330	62,330	62,330	62,330	62,330	62,330
Adjusted R^2 or pseudo R^2	0.004	0.010	0.031	0.001	0.004	0.006	0.010
Fixed effects	Year	Industry×Year	Industry×Year	Year	Industry×Year	Industry×Year	Firm and Year

Notes: Panel A (panel B) of this table presents coefficient estimates from the Cox proportional hazard model and linear probability model that relate the likelihood of voluntary CEO (non-CEO executive) turnover to pay duration. Time-to-turnover is right censored. *Duration* is the measure of executive pay duration discussed in section 2. All other variables are defined in the Appendix. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A of Table 3 presents the results for voluntary CEO turnover. In column (1), we estimate the model without any controls and with only year fixed effects and find that the coefficient on *Duration* is negative and significant. This is consistent with our univariate results. In column (2), we include within industry-year fixed effects to account for all time-series difference in the average turnover likelihood within industries and continue to find a negative and significant coefficient on *Duration*. In column (3), we include a set of firm and CEO characteristics as controls. The specific firm characteristics we include are: *Stock return*, *Firm size*, *Volatility* and *Blockholder*. The last variable is a dummy variable that identifies the presence (coded one) of a block holder with more than 10% shareholding in the firm and zero otherwise. The set of CEO characteristics we include are: *Ln(Tenure)*, *Age*, *Stock holding*, and *Duality*. All variables we employ in our analysis are defined in Appendix. We find that the coefficient on *Duration* continues to be negative and significant and increases in economic magnitude as we add more controls. From the coefficients on the control variables, we find that CEOs in firms with lower stock returns (negative coefficient on *Stock return*) or no blockholder in their shareholder base (negative coefficient on *Blockholder*), those with less shareholding in the firm (negative coefficient on *Stock holding*), and those who are not the chair of their board (negative coefficient on *Duality*) are more likely to voluntarily leave the firm.

In columns (4)–(7) we repeat our estimates using a linear probability model with columns (4)–(6) using the same specification as in columns (1)–(3), respectively. We do this for two reasons. First, with the linear probability model, we can estimate the economic significance of our results more easily and intuitively. Second, it allows us to include firm fixed effects, as presented in column (7), so that the impact of all time-invariant firm characteristics is removed. In contrast, because of the incidental parameters problem (Neyman and Scott 1948), firm fixed effects cannot be included in the non-linear Cox hazard model. Our results from the most stringent specification in both columns (6) and (7) show that CEOs with longer duration pay are less likely to voluntarily leave their firm. Here again we find that the fixed effects and control variables we employ in our regression do not significantly affect the coefficient on *Duration*. This highlights that *Duration* has incremental information not correlated with our controls. The negative coefficient on *Duration* in column (6) implies that a one standard deviation increase in *Duration* (0.85) results in a decrease in the annual probability of a voluntary CEO turnover by 1.11 percentage points (0.85×-0.013). In comparison, the unconditional probability of a voluntary CEO turnover in any year in our sample is 1.89% (untabulated). We note that voluntary CEO turnover is a rare event as suggested by the low unconditional probability. That is, on average, there are just about 28 CEOs who jump ship in a given year. Hence, an increase in 0.85 years of their pay duration would result in fewer than 12 of them jumping ship (a 58.73% decrease), which is a relatively significant effect.

Panel B of Table 3 presents the results for voluntary turnover of non-CEO executives. Consistent with our results in panel A, we find that non-CEO executives with longer duration pay are less likely to voluntarily leave the firm, too. Our results are robust to the inclusion of control variables and fixed effects. Fee and Hadlock (2004) find that the probability of non-CEO executives' departure increases around CEO dismissals, especially when the replacement CEO is an external hire. Hence, apart from the usual set of controls, we also control for instances of CEO turnover during the previous two years (*CEO turnover*) and for instances when there is an external hire to replace the departing CEO during the previous two years (*External hire*). We do this to ensure that executive turnovers, which may result from a change in the top management of the firm, do not affect the coefficient on *Duration*. From the coefficients on the control variables (in column (3)) we find that non-CEO executives of larger firms (positive coefficient on *Firm size*), those from firms with poorer stock performance or more stock return volatility (negative coefficient on *Stock return* and positive coefficient on *Volatility*), those with shorter tenure (negative coefficient on *Ln(Tenure)*), and younger executives (negative coefficient on *Age*) are more likely to jump ship. Also, the likelihood of an executive jumping ship decreases following CEO turnover

(negative coefficient on *CEO turnover*), but increases if the replacement CEO is an external hire (positive coefficient on *External hire*).

The coefficient on *Duration* in column (6) implies that a one standard deviation increase in *Duration* (0.78) is associated with a decrease of 0.47 percentage points (0.78×-0.006) in the probability of an executive jumping ship. In comparison, the unconditional probability of an executive jumping ship in our sample is 1.22% (untabulated). Similar to the rarity of voluntary CEO turnover, on average, there are only about 59 non-CEO executives who jump ship in a given year during the sample period. Hence, an increase in 0.78 years of their pay duration would lead to just over 36 of them jumping ship (a 38.5% decrease), an effect that is relatively significant although milder than in the case of voluntary CEO turnover.

Executives may experience private shocks, either in terms of an attractive outside opportunity or to their preferences, which make an early departure more likely, even at the cost of losing unvested pay. We conjecture that such shocks become more likely with the passage of time. Thus, we hypothesize that the retention role of pay duration may become weaker as *Duration* becomes longer. This predicts a nonlinear relation between *Duration* and the likelihood of voluntary turnover.[21] We examine this by including in the baseline regressions an additional squared term of *Duration*. For the sake of brevity, we present the results in Table IA-1 in the online Appendix.[22] The estimated coefficients on *Duration* remain negative and significant for both CEOs and non-CEO executives. Consistent with the marginally declining impact of pay duration when pay duration gets longer, the estimated coefficients on the squared term of *Duration* are positive and significant.

We conduct additional robustness checks. First, we repeat our tests after controlling for other types of deferred pay, such as defined benefit pension plans, long-term bonus plans, and other deferred compensation. We also repeat our tests with an adjusted version of *Duration* by incorporating the other types of deferred pay with some assumptions about the vesting schedules of these benefits. In both tests, we confirm that our main findings continue to hold. In the interest of brevity, we leave the details of the two tests in the online Appendix, with the results tabulated in Table IA-2. Second, to ensure that the 2007–2009 financial crisis does not unduly influence our results, in Table IA-3 of the online Appendix, we show that our main findings continue to hold qualitatively even when we exclude those years. Third, Jenter and Lewellen (2020) suggest that some executive turnovers are performance-induced, but not necessarily voluntary as classified by the standard algorithms. To account for this, we reclassify voluntary turnovers in firms whose stock return during the year is below the sample median as involuntary and repeat our tests. The results, presented in Table IA-4 of the online Appendix, show a significant negative association between pay duration and the newly-defined voluntary turnover. Overall, the evidence is consistent with the robustness of the impact of pay duration on voluntary turnover.

Endogeneity of pay duration

In this subsection, we explore the causal link between pay duration and the likelihood of voluntary executive turnover. To do this, we examine the impact of lumpy vesting of prior-year equity grants on voluntary turnover. We also implement a two-stage IV regression with an IV for pay duration. We further take advantage of an exogenous cross-state variation in employee mobility induced by the recognition of the IDD by US state courts, and examine whether the relation between pay duration and the likelihood of voluntary executive turnover changes with the adoption of the IDD.

21. That is, the likelihood of voluntary turnover is lower for managers with longer pay *Duration*, but the marginal effect of *Duration* becomes smaller when it gets longer.
22. See supporting information as an addition to the online article.

Impact of lumping vesting of prior-year equity grants

Our first test identifies executive-years in which large prior-year stock or option grants vest (*Large vesting*) and examines the effect of lumpy vesting on executive voluntary turnover. To circumvent the endogeneity of stock or option grant vesting schedules, we focus on grants that were awarded more than two years ago. More specifically, for each executive, *Large vesting* takes a value of one during the years when equity grants that were awarded at least two years prior vest, and the total size of these grants to be vested is the largest during the executive's tenure within the sample period, and zero otherwise.[23] To the extent that these grants were awarded in the distant past, their vesting is unlikely to be correlated with time-varying firm- and executive-level omitted variables that may also affect executive voluntary turnover.

We first check and confirm that vesting of a large stock or option grant during a year reduces *Duration*. The coefficient on *Large vesting* is significantly negative in the regression of the change in *Duration* on *Large vesting* and other control variables (results tabulated in Table IA-5 of the online Appendix). This is consistent with firms not replenishing a large grant with an equivalent one.[24] Note that the main reason why firms may not replenish these grants is likely because of the cost involved.[25] Given the large size of these grants, firms may find it too expensive to replenish them with grants of a similar size. These grants may represent one-time abnormal grants possibly offered to the executive at the time that they joined the firm (see Ittner et al. 2003). We find that the grants associated with *Large vesting* are on average 55.8% (52.8%) (untabulated) larger than the average stock (option) grant.

We then estimate the effect of *Large vesting* on voluntary turnover. Given that pay duration has a similar effect on voluntary turnover for CEOs and non-CEO executives, and since we define *Large vesting* in a similar manner for both CEOs and non-CEOs, we pool CEOs and non-CEOs in this regression. Before we present the results of our multivariate regressions, we present some univariate evidence consistent with our hypothesis. In Figure 1, we plot the number and proportion of CEO and non-CEO voluntary turnover events around the year of large vesting. In this figure, the *X*-axis represents the months relative to the month with a large vesting of an equity grant. We find a sharp jump in both the number and proportion of CEO and non-CEO turnovers in the month immediately after large vesting. The number (proportion of the total number of executives as of the beginning of the year who depart) of turnover events increases from 38 (0.63%) in the month before large vesting to 139 (2.06%) in the month after large vesting. This provides very strong evidence consistent with a causal effect of deferred equity pay on voluntary executive turnover.

23. Take the following as an example. For Theodore M. Solso (CEO) of Cummins Inc., 2011 is identified as the year with *Large vesting*. In this year, a total of 108.13 thousand shares vested (25.38 thousand shares associated with 25.38 thousand shares of three-year cliff-vesting stock award in 2008; 82.75 thousand shares associated with 82.75 thousand shares of two-year cliff-vesting options awarded in 2009). During Solso's tenure over the sample period, there are no other years with a larger number of shares vested than 108.13 thousand shares. We note that in some cases, there are multiple years during an executive's tenure when the total size of the grants that were awarded two years prior and are to be vested in the year is the largest but also the same across these years. In such cases, these multiple years are identified as years with *Large vesting* for this executive. As a robustness check, we repeat our tests with *Large vesting* constructed to take a value of one during the years when the total size of the grants that were awarded two years prior and are to be vested is either the largest, or the second largest during the executive's tenure within the sample period, and zero otherwise. The results continue to hold.

24. Further to the example of Theodore M. Solso of Cummins Inc. in the preceding footnote, in 2011, Solso was awarded 37.81 thousand new shares of stocks and options. His *Duration* in 2010 was 0.59, while in 2011 it was 0.32. In untabulated results, we find that while about 45% of the firms replenish the vested grants with replacement grants, the size of the replacement grant is much smaller than the size of the vested grant. The average (median) replacement grant is only 14.4% (0.6%) of the executive's total unvested equity as of the beginning of the year. That is, on average, only 53.3% of the vested grant is replenished, with the median being much smaller at 1.6%.

25. Cadman (2013) suggests that firms do not fully replenish executives' divested equity incentives due to executives' wealth diversification consideration.

In Table 4, we present the multivariate regression results. Consistent with the univariate evidence, voluntary turnover is significantly more likely following a large vesting of an equity grant. The coefficient on *Large vesting* is positive and highly significant. Economically, according to both columns (2) and (3), the probability of voluntary turnover increases by 1.7 percentage points following the large vesting, while the unconditional probability is 1.38% (untabulated). Thus, the economic impact is substantial. As a robustness check, instead of a dummy variable, we calculate *Large vesting* as the ratio of total stocks and options vested during the year to the total unvested stocks and options at the beginning of the year and then repeat the regressions in Table 4. We find that the results (not tabulated for brevity) continue to hold.

IV test

We also employ a two-stage IV analysis with an IV for pay *Duration*. We construct the instrument using the observation that firms often grant options according to two types of multi-year plans: fixed-number versus fixed-value (Hall 1999). On a fixed-number (fixed-value) plan, a manager receives the same number (value) of options each year within a grant cycle. While the value of new options granted changes with the price of the underlying stock for managers on fixed-number plans, the value of new options granted remains fixed within a cycle for managers on fixed-value plans. This occurs because the Black-Scholes value of an at-the-money option increases in the price of the underlying stock. We use industry returns, which are potentially exogenous, to proxy for firm stock returns and instrument pay duration with the interaction term between the plan type (an indicator for fixed-number plans) and industry returns. Shue and Townsend (2017) use this identification strategy to examine the impact of option compensation on managerial risk-taking incentives.

To account for the possibility that industry returns can affect executive turnover, we control for them. We are able to do this because we include executives with fixed-value plans as a control group. Specifically, we run the two-stage regressions based on the following specifications:

$$\text{First stage: } Duration = \beta_0 + \beta_1 I_{ijt}^{FN} + \beta_2 R_{kt} + \beta_3 I_{ijt}^{FN} R_{kt} + Year\,F.E. + Controls + \varepsilon,$$

and

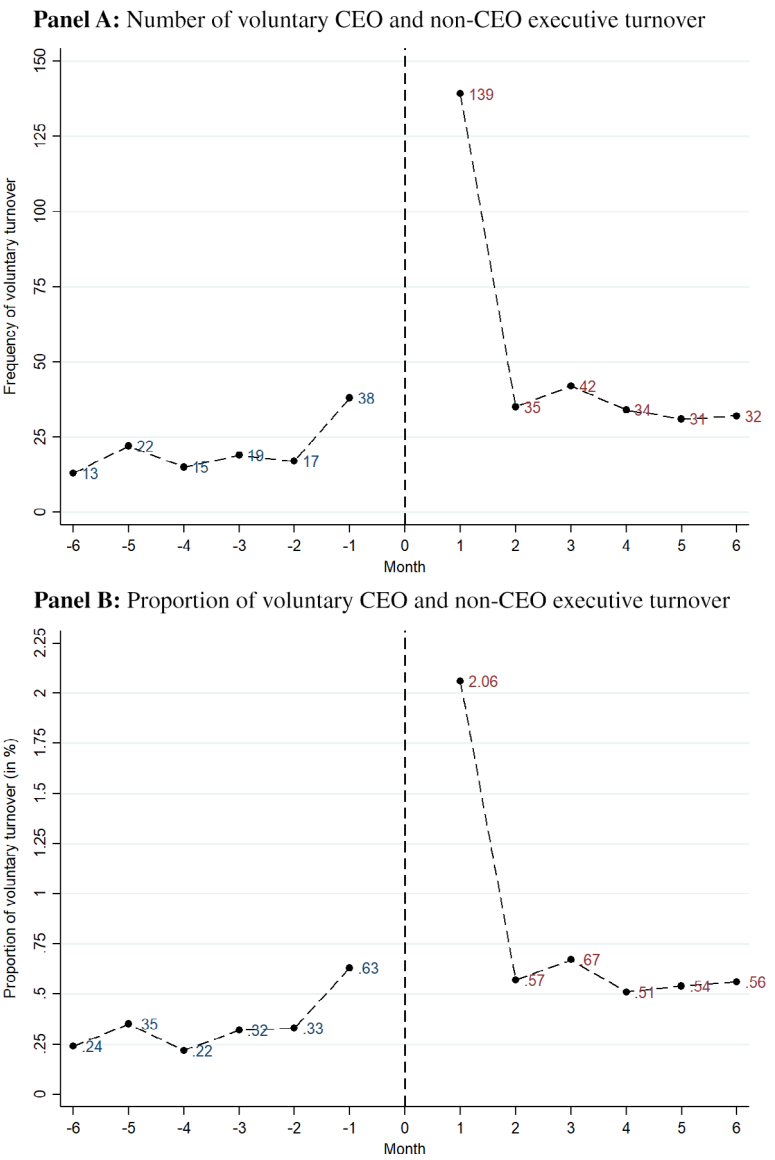
$$\text{Second stage: } Y_{itj} = \propto_0 + \propto_1 I_{ijt}^{FN} + \propto_2 R_{kt} + \propto_3 \widehat{Duration} + Year\,F.E. + Controls + \mu,$$

where I_{ijt}^{FN} is an indicator equal to one if the executive i in firm j is on a fixed-number plan and zero if the executive is on a fixed-value plan, and R_{kt} is the 3-digit SIC industry (k) return over the 12 months prior to the grant date (*Industry Return*). The interaction term, $I_{ijt}^{FN} R_{kt}$, is the instrument for pay *Duration*. The coefficient $\propto_3$ captures the effect of the instrumented pay duration on the outcome variable Y_{itj} — the executive's voluntary turnover. Year fixed effects are included in both stages.[26]

As in Shue and Townsend (2017), our sample is restricted to executives on fixed-number or fixed-value plans. We identify executives on fixed-number and fixed-value plans in the same way as Shue and Townsend (2017).[27] Namely, if an executive is granted the same number of options in two consecutive years after adjusting for stock splits, the executive is regarded to be on a fixed-number cycle in these years.[28] If an executive receives options in a year with the value being within 3% of the previous year, the executive is then considered to be on a fixed-value

26. We do not conduct an additional test with firm fixed effects because firms seem to be sticky in choosing the type of option grant plans. Shue and Townsend (2017) find suggestive evidence that firms choose fixed-number plans due to contracting frictions and a lack of sophistication in option valuation, and Hall (1999) has a similar observation. This might thus explain the stickiness of plans.
27. The only difference is that we use the data on option grants from Equilar and Incentive Lab, while Shue and Townsend (2017) back out the option granting information from the executive's aggregate option component of compensation data in ExecuComp.
28. In case of multiple grants made to an executive in a year, only the largest one is counted.

Figure 1 Voluntary CEO and non-CEO executive turnover around large vesting



Notes: Panel A (panel B) plots the number (proportion of the total number of executives as of the beginning of the year who depart) of voluntary CEO and non-CEO executive turnover 6 months before and 6 months after *Large vesting* occurs (Month 0).

cycle in these years.[29] We also exclude observations of the first year of a granting cycle. This is because, for our identification purpose as previously discussed, we focus on the change in option value brought only by change in industry returns, but the change in option value for options

29. The fixed-value cycle is defined using the same valuation method (either Black-Scholes value or face value) in all years. The 3% deviation is tolerated because firms often grant options in round lots, and as a result, value is not always exactly fixed even by a firm's own internal valuation methodology.

TABLE 4
Pay duration and voluntary managerial turnover: Evidence from a shock to duration

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Large vesting	1.093***	0.017***	0.017***
	(0.067)	(0.001)	(0.001)
Stock return	−0.364***	−0.006***	−0.004***
	(0.097)	(0.001)	(0.001)
Volatility	2.931***	0.042***	0.015
	(0.701)	(0.012)	(0.012)
Firm size	0.038	0.001*	0.003*
	(0.025)	(0.000)	(0.002)
Blockholder	−0.150**	−0.002**	−0.002**
	(0.067)	(0.001)	(0.001)
Ln(Tenure)	−0.149***	−0.002***	−0.000
	(0.032)	(0.000)	(0.001)
Age	0.002	0.000	0.000
	(0.005)	(0.000)	(0.000)
Stock holding	−5.406**	−0.040***	−0.034*
	(2.191)	(0.014)	(0.018)
Constant		0.004	−0.018
		(0.004)	(0.013)
Observations	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.038	0.014	0.017
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Notes: This table presents coefficient estimates from the Cox proportional hazard regression and linear probability regressions that relate voluntary turnover of CEOs and non-CEO executives to *Large vesting*. *Large vesting* is an indicator variable that takes a value of one during the years when a large stock or option grant vests and zero otherwise. All other variables are defined in the Appendix. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

granted in the first year of a cycle can also be due to the change in the number of options granted from the previous cycle.[30]

Our exclusion restriction requires that the sensitivity of executive voluntary turnover to industry returns be similar across firms with fixed-number and fixed-value plans, but differ for the effect of industry returns on the value of the option plan and consequently, pay duration. This exclusion restriction is reasonable because, although firms with fixed-number plans and firms with fixed-value plans may differ substantially, it is unlikely that industry returns can impact executive voluntary turnover differently in these firms in noncompensation-related ways.

The results of the two-stage IV regression are presented in Table 5. We also pool CEOs and non-CEOs as in the case of *Large vesting* (Table 4), and employ the linear probability model in the IV estimation. In columns (1)–(2), no control variables are included, while in columns (3)–(4), the usual control variables as in Table 3 are included. Results are not very sensitive to the inclusion of control variables. From the first-stage results, we find that the coefficients on the IV

30. For fixed-number plans, the number of options granted remains the same each year within a cycle, but can vary in different cycles.

Fixed-Number Plan×*Industry Return* are positive and significant. Thus, there is a significant increase in *Duration* for executives on fixed-number plans when industry returns are high. Clearly, *Fixed-Number Plan*×*Industry Return* is a strong instrument as can be seen from the large *F*-values for the first-stage regression. Consistent with the findings in Table 3, the results of the second-stage regression show that the coefficients on instrumented *Duration* remain negative and significant. Economically, the magnitudes of the coefficients are larger than the OLS estimates.

Cross-state variations in employee mobility from a quasi-natural experiment

Our last identification strategy takes advantage of the cross-state variation in employee mobility restrictions induced by the recognition of the IDD by US state courts, and examines how the effect of pay *Duration* on voluntary executive turnover is affected by such a rule change.

The IDD is meant to legally protect trade secrets for firms located in a state. It allows the state courts to prevent an employee from working for the firm's competitor or limit the employee's responsibility in the new firm when the employee can inevitably use or disclose knowledge of such trade secrets in their new employment and potentially cause the former employer irreparable harm. The recognition of the IDD in a state is shown to have significantly reduced the mobility of executives who have access to a firm's trade secrets (Klasa et al. 2018).[31] Our hypothesis thus predicts that the relation between pay *Duration* and the likelihood of executive voluntary turnover will be moderated (i.e., weakened) following a state's adoption of the IDD, because with such an employee mobility restriction, there is less role for pay duration in talent retention.

Note that the adoption or rejection of the IDD policy in a state is likely to be largely exogenous to executive turnover in individual firms. Unlike other state laws, the enforcement of which can be under great influence of interest groups such as labor unions and individual companies, the adoption (rejection) of the IDD depends on judicial decisions that are based on the merits of the specific case. This is intended to achieve a balance between corporate interest of stronger protection of trade secrets and employees' interest of labor market freedom (see Godfrey 2004; Harris 2000). In support of the argument that IDD adoptions are exogenous, Klasa et al. (2018) show that state courts' decisions to adopt the IDD are independent of contemporaneous factors such as worker traits, labor laws (e.g., wrongful discharge laws), unions, and economic conditions, and are largely immune to lobby groups and political pressure.[32]

The typical empirical approach in prior studies examines difference-in-differences in corporate outcome variables utilizing the staggered adoption of the IDD in different states over time. Our sample period (starting in 2006) prevents us from examining the change in the turnover-duration sensitivity around the adoption of the IDD because the latest adoption was in 2006 by Kansas.[33] Instead, we note that there are 10 states, which initially adopted the IDD but rejected it during our sample period (the rejection year is specified in the parenthesis): Arkansas (2009), Georgia (2013), Massachusetts (2012), North Carolina (2014), New Hampshire (2010), New Jersey (2012), New York (2009), Ohio (2008), Washington (2012), and Wisconsin

31. As a result, Chen et al. (2018) suggest that firms have to acquire other firms in order to poach talent. Consistent with this, they find a significant increase in the likelihood of being acquired among firms headquartered in states that recognize the IDD relative to firms headquartered in states that do not.

32. The literature has widely taken the adoption (rejection) of the IDD as a quasi-natural experiment to examine its implications on various corporate decisions such as capital structure (Klasa et al. 2018), voluntary disclosure (Ali et al. 2019; Li et al. 2018), cash holding (Ghaly et al. 2017), merger and acquisition (Chen et al. 2018), and patenting (Contigiani et al. 2018).

33. Instead of the difference-in-differences in the turnover-duration sensitivity, we conduct a simple cross-state comparison and find that the sensitivity is significantly weaker in IDD states (the economic magnitude drops by half) than in non-IDD states. The results, not tabulated, have to be interpreted with caution because the difference can be driven by state-specific differences between states rather than by the IDD adoption.

TABLE 5
Pay duration and voluntary managerial turnover: An IV estimation

	Voluntary turnover (CEOs and non-CEOs combined)			
Dependent variable	(1) Stage 1	(2) Stage 2	(3) Stage 1	(4) Stage 2
Fixed Number Plan×Industry Return	0.180***		0.159***	
	(0.050)		(0.049)	
Duration		−0.111*		−0.122*
		(0.061)		(0.070)
Industry Return	−0.109***	−0.010	−0.109***	−0.011
	(0.034)	(0.007)	(0.033)	(0.008)
Fixed Number Plan	−0.073***	−0.013**	−0.005	−0.005
	(0.019)	(0.006)	(0.019)	(0.004)
Stock return			0.029	0.002
			(0.023)	(0.006)
Volatility			−0.355*	−0.022
			(0.200)	(0.053)
Firm size			0.043***	0.005
			(0.005)	(0.003)
Blockholder			0.044***	0.001
			(0.016)	(0.005)
Ln(Tenure)			−0.101***	−0.013*
			(0.010)	(0.007)
Age			−0.011***	−0.002*
			(0.001)	(0.001)
Stock holding			−2.676***	−0.328
			(0.509)	(0.222)
Constant	1.077***	0.132**	1.563***	0.215*
	(0.010)	(0.065)	(0.080)	(0.111)
Observations	5,424		5,424	
F-statistic	11.53		40.62	
Fixed effects	Year		Year	

Notes: This table presents results of a two-stage instrument variable regression that relates voluntary turnover of CEOs and non-CEO executives to pay duration. The instrument of pay duration is *Fixed Number Plan×Industry Return*. We infer an executive to be on a fixed-number plan in two consecutive years if the executive receives the exact same number of options in both years, adjusting for stock splits. We infer an executive to be on a fixed-value cycle in two consecutive years if the value of the options the executive receives is within 3% of the previous year. We exclude observations of the first year of a granting cycle. *Industry Return* is the 3-digit SIC industry return over the 12 months prior to the grant date. The sample is limited to executives on fixed-number or fixed-value plans. *Duration* is the measure of executive pay duration discussed in section 2. All other variables are defined in the Appendix. Continuous variables in the interaction terms are demeaned. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

(2009).[34] We therefore examine the difference-in-differences in the turnover-duration sensitivity utilizing the staggered *rejection* of the IDD in different states over time.

The empirical regression specification we employ is as follows:

34. See Klasa et al. (2018) for detailed data on the adoption (rejection) of the IDD and Flammer and Kacperczyk (2016) for additional data on the rejection of the IDD.

$$\begin{aligned} Volturnover = \alpha &+ \beta_1 Duration + \beta_2 Duration \times Rejection \times Treatment + \beta_3 Duration \times Treatment \\ &+ \beta_4 Duration \times Rejection + \beta_5 Rejection + \beta_6 Treatment + \beta_7 Rejection \times Treatment \\ &+ \beta_8 Controls + Industry \times Year\, F.E. + \varepsilon, \end{aligned}$$

where *Volturnover* is the indicator of voluntary turnover that equals one if a firm experiences a voluntary executive turnover in the year and zero otherwise, and *Duration* is the measure of pay duration. *Treatment* is a dummy variable that equals one for firms headquartered in the 10 states that rejected the IDD during our sample period and zero otherwise. *Rejection* is defined as follows: for firms in the 10 states that rejected the IDD during our sample period, it is a dummy that equals one for years starting from the rejection of the IDD and zero for all prior years; for firms in states that already had the IDD in place as of 2006 and did not reject it during our sample period, it equals zero throughout our sample period; and for firms in states that had not adopted the IDD by 2006, it equals one throughout our sample period. *Controls* include a set of control variables used in the baseline regressions reported in Table 3. Industry-year fixed effects are applied in the regressions to ensure the impact of any industry-time-specific factors is removed. Robust standard errors are clustered at the 3-digit SIC code level.[35]

The coefficient on the variable of key interest *Duration*×*Rejection*×*Treatment* (β_2) is expected to be negative as the effect of pay *Duration* on voluntary turnover is expected to strengthen when the restriction on employee mobility is removed following the IDD rejection. We find that to be the case, as shown in Table 6 where CEOs and non-CEO executives are pooled in the analysis. The coefficient on pay *Duration* (β_1) remains negative and significant, indicating the robustness of our main finding that executives with longer duration of pay are less likely to depart voluntarily.[36]

Grant size, vesting schedule, and voluntary turnover

Both the size of the grant and the vesting time of unvested equity grants affect *Duration*.[37] In this section, we examine the extent to which grant size and vesting time independently affect executive turnover. Such a check helps to delineate the relative contribution of grant size and vesting time in talent retention. We first decompose *Duration* into two components, *Grant size* and *Vesting time*, as the contribution of grant size and vesting time to pay duration, respectively (see the Appendix for the details). We then repeat the analyses in Table 3 after replacing *Duration* with *Vesting time* and *Grant size*. Table 7 presents the results with voluntary CEO and non-CEO turnover pooled. Both *Vesting time* and *Grant size* are negatively and significantly associated with voluntary executive turnover. Economically, *Grant size* does appear to have a larger effect on voluntary managerial turnover as compared to *Vesting time*. Based on the coefficients in column (7), a one standard deviation increase in *Vesting time* (0.65) and *Grant size* (0.46) is associated with a decrease in the annual probability of a voluntary executive turnover of 0.2 (0.65×-0.003) and 0.83 percentage points (0.46×-0.018), respectively. In comparison, the unconditional mean annual probability of a voluntary executive turnover in our sample is 1.38% (untabulated).

35. Results are robust if we cluster the standard errors at the state or firm level.
36. A natural question is how firms may change the duration of pay for executives following a state's rejection of the IDD. Table IA-6 of the online Appendix reports the results where we regress pay duration on *Treatment*, *Rejection*, and their interaction as well as other control variables. Interestingly, we find that the coefficient on the interaction term, *Treatment*×*Rejection*, is positive and significant. This suggests that firms tend to increase the duration of pay when the legal constraint on employee mobility is released following the IDD rejection. This is consistent with firms proactively managing the duration of executive pay to retain talent.
37. There are, however, two scenarios where *Duration* could be the same but with different compositions of grant size and vesting time: one with a small grant size but a long vesting time, and the other with a large grant size but a short vesting time. It may be that the retention effect is weaker in the former case because the manager is likely to be less patient and more likely to forgo the small grant and depart voluntarily before it vests.

TABLE 6
Pay duration and voluntary managerial turnover: The impact of the rejection of IDD

	Voluntary turnover (CEOs and non-CEOs combined)
	(1)
Dependent variable	OLS
Duration	−0.006***
	(0.001)
Duration×Rejection×Treatment	−0.007***
	(0.002)
Duration×Treatment	0.000
	(0.002)
Duration×Rejection	−0.000
	(0.002)
Rejection	−0.001
	(0.001)
Treatment	−0.004***
	(0.001)
Rejection×Treatment	−0.002
	(0.002)
Stock return	−0.005***
	(0.001)
Volatility	0.040***
	(0.012)
Firm size	0.002***
	(0.000)
Blockholder	−0.002**
	(0.001)
Ln(Tenure)	−0.003***
	(0.000)
Age	−0.000
	(0.000)
Stock holding	−0.073***
	(0.017)
Constant	0.008*
	(0.005)
Observations	81,433
Adjusted R^2	0.012
Fixed effects	Industry×Year

Notes: This table presents results from a difference-in-difference regression that examines how the effect of pay duration on voluntary executive turnover is affected by the IDD rejection. *Treatment* is an indicator that takes the value of one for firms headquartered in the 10 states that rejected the IDD during our sample period and zero otherwise. *Rejection* is defined as follows: for firms in the 10 states that rejected the IDD during our sample period, it is a dummy that equals one for years starting from the rejection of the IDD and zero for all years prior to it; for firms in states that already had the IDD in place as of 2006 and did not reject it during our sample period, it equals zero throughout our sample period; for firms in states that had not adopted the IDD by 2006, it equals one throughout our sample period. Continuous variables in the interaction terms are demeaned. *Duration* is the measure of executive pay duration discussed in section 2. All other explanatory variables are defined in the Appendix. Robust standard errors are clustered at the 3-digit SIC code level and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

4. Pay duration and voluntary turnover: Cross-sectional variations

In this section, we report the results of cross-sectional tests that explore the role of contractual, firm, and executive characteristics in moderating the retention role of pay *Duration*. The results are presented in Tables 8–10. Specifically, in each panel of the tables, unless otherwise specified, we pool CEOs and non-CEOs and augment the baseline analysis in Table 3 by interacting *Duration* with one of the factors we focus on. For brevity, only the estimated coefficients for the variables in the interaction term and the interaction term itself are tabulated. Moreover, to ease the interpretation of the estimated coefficients, we demean all continuous variables in the interaction terms.

The impact of contractual features

We first examine the impact of two features in executive compensation contracts on the duration-turnover relationship: signing bonuses and performance-vesting provisions.

Signing bonuses

If firms that wish to attract executives offer signing bonuses to compensate for the lost deferred pay, doing so may moderate the retention role of deferred pay. In support of this, Xu and Yang (2016) document that executive signing bonuses are sizable and are increasing in prevalence, and Fee and Hadlock (2003) find that hiring grants are correlated with the equity portion of forfeited grants at the prior employer. To examine the role of signing bonuses, we first follow the procedure in Xu and Yang (2016) and search SEC filings for the keyword "signing bonus" and its variants, such as "sign-on bonus," "signing payment," and "sign-on payment."

Of those executives that laterally jump ship in our sample (i.e., appointed as a top five executive in both firms), we are able to find the new employment agreement for 601. Among them, 223 did not receive a signing bonus. These executives on average forfeited equity grants worth $2.6 million. The remaining 378 executives were awarded an average signing bonus of $1.9 million, while on average they forfeited equity grants worth $4.2 million. In results not tabulated for brevity, we also find that signing bonuses and forfeited equity grants (both taken in natural logarithm) are positively correlated with a high statistical significance (p-value = 0.002). These results suggest that firms do use signing bonuses to partially compensate executives for the loss of deferred pay, especially when the losses are large.

We next examine how signing bonuses may moderate the retention role of long-duration pay. The empirical challenge is that we do not observe the counterfactuals—that is, whether and how much signing bonuses were offered in cases where executives with long-duration pay decided to stay with their current firm. Hence, to operationalize the test, we use industry-average signing bonuses offered in the previous year as an ex ante proxy for the potential signing bonus that an executive can expect to get. We believe this approach reasonably reflects the talent market condition that a firm and its executives face when industry peers are potential talent poachers. Specifically, we define *High sign-on* as a dummy that takes a value of one for those industry-years (industry defined at 2-digit SIC level) in which the average industry signing bonus is above the median for that year, and zero otherwise. To obtain the average signing bonus for an industry-year, we search SEC filings for information on signing bonuses for the entire universe of S&P 1500 firms beyond those covered by Equilar and Incentive Lab. During our sample period, we are able to find the employment agreements of 1,043 executives who jumped ship to a new S&P 1500 firm. Among them, we did not find signing bonuses for 354 executives, while the remaining 689 received signing bonuses with an average size of $2.1 million.[38] We expect

38. Note that many of these executives are not in our sample because they were hired either from non-S&P 1500 firms or promoted from lower ranks in S&P 1500 firms (i.e., non–top five executives, and thus not covered in our sample).

TABLE 7
Vesting time, grant size, and voluntary managerial turnover

	Voluntary turnover (CEOs and non-CEOs combined)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	Cox			OLS			
Grant size	−0.787***	−0.839***	−1.008***	−0.011***	−0.012***	−0.015***	−0.018***
	(0.077)	(0.074)	(0.081)	(0.001)	(0.001)	(0.002)	(0.002)
Vesting time	−0.236***	−0.250***	−0.317***	−0.002***	−0.003***	−0.004***	−0.003***
	(0.078)	(0.085)	(0.087)	(0.001)	(0.001)	(0.001)	(0.001)
Stock return			−0.292***			−0.005***	−0.004***
			(0.093)			(0.001)	(0.001)
Volatility			1.935***			0.033***	0.015
			(0.712)			(0.012)	(0.012)
Firm size			0.184***			0.003***	0.003**
			(0.024)			(0.000)	(0.002)
Blockholder			−0.131**			−0.002**	−0.002**
			(0.065)			(0.001)	(0.001)
Ln(Tenure)			−0.175***			−0.003***	−0.001
			(0.031)			(0.000)	(0.001)
Age			0.000			0.000	0.000
			(0.004)			(0.000)	(0.000)
Stock holding			−7.242***			−0.069***	−0.046**
			(2.037)			(0.018)	(0.020)
Constant				0.024***	0.025***	0.009*	0.001
				(0.002)	(0.001)	(0.005)	(0.014)
Observations	81,433	81,433	81,433	81,433	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.008	0.018	0.031	0.002	0.011	0.012	0.016
Fixed effects	Year	Industry×Year	Industry×Year	Year	Industry×Year	Industry× Year	Firm and Year

Notes: This table presents coefficient estimates from the Cox proportional hazard model and linear probability model that relate the likelihood of voluntary CEO and non-CEO executive turnover to *Vesting time* and *Grant size*. Time-to-turnover is right censored. All variables are defined in the Appendix. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

the effect of *Duration* on voluntary turnover to be weaker for executives in *High sign-on* industry-years.

Panel A of Table 8 presents the results. In columns (1) and (2), we restrict our analysis to industry-years with non-missing signing bonuses; hence, *High sign-on* is constructed based on the observed signing bonuses for the 689 executives. In columns (3) and (4), we include the 354 cases with missing signing bonuses in the analysis and assume the signing bonus to be zero. In all columns, while the coefficients on *Duration* remain significantly negative, the coefficients on *Duration*×*High sign-on* are positive and statistically significant. Economically, the effect of signing bonuses is substantial. According to column (2), the impact of *Duration* is reduced by 30% for executives in the *High sign-on* group. Overall, the results suggest that the impact of pay duration on voluntary executive turnover is significantly weakened for executives in industries that on average pay high signing bonuses.

Performance-vesting grants

There is a growing use of performance-vesting provisions in equity awards to top executives (see, e.g., Li and Wang 2016; Bettis et al. 2018). We confirm this in the latest years for our sample. Specifically, we find that the proportion of firms that offer performance-vesting equity awards to at least one of their executives increases from 48% in 2006 to 89% in 2018 (untabulated). Meanwhile, the fraction of total new equity awards in the current year (in grant-date fair value) that are contingent on future accounting performance increases from 24% to 52%.[39]

Recall that our pay duration measure uses the performance measurement period as the vesting period for performance-vesting grants with the assumption that the performance target will be met upon vesting; hence, it captures the time-vesting feature of these grants. While this is not unreasonable for an ex ante measure of pay duration, it does not take into account the uncertainty introduced by the performance-vesting feature; that is, the contingence on performance introduces uncertainty about the vesting of the grant. We conjecture that this uncertainty will reduce the retention role of long-vesting grants.

To test the impact of performance-vesting provisions on the turnover-duration sensitivity, we define *Performance-vesting* as the ratio of the total dollar value of all unvested performance-vesting grants (including those awarded in prior years) to the dollar value of all unvested equity pay. *Performance-vesting* thus captures the size of performance-vesting grants relative to equity pay. The results—presented in panel B of Table 8—are consistent with a moderating role of performance-vesting provisions. The coefficients on the interaction term *Duration*× *Performance-vesting* are significantly positive, while those on *Duration* remain significantly negative. It shows that a higher share of performance-vesting grants in equity pay reduces the effect of pay *Duration* on voluntary executive turnover. It is likely that, on average, the uncertainty associated with performance-vesting makes risk-averse executives downplay unvested performance-linked pay in their voluntary turnover decisions. Our finding highlights the challenge to the retention role of deferred pay arising from performance-vesting provisions.

The impact of firm- and executive-level factors

We next estimate the effect of certain firm and executive characteristics on the relationship between pay duration and voluntary executive turnover. These characteristics can be categorized into two factors that have been argued in the literature, both theoretically and empirically, to be related to voluntary turnover: managerial ability and firm-specific knowledge. In this subsection, we examine how these factors may affect the retention role of pay duration.

39. Such an increasing trend is robust, although less pronounced, if we account for all unvested grants from prior years, namely, the fraction of all unvested equity grants that have performance-vesting provisions increases from 29% to 39%.

TABLE 8
Pay duration and voluntary managerial turnover: The impact of compensation contractual features

Panel A: Signing bonuses

	Voluntary turnover (CEOs and non-CEOs combined)					
	Cox	OLS	OLS	Cox	OLS	OLS
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Duration	−0.775***	−0.010***	−0.010***	−0.736***	−0.009***	−0.009***
	(0.091)	(0.001)	(0.001)	(0.086)	(0.001)	(0.001)
Duration×*High sign-on*	0.285**	0.003**	0.003**	0.228**	0.002*	0.002*
	(0.122)	(0.001)	(0.001)	(0.114)	(0.001)	(0.001)
High sign-on	−0.001	−0.001	−0.001	0.019	−0.000	−0.001
	(0.069)	(0.001)	(0.001)	(0.068)	(0.001)	(0.001)
Observations	64,509	64,509	64,509	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.023	0.006	0.017	0.021	0.005	0.015
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Industry and Year	Industry and Year	Firm and Year	Industry and Year	Industry and Year	Firm and Year

Panel B: Performance-vesting grants

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Duration	−0.591***	−0.007***	−0.008***
	(0.064)	(0.001)	(0.001)
Duration×*Performance-vesting*	0.598***	0.007***	0.008***
	(0.186)	(0.003)	(0.002)

(The table is continued on the next page.)

TABLE 8 (continued)

Panel B: Performance-vesting grants

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Performance-vesting	−0.188	−0.005***	−0.012***
	(0.140)	(0.002)	(0.003)
Observations	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.029	0.012	0.016
Controls	Yes	Yes	Yes
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Notes: This table presents coefficient estimates from the Cox proportional hazard model and linear probability model that relate the likelihood of voluntary CEO and non-CEO executive turnover to pay duration. Time-to-turnover is right censored. *Duration* is the measure of executive pay duration discussed in section 2. All controls from Table 3 are included in all regressions but not tabulated for brevity. In panel A, *High sign-on* is a dummy that takes a value of one for those industry-years (industry defined at 2-digit SIC level) in which the average signing bonuses are above the yearly median, and zero otherwise. In columns (1) and (2), we restrict our analyses to industry-years with non-missing signing bonuses; the average signing bonuses for an industry-year is thus based on the 689 cases with observed signing bonuses. In columns (3) and (4), we include the 354 cases with missing signing bonuses in the analyses and treat them as having zero bonuses; we calculate the average signing bonuses for an industry-year accordingly. In panel B, *Performance-vesting* is the ratio of the total dollar value of all unvested performance-vesting grants (including those awarded in prior years) to the dollar value of all unvested equity pay. Continuous variables in the interaction terms are demeaned. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Managerial ability

Executives with superior managerial ability are likely to be in high demand in the labor market. We expect firms to be willing to pay a premium, say in the form of a large signing bonus, to attract such executives. Hence, we expect the retention role of pay duration to be weaker for more capable executives. The literature on executive turnover and compensation typically uses firm performance as a signal of managerial ability. Fee and Hadlock (2003) confirm that superior stock performance of a firm increases the likelihood of its executives jumping ship. They also find that executives of large firms are more desired in the labor market, suggesting a top position in these firms is indicative of managerial ability. We thus test the impact of managerial ability with these two proxies for managerial ability, *Stock return* and *Firm size*.

The results are presented in Table 9 with panel A for *Stock return* and panel B for *Firm size*. In both panels, the coefficients on the interaction term of *Duration* with the two proxies for managerial ability are significantly positive, while those on *Duration* remain significantly negative. The findings suggest a weakened retention role of pay duration for executives perceived to have more ability, consistent with an efficient labor market for executive talent.

Firm-specific knowledge

We next explore the role of firm-specific knowledge in the retention effect of pay duration. By definition, firm-specific knowledge has less value outside the firm but is likely to be valued within the firm. Consistent with this, Fee et al. (2018) show that CEOs who are more closely attached to their old employers as proxied by longer tenure and being hired from inside fare significantly worse in the outside labor market. As a result, the benefits of staying with the firm are high for executives who have accumulated sufficient firm-specific knowledge, regardless of their pay duration. We therefore expect the effect of pay duration on voluntary turnover to be mitigated for executives with more firm-specific knowledge.[40]

Consistent with the notion that firm-specific knowledge is developed over time (e.g., Becker 1964), Fee and Hadlock (2003) document that longer-tenure executives are less likely to jump ship. We thus take tenure (specifically, *Ln(Tenure)*) as a proxy for an executive's level of firm-specific knowledge. There is also a growing literature about the implications of the difference between general managerial skills that are transferrable across firms and industries and firm-specific human capital in the market for CEOs and for practices in executive compensation, such as benchmarking and pay for luck (e.g., Murphy and Zábojník 2004, 2007; Custodio et al. 2013; Cremers and Grinstein 2014; Pan 2017; Carter et al. 2019). For each executive in our sample, we follow Custodio et al. (2013) and construct an index of general skills gathered during a lifetime of working experience. We then define an indicator variable, *Specialist*, for those executives who have their index value below the sample median (coded one), that is, whose skills are more firm-specific (and zero otherwise).[41] As in the case of longer-tenure executives, we expect a

40. Alternatively, if executives with more firm-specific knowledge are awarded pay with longer duration and are also less likely to depart voluntarily, we would expect a more pronounced effect of pay duration on voluntary turnover. On the other hand, it may be less necessary to award these executives pay with longer duration as their incentive for voluntary departure is low.

41. We construct a parsimonious measure of managerial ability by using principal components analysis to isolate the common component of general human capital in the four proxies: (i) Number of positions: number of different positions that the executive performed during their career; (ii) Number of firms: number of firms where the executive worked; (iii) Number of industries: number of firms at the 3-digit SIC level where the executive worked; and (iv) Conglomerate dummy: a dummy variable that equals one if the executive worked for a multi-division firm. Note that we do not include the fifth proxy as in Custodio et al. (2013), the CEO Experience dummy—a dummy that equals one if the executive worked as a CEO in a firm and zero otherwise—because our sample involves mostly non-CEO executives.

TABLE 9
Pay duration and voluntary managerial turnover: The impact of managerial ability

Panel A: *Stock return*

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Duration	−0.606***	−0.008***	−0.008***
	(0.071)	(0.001)	(0.001)
Duration×*Stock return*	0.354**	0.006***	0.006***
	(0.156)	(0.002)	(0.002)
Stock return	−0.222**	−0.005***	−0.003***
	(0.108)	(0.001)	(0.001)
Observations	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.027	0.012	0.015
Controls	Yes	Yes	Yes
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Panel B: *Firm size*

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Duration	−0.675***	−0.008***	−0.009***
	(0.075)	(0.001)	(0.001)
Duration×*Firm size*	0.148***	0.002***	0.002***
	(0.023)	(0.000)	(0.000)
Firm size	0.185***	0.002***	0.003*
	(0.024)	(0.000)	(0.002)
Observations	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.030	0.012	0.016
Controls	Yes	Yes	Yes
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Notes: This table presents coefficient estimates from the Cox proportional hazard model and linear probability model that relate the likelihood of voluntary CEO and non-CEO executive turnover to pay duration. Time-to-turnover is right censored. *Duration* is the measure of executive pay duration discussed in section 2. All controls from Table 3 are included in all regressions but not tabulated for brevity. *Stock return* and *Firm size* are defined in the Appendix. Continuous variables in the interaction terms are demeaned. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

weaker turnover-duration sensitivity for *Specialist* executives due to their incentives to stay with the firm.

The results, presented in Table 10 with panel A for *Ln(Tenure)* and panel B for *Specialist*, confirm our conjecture. In both panels, the coefficients on *Duration* continue to be significantly negative while the coefficients for the interaction terms of *Duration* with the two measures of firm-specific knowledge are both significantly positive. Economically, panel B shows that the turnover-duration sensitivity for a *Specialist* executive is less than half of that for a non-*Specialist*

TABLE 10
Pay duration and voluntary managerial turnover: The impact of firm-specific knowledge

Panel A: *Ln(Tenure)*

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Duration	−0.594***	−0.007***	−0.008***
	(0.065)	(0.001)	(0.001)
Duration×*Ln(Tenure)*	0.081*	0.002***	0.002***
	(0.051)	(0.001)	(0.001)
Ln(Tenure)	−0.178***	−0.003***	−0.001**
	(0.031)	(0.000)	(0.001)
Observations	81,433	81,433	81,433
Adjusted R^2 or pseudo R^2	0.026	0.012	0.016
Controls	Yes	Yes	Yes
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Panel B: *Specialist*

	Voluntary turnover (CEOs and non-CEOs combined)		
	Cox	OLS	
Dependent variable	(1)	(2)	(3)
Duration	−0.695***	−0.011***	−0.011***
	(0.078)	(0.001)	(0.001)
Duration×*Specialist*	0.180*	0.006***	0.006***
	(0.108)	(0.001)	(0.001)
Specialist	−0.499***	−0.007***	−0.006***
	(0.077)	(0.001)	(0.001)
Observations	76,883	76,883	76,883
Adjusted R^2 or pseudo R^2	0.035	0.012	0.015
Controls	Yes	Yes	Yes
Fixed effects	Industry×Year	Industry×Year	Firm and Year

Notes: This table presents coefficient estimates from the Cox proportional hazard model and linear probability model that relate the likelihood of voluntary CEO and non-CEO executive turnover to pay duration. Time-to-turnover is right censored. *Duration* is the measure of executive pay duration discussed in section 2. All controls from Table 3 are included in all regressions but not tabulated for brevity. In panel B, we follow Custodio et al. (2013) and first construct a parsimonious measure of managerial ability by using principal components analysis to isolate the common component of general human capital in the four proxies: number of different positions that the executive performed during their career; number of firms where the executive worked; number of firms at the 3-digit SIC level where the executive worked; whether or not the executive worked for a multi-division firm. We then define an indicator variable (*Specialist*) that takes a value of one for those executives who have their index value below the sample median, and zero otherwise. Continuous variables in the interaction terms are demeaned. Robust standard errors are clustered by 3-digit SIC industry and reported in parentheses. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

executive. Our findings suggest that firm-specific knowledge can act as a substitute retention mechanism, and for executives with high firm-specific knowledge, pay duration becomes a less influential retention tool.

5. Discussion of pay duration and involuntary turnover

In this section, we examine the implications of our study on involuntary turnover of executives and its sensitivity to firm performance. To the extent that long pay duration indicates the importance of human capital and a good executive-firm match in these firms, the boards of such firms may be reluctant to fire the executive, and notwithstanding poor performance, may choose to wait longer before making the decision to fire. If so, this would lead to the prediction that executives with longer pay duration should be less likely to be forced out and also have a lower turnover-performance sensitivity. We find this is indeed the case. For brevity, we leave the details of the tests and discussions to the online Appendix, with the results tabulated in Tables IA-7 and IA-8.

6. Conclusion

In this paper, we study the role of deferred equity pay on executive turnover. Firms increasingly use stock and option grants with long vesting schedules to retain managers. The forfeiture of all unvested stock and option grants when an executive leaves the firm increases the cost of managerial departure to the executive. Using the duration measure of executive compensation introduced by Gopalan et al. (2014), which captures both the magnitude and the vesting length of equity pay, we find that there is a negative effect of pay duration on voluntary executive turnover.

We also examine the extent to which the impact of pay duration on talent retention is moderated by other factors. We find that other compensation contractual features, such as signing bonuses potentially awarded by poachers and performance-vesting equity grants in the composition of an executive's current compensation, moderate the effectiveness of pay duration in talent retention. Moreover, the impact of pay duration is weaker for executives who are more capable and have more firm-specific knowledge. We also find that pay duration is negatively related to involuntary executive turnover and the sensitivity of involuntary turnover to firm performance. These findings are consistent with firms taking into account the need for managerial talent when designing executive compensation.

Our study suggests that firms' compensation policies and management turnover decisions are interlinked. We highlight the extent of the effectiveness of explicit compensation contracts in talent retention, which has received little attention in the prior literature on managerial compensation. Future research can explore how managerial compensation, by providing incentives and helping retain talent, affects corporate financial policies.

Appendix: Variable definitions

Age	Age of the executive (in years)
Blockholder	Indicator variable that takes a value of one if there is at least one institution holding more than 10% of the firm's shares outstanding
Duality	Indicator variable that takes a value of one if the CEO is also the chair of the board, and zero otherwise
External hire	Indicator variable that takes a value of one if an outsider is hired as a CEO, and zero otherwise
Firm size	Natural log of the total assets of the firm
Grant size	Contribution of grant size to pay duration, estimated separately for all CEOs and non-CEO executives as $\hat{\beta}_0 + \hat{\beta}_1 Optstockfrac$ from the regression based on the following specification: Duration $= \beta_0 + \beta_1 Optstockfrac + \varepsilon$, where *Optstockfrac* is the proportion of option and stock grants in total pay

(The table is continued on the next page.)

(continued)

Stock holding	Fraction of shares owned by the executive
Stock return	Firm's annualized stock return
Tenure	Number of years an executive has been in office
Vesting time	Contribution of vesting time to pay duration, estimated separately for all CEOs and non-CEO executives as $\hat{\varepsilon}$ from the regression based on the following specification: Duration $= \beta_0 + \beta_1 Optstockfrac + \varepsilon$, where *Optstockfrac* is the proportion of option and stock grants in total pay
Volatility	Standard deviation of the firm's stock return over 12 months

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:
Online Appendix. Supporting information