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Outside Employment Opportunities and Tournament Incentives

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Abstract

We find that firms enlarge the executive pay gap when executive mobility is constrained by more enforceable noncompete agreements. We interpret this finding as evidence that firms increase tournament incentives to keep executives incentivized after the loss of valuable outside employment options. Consistent with this argument, we observe more significant increases in pay gaps for executives with greater ex ante mobility options. However, shocks reducing enforceability have a weaker, less robust impact on pay gaps, contributing to asymmetric effects. Following restrictions to mobility, equity portfolios that long (short) firms that boost (do not boost) executive pay gaps generate positive alphas.

I. Introduction

Establishing effective compensation schemes is essential for incentivizing and retaining human capital. The compensation gap across the ordinal rank of workers in an organization is a form of rank-order tournament incentive in which an individual's performance is relatively evaluated (e.g., Lazear and Rosen (1981)). The reward for the best relative performer is theoretically the leadership of the organization, a position associated with increased pecuniary wealth and social reputation. Thus, a pay gap, like a tournament prize, motivates employees. Promotion-driven pay increases

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are particularly significant among top executives (Belzil and Bognanno (2008)), especially those who get the coveted chief executive officer (CEO) position. Accordingly, tournament incentives should greatly affect the behavior of a firm's vice presidents (VPs), inducing them to exert effort and boost their willingness to take risks (Hvide (2002), Lazear and Rosen (1981)), thereby shaping various corporate outcomes (e.g., Burns, Minnick, and Starks (2017), Kale, Reis, and Venkateswaran (2009), Kini and Williams (2012)).

While several past findings pertain to the effects of rank-order tournament incentives, there is limited evidence on their determinants (e.g., Bognanno (2001), Burns et al. (2017), Henderson and Fredrickson (2001), Kale et al. (2009), Main, O'Reilly, and Wade (1993)). Furthermore, related studies largely consider tournament incentives in isolation from the external managerial labor market, overlooking the role of executive mobility—an issue that has garnered significant attention from both academics and practitioners. We provide a novel contribution to this literature by studying whether exogenous variations in VPs' outside job opportunities affect the magnitude of the internal tournament incentives that VPs encounter in their current workplace. In other words, we address whether firms adjust their internal tournament incentives for VPs following changes to the VPs' external job opportunities.

Internal promotion (vertical move) is an important incentive device for VPs, but so are outside employment opportunities. VPs can strive for the CEO position in another firm (diagonal move) or join another firm with a similar job title but better pay and status (horizontal move). Horizontal and diagonal moves are particularly common. Graham, Kim, and Kim (2020) document that chief financial officer (CFO) mobility is higher and has increased faster than CEO mobility since the last century, and Kale, Reis, and Venkateswaran (2014) report that 40% of the VPs in S&P 500 firms assume the CEO position after moving across firms.

We use the term "external tournament incentives" to describe incentives associated with a VP's opportunity to leave for an outside job, which would motivate the VP to perform better. Prior studies highlight that executive tournaments can occur *within* similar product markets or local labor markets (e.g., Coles, Li, and Wang (2018), Ma, Pan, and Stubben (2020)). However, the concept of an external tournament, as defined here, is broader, as it relates to all prospective job opportunities in both horizontal and diagonal career moves, including those *across* different markets. Thus, it is hard to develop a proxy for external tournament incentives. However, we argue that the most obvious factor associated with such incentives is a VP's potential job mobility. If a VP's ability to join another firm is low, the incentives arising from the external executive market are limited.

Similar to Ewens and Marx (2018) and Kini, Williams, and Yin (2021), we use the variations in the state-level enforceability of employee noncompete agreements (NCAs) as exogenous changes in VPs' external tournament incentives. NCAs are legal clauses that can be embedded in employment contracts to restrict employees' ability to join competing firms. Studies suggest that more than 70% of top executives are constrained by NCAs (Garmaise (2011), Kini et al. (2021)), but the actual proportion is likely higher, owing to underreporting by firms (Lin, Peters, and Seo (2022)). Since executive labor markets are segmented (e.g., Ma et al. (2020), Yonker (2017)), state-level rules increasing (reducing) the enforceability of NCAs

should negatively (positively) affect the mobility of a firm's VPs in the labor market (Garmaise (2011)). These rules are unlikely to be influenced by a firm's actions and can therefore be deemed exogenous to the firm's executive pay system. We identify 9 (6) states that have been through increases (decreases) in NCA enforceability from 1993 to 2018. Exploiting the changes in enforceability in a difference-in-differences (DID) framework, we examine how labor market frictions shape internal tournaments and, more specifically, the executive pay gap (i.e., the pay gap between the CEO and other executive officers).

We argue that an increase in NCA enforceability might lead to a larger executive pay gap for two reasons. First, the implicit incentives that executives derive from outside opportunities become less effective when NCAs are more enforceable, which makes internal promotions critical. Thus, firms may widen the pay gap between the CEO and VPs to enhance the utility associated with future promotions and make up for the VPs' lost external opportunities (Gibbons and Murphy (1992)). Second, firms might struggle to locate capable candidates externally when executive mobility is curtailed; therefore, selecting and promoting incumbent executives become crucial. A more competitive internal tournament would generate signals about the quality of executives, which are useful in the promotion process.

However, several mechanisms cast doubt on the link between strengthened NCA enforcement and increases in the executive pay gap. First, firms could react to the weakening of the external tournament for VPs by embedding performance-vesting (PV) provisions in their stock and option awards. Such provisions could enhance the relative performance evaluation (RPE) of VPs without affecting the executive pay gap. Second, a reduction in the number of outside employment opportunities could motivate VPs to perform better even if their internal tournament incentives are not adjusted, since potential dismissal could result in a costly and delayed reentry to the executive labor market. Third, prior studies find that stricter NCA enforcement raises executives' dismissal risks (Kini et al. (2021), Lin et al. (2022)), which could further motivate VPs to perform. Overall, it is an empirical question whether firms increase their internal tournament incentives when there is a reduction in executives' outside employment opportunities.

We do not predict a monotonic relation; that is, a decrease in NCA enforceability might not have a negative impact on the executive pay gap. While this is ultimately an empirical question, our ex ante prediction is that the specific negative shocks to NCA enforceability in our study should result in a weak or even insignificant effect on the executive pay gap. As we explain in Section II, this expectation is informed by several idiosyncratic features of these events, as well as by prior evidence on how such events impact different outcomes (Lakkis (2023), Mueller (2023), and Tang, Wang, and Zhou (2021)).

As mentioned previously, we employ a DID framework in our analyses. We follow Baker, Larcker, and Wang (2022) and adopt a stacked regression approach to mitigate the estimation bias of a standard staggered DID, where already-treated units may later serve as controls (Baker et al. (2022), Goodman-Bacon (2021)). For each NCA enforceability event at time t, we include treated and control observations over the treatment window ($t-10$, $t+10$), with control observations belonging to states that are never treated by an NCA shock.

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In the main DID tests, we find a highly statistically significant rise in the executive pay gap following a state-level increase in NCA enforceability; following a state-level decrease in NCA enforceability, we find a reduction in the pay gap that is, at best, significant only at the 10% level (when including all the control variables). In these tests, we define the executive pay gap as the difference between a CEO's pay and the average pay of the VPs from the CEO's firm. On average, a firm affected by a positive NCA shock (a treated firm) has a pay gap that is approximately \$0.84 million larger than that of a nontreated firm. In the same model, we estimate that the interquartile change of the distribution of firm size—the most economically significant variable in determining executive compensation (Gabaix and Landier (2008), Gabaix, Landier, and Sauvagnat (2014))—enlarges the pay gap by about \$3.44 million. Therefore, the impact of stronger NCA enforcement is economically meaningful, as it is almost one-quarter as large as the impact of firm size. We obtain robust findings for increases in NCA enforceability when using alternative treatment windows, not-yet-treated observations as controls, a standard staggered DID method, and the Callaway and Sant'Anna (2021) estimator. However, the negative effect of a decrease in NCA enforceability on the executive pay gap is mostly insignificant across the above specifications.

In a dynamic setting, we find that the effects of an increase in NCA enforceability on the pay gap emerge in the year of the event and persist over time. In contrast, the parallel trends assumption does not hold in the case of decreases in NCA enforceability. Significant pre-shock trends are observed for firms affected by NCA enforceability reductions, calling into question the already weak results for these events. Additionally, while we report significant increases for CEO and VP pay as well as VP mobility when NCAs become more enforceable, we find that, in general, negative shocks to NCA enforceability do not cause significant changes in executive pay levels or VP mobility.

In cross-sectional tests, we evaluate whether executive mobility is the mechanism behind our findings by focusing on VPs who are more likely to value mobility. We find that the effect of an increase in NCA enforceability is more significant in firms in states where CEOs are frequently hired from other firms, firms in states with higher skewness of CEO pay levels, and firms led by founder CEOs. In these firm subsamples, VPs are likely to value outside employment options more and to have a high ex ante tendency toward mobility because their within-firm promotion expectations are limited, or their across-firm movements are more rewarding. Further, the impact of enhanced enforceability is more pronounced in firms whose VPs have more significant outside job opportunities (i.e., firms with younger VPs or more able executives, or in industries with lower product market concentration). None of these same cross-sectional analyses generate significant findings when the shocks to NCA enforceability are negative.

Following an increase in NCA enforceability, firms may respond to their VPs' weakened external tournament incentives by attempting to incentivize the VPs through additional PV provisions in stock and option awards (Bettis, Bizjak, Coles, and Kalpathy (2010)), so as to stimulate competition with executives across firms through RPE (Bettis, Bizjak, Coles, and Kalpathy (2018), De Angelis and Grinstein (2020), and Wruck and Wu (2022)). Thus, firms resorting to PV provisions might not need to change the executive pay gap as much. Our empirical evidence does not

support this argument. First, we find that the impact of an NCA enforceability shock (whether positive or negative) on the executive pay gap is not different in firms that tend to use PV provisions. Second, we do not observe variations in firms' reliance on RPE plans following an NCA enforceability event.

A retention mechanism could also be at play here, as more enforceable NCAs hinder executives' mobility and make it less costly for firms to retain valuable executives. This could reduce the need for schemes that incentivize and reward VPs for performance, including promotion incentives through executive pay gaps. In contrast, shocks that reduce NCA enforceability raise executive retention costs, which could force firms to enhance both executive compensation levels and pay gaps to retain VPs. We consider several proxies to identify firms for which the retention mechanism should be more relevant (i.e., firms whose VPs are ex ante more valuable and more mobile). These proxies measure whether a firm has VPs that are young or capable, operates in a state where CEOs tend to be hired externally or that has highly skewed CEO pay, belongs to an industry with low concentration or high levels of litigation, has a high market-to-book ratio, and depends on highly skilled labor. We find that these variables do not affect the impact of a negative NCA enforceability shock on the executive pay gap. Furthermore, most of these variables actually magnify rather than mitigate the effect of a positive NCA enforceability shock on the pay gap. On the whole, these findings are inconsistent with a retention-cost explanation. Finally, we rule out that our main findings are driven by plausible alternative explanations based on CEO power (Bebchuk, Cremers, and Peyer (2011)), talent differentials (Mueller, Ouimet, and Simintzi (2017), Terviö (2008)), or CEO bargaining power (Kini et al. (2021)). Taken together, our results suggest that the executive pay gap changes we observe following shifts in NCA enforceability most likely capture variations in tournament incentives.

Another important question is whether the adjustments to executive pay gaps driven by shocks to NCA enforceability have implications for firm value. Prior studies highlight the adverse effects of more enforceable NCAs on firm efficiency owing to limitations to the reallocation of talent (Anand, Hasan, Sharma, and Wang (2018), Bai, Eldemire, and Serfling (2024), He and Wintoki (2023), and Shi (2023)). Arguably, firms can counteract these adverse effects by adjusting internal tournament incentives. We provide stock-market-based evidence showing that a strategy that goes long (short) in a portfolio comprising treated companies with (without) increased pay gaps can generate positive alphas. Put differently, firms that increase their internal tournament incentives for VPs when the external ones weaken perform significantly better than other treated firms.

To the best of our knowledge, our study is the first to provide *direct* evidence of a substitution effect between external and internal tournament incentives for top executives. In a related study, Coles et al. (2018) argue that CEO departures through external tournaments can be the precondition for an effective internal rank-order tournament; otherwise, the VPs' opportunities on the internal promotion ladder would be negligible. This argument is incomplete, given that CEOs can be dismissed and, importantly, VPs also have external career opportunities. In this study, we argue that the interplay between VPs' internal promotion and external employment opportunities is key to our understanding of the drivers of the internal tournament. More broadly, we contribute to the literature investigating the drivers

of rank-order tournament incentives, especially the executive pay gap (e.g., Bognanno (2001), Burns et al. (2017), Kale et al. (2009), and Main et al. (1993)).

Moreover, Coles and Li (2023) call for future research to explore variations in executive contract design that cannot be fully explained by managerial and firm attributes. Our findings respond to this call by identifying external tournament incentives as a distinct determinant of executive pay arrangements. Similarly, we contribute to the related topic of the effects of labor mobility on managerial compensation (e.g., Chen, Jung, Peng, and Zhang (2022), Kini et al. (2021)). Kini et al. (2021) argue that CEOs receive higher compensation because NCAs raise their unemployment risks. In this paper, however, we identify an alternative explanation for this increase in CEO compensation—one based on VPs' tournament incentives.

Lastly, a recent study by Johnson, Lavetti, and Lipsitz (2024) finds that stronger NCA enforceability exacerbates gender and racial salary gaps. Instead of gender and racial gaps, we study the executive pay gap and show that firms intentionally expand the gap to generate internal tournament incentives as a substitute for the loss of external ones. Importantly, we also study the implications of this practice for firm value, complementing other studies that provide inconsistent results on the subject (Anand et al. (2018), Bai et al. (2024), Garmaise (2011), and He and Wintoki (2023)). Finally, our findings help reconcile conflicting prior evidence on the effects of executive mobility and provide insights for the ongoing debate about pay inequality.

II. Institutional Background

Noncompete clauses embedded in a firm's employment contracts restrict signers from joining competitors if their doing so could infringe upon the firm's legitimate business in the future. Prior work shows that these restrictions protect the firm against losing its key human capital for around 2 years (Malsberger (1996), Vanko (2002)). The scope of geographic constraints specified in NCAs varies, but NCAs typically cover all the places where the employer has operations (Bishara, Martin, and Thomas (2015), Kini et al. (2021)).

By convention, U.S. courts do not scrutinize the reasonableness or adequacy of contract terms under contract law, and employers can freely include noncompete clauses in employment contracts (Vanko (2002)). At the same time, employers have a strong incentive to sue employees who breach the agreements. Thus, the costs of violating NCA terms are potentially significant. In addition to individuals suspected of violating NCAs (who are vulnerable to lawsuits from their former employers), new employers may be liable for possible monetary damages. At worst, the new employment relationship could be ceased forcefully (Bai et al. (2024), Vanko (2002)).

Therefore, noncompete limitations for top executives can be far-reaching, and their reach is not necessarily confined to the same industry or state as the executive's firm (Bishara et al. (2015)). Nonetheless, the real extent of noncompete restrictiveness is determined by state-level enforceability, which is dictated by legislative actions or prior court rulings. Noncompete laws vary considerably across different states. Although individuals can sometimes escape local regulations through cross-

state movements (Marx, Singh, and Fleming (2015)), such moves may not be optimal for executives' career development, as many studies find that executive labor markets are geographically segmented (e.g., Ma et al. (2020), Yonker (2017)). Thus, executives are likely to take into account the effect of state-level restrictions. In turn, these rules can also affect firms' decisions, as firms, critically, must grasp their legal surroundings and adjust production factors on the premise of state law compliance (Anand et al. (2018)).

Malsberger (1996), Garmaise (2011), and several subsequent studies (e.g., Bai et al. (2024), He and Wintoki (2023), Kini et al. (2021), and Lin et al. (2022)) consider answers to 12 questions to evaluate the level of NCA enforceability in a particular state and track substantial exogenous changes in enforceability.[1] We follow the same empirical strategy and find that, during our sample period, the following 9 states have experienced increases in NCA enforceability: Florida in 1996, Georgia in 2004 and 2010, Ohio in 2004, Vermont in 2005, Idaho in 2008, Wisconsin in 2009, Texas in 2010, Colorado in 2011, and Virginia in 2013. We record decreases in NCA enforceability in 6 states: Texas in 1994, Louisiana in 2001, Oregon in 2008, New Hampshire in 2012, Illinois in 2013, and Kentucky in 2014. The events analyzed here are comparable to those in studies with similar sample periods, such as Bai et al. (2024), Ewens and Marx (2018), and Kini et al. (2021). A few discrepancies are discussed in detail and motivated in the Supplementary Material, which contains a summary of the events.

Though some studies propose using a discrete enforceability index based on Garmaise's (2011) 12 questions as a test variable (e.g., by counting the number of positive answers), we prefer a binary test variable, which captures changes in the index in a DID specification. There are three reasons that justify our choice. First, it is difficult to assess whether each question is of equal importance and has an equivalent impact on executive mobility. By creating a dummy indicator, we only need to detect if there are events causing qualitative differences in enforceability. Second, our approach allows us to classify a firm into either the treated or control group according to its home state and cleanly estimate the effect of the treatment. Last, having separate dummies for upward and downward changes in enforceability allows us to examine the heterogeneous effects of the two types of events. In robustness checks, we find that our results are in line with our baseline findings when using the discrete enforceability index. If a state has been through more than 1 change in the same direction during our sample period, we only focus on the first transition. If there are multiple changes in opposite directions, we exclude the observations after the second event.

We expect the upward shifts in NCA enforceability to more strongly affect the executive pay gap than the downward shifts, for several reasons. First, most prior findings support this asymmetry. Specifically, we are aware of at least 6 previous studies that have analyzed the effects of increases and decreases in NCA

[1]Bai et al. (2024) and Johnson et al. (2024) present formal evidence that an array of state-level economic and political characteristics and other laws for labor protection and trade secrets are not correlated with NCA enforcement. Jeffers (2024) also reports that the distributions of macro conditions are similar across states with or without changes in enforceability. These findings further support the argument that changes in NCA enforceability are plausibly exogenous.

enforceability on a variety of outcomes (but not on the executive pay gap), and most find asymmetric effects. There are three studies that report insignificant findings for decreases in enforceability (Lakkis (2023), Mueller (2023), and Tang et al. (2021)), and one simply shows that the effects are more significant for increases than for decreases (Lin et al. (2022)). Still, we note that Chen, Balasubramanian, and Forman (2024) do not find any evidence of asymmetric effects, and He and Wintoki (2023) report significant effects only for downward shifts in enforceability.

Second, in Table OA.2 of the Supplementary Material, we study market reactions to enforceability shocks and report significant abnormal returns during the window from day −1 to day +3 around events that increase NCA enforceability. The reactions to such events are positive (e.g., Market Model CAR [−1;3] is 1.465%, $p < 0.01$), consistent with the view that NCAs favor employers. In contrast, no abnormal returns are reported around events that weaken NCA enforceability, which could indicate that market participants do not expect firms to be significantly affected.

Third, we find that when NCAs become more enforceable, there is a significant reduction in VP mobility (−0.049, $p < 0.05$). When NCAs become less enforceable, there is no significant effect (see Table OA.3 of the Supplementary Material).

Fourth, our sample of negative shocks to NCA enforceability is smaller than our sample of positive shocks. Thus, when we study negative shocks, a single event's idiosyncratic characteristics may heavily affect our estimations by adding noise. It is also questionable whether, for 3 of our 6 decreases in enforceability, we should expect any significant findings. The decrease for Louisiana in 2001 was quickly reversed in 2003, making this event rather problematic. Adjustments to executive compensation take time, and the reversal event may have stopped such adjustments in their tracks. There were 2 other decreases—Oregon's in 2008 and New Hampshire's in 2012—that resulted from legislative decisions rather than court cases. Ewens and Marx ((2018), Section 5.1) highlight that laws, unlike court decisions, are generally forward-looking and apply to future contracts without invalidating existing ones (including NCAs). It is unlikely that firms will update current contracts to incorporate new NCA clauses, given that events that weaken NCA enforceability favor employees.

Finally, when NCA enforcement is weakened, firms' reactions may be muted, since it is hard to adjust the executive pay gap downward. Given that a CEO's pay is significantly larger than that of the average VP and considering the rarity of pay cuts, a reduction in the pay gap would result from substantially larger relative pay raises for VPs than for the CEO. Unequal growth rates in pay that favor VPs are feasible, but they could demotivate the CEO and affect the CEO's performance. Indeed, recent findings relate CEO pay arrangements to issues beyond monetary incentives, such as the perception of fairness (Edmans, Gosling, and Jenter (2023)).

III. Methodology

A. Empirical Methodology

Our identification relies on the variations in NCA enforceability across states and over time. However, staggered DID applications have been questioned due to

the potential use of already-treated observations as control firm-years (Baker et al. (2022), Goodman-Bacon (2021)). Also, a comparison between an earlier-treated and a later-treated group potentially suffers from estimation bias when treatment effects are heterogeneous. This issue is highly relevant in our setting since the timing of the treatment effect of enforceability might vary across a long sample period. To alleviate potential concerns, we follow Baker et al. (2022) and use stacked specifications as our main methodological approach. Specifically, we set a test window from $t-10$ to $t+10$ for each specific event in year t. In the Supplementary Material, we show that our results persist when we restrict our analyses to shorter test windows. In each cohort, we use "never treated" firms, that is, those located in states that are never affected by an NCA enforceability shock (regardless of direction), as control firms. Last, we stack the events together and estimate the average effects for all the events in the following specification:

$$(1)\quad Ln\left(Pay\ Gap\right)_{c,i,t+1} = \alpha + \beta \times NCA\ Enforceability\ Up/Down_{c,t,s} + \gamma \times X_{c,i,t} + \tau \times Z_{c,i,t+1} + \mu_{c,i} + \rho_{c,t} + \theta_{c,s} + \varepsilon_{c,i,t+1},$$

where c, i, t, and s denote cohort, firm, year, and state of firm headquarters, respectively.

The dependent variable captures the gap in pay between a CEO and the average VP in the firm, following prior studies (e.g., Bognanno (2001), Henderson and Fredrickson (2001)). We take the average VP compensation as the benchmark to construct the *Pay Gap* proxy for two reasons. First, all the VPs can be subject to NCAs that restrict their mobility. They are, therefore, all susceptible to changes in state-level NCA enforceability (Chen et al. (2022), Garmaise (2011)). Second, using information for all VPs is helpful in capturing variations due to changes in the size of top management teams. We follow prior studies and take the natural logarithm of the highly skewed *Pay Gap*, but also use alternative proxies and transformations in robustness tests. We measure the dependent variable at $t+1$ to ease reverse causality concerns and because adjustments to executive pay are not instantaneous and inevitably happen with a lag.

The main test variable, $NCA Enforceability\ Up/Down_{t,s}$, is a binary variable that equals 1 if state-level NCA enforceability has increased (or decreased) in the current or previous years, and 0 otherwise. We follow Kale et al. (2009) and include a vector of controls related to executive, firm, and industry characteristics that are expected to determine the size of the *Pay Gap*. Specifically, firm size, median industry-level pay gap, stock return volatility, and the number of business segments are firm characteristics that are predicted to directly affect the executive pay gap. In addition, Kale et al. (2009) highlight that the total VP utility in each internal tournament depends on the size of the prize the VPs obtain in the event of promotion and their probability of promotion. Promotion likelihood should be negatively correlated with prize size, since firms do not need to guarantee their executives a large expected benefit from a promotion when such an event is particularly likely. Thus, factors directly associated with VPs' promotion chances can be considered as determinants of the pay gap. These factors include variables capturing whether the CEO is new, an insider, or retiring, as well as CEO duality, CEO age, CEO tenure, number of VPs, whether the CFO is a VP, whether the firm has a propensity for relay

succession, and industry homogeneity. Detailed variable definitions can be found in the Appendix. We measure all the executive characteristics, Z, at year $t+1$ and firm financials or industry characteristics, X, at year t. We do not discuss the expected signs of these controls here for brevity.

The baseline models include firm (μ_i) and year (ρ_t) fixed effects (FEs) in each cohort c to control for time-invariant omitted firm characteristics and time-specific factors. Firm FEs can also help capture the firm-level variations in NCA usage, since NCA usage should persist over time (Chen et al. (2022)). In addition, we control for the time-invariant state attributes with state FEs (θ_s) in a cohort because firms may relocate their headquarters to other states (Bai, Fairhurst, and Serfling (2020), Chen et al. (2022)). The standard errors are robust to heteroskedasticity and clustered at the headquarter-state level.

B. Sample Selection

Our initial sample comes from the S&P ExecuComp database over the period 1993–2018. We use the "CEO annual flag" (CEOANN = CEO) to identify a firm's CEO. However, some firm-year annual flags either do not allow us to find a CEO or indicate the existence of multiple CEOs. BoardEx database helps us to fill in or correct 42.2% of these observations. In particular, we identify CEOs by their "role name," considering variants of the term "CEO." Other nonCEO named corporate executive officers are categorized as VPs (Kale et al. (2009), Kini and Williams (2012)). We drop the firm-year observations still without an identifiable CEO or with missing CEO annual pay (ExecuComp item: TDC1). Consistent with Kini and Williams (2012), we retain firm-years as long as ExecuComp lists at least 1 senior executive besides the CEO.[2]

ExecuComp modified its reporting format of TDC1 after the passage of FAS 123R, making the comparability between pre- and post-FAS 123R problematic. We thus follow Coles, Daniel, and Naveen (2013) and Kini and Williams (2012) to recalculate the value of executives' total compensation to ensure data consistency across the sample period. Though our central focus is on *Total Gap*, we decompose total executive compensation into its short-term (ST) and long-term (LT) components and build two additional outcome variables: *ST Gap* and *LT Gap*. ST pay is the sum of salary and bonus, while LT pay mainly consists of stock and option grants. We exclude, from the regression, nonpositive values that are less likely to reflect tournament dynamics.[3] When *Total Gap* values are excluded, we argue that VPs are

[2]However, requiring firms to have at least 2 or at least 3 VPs does not affect our results, as shown in Panel A of Table OA.15 in the Supplementary Material.

[3]Kini and Williams (2012) find that negative executive pay gaps mostly occur when the CEOs are founders who receive low compensation but have large equity stakes. A negative gap is also possible when the former CEO becomes a VP but continues to receive compensation that is higher than that of the new CEO. Thus, negative pay gaps are likely to introduce noise. We alternatively recalculate the variable in different ways: i) we monotonically add a constant to make all pay gaps positive; ii) we replace the negative values with the median industry pay gap; and iii) when the CEO's pay is smaller than the VPs', we replace it with the industry median CEO pay. Next, we transform the dependent variables using natural logarithms. In all cases, the results are qualitatively similar to those from our baseline estimations (see Panel B, Table OA.15 in the Supplementary Material).

not substantially incentivized in terms of monetary compensation, and we discard the same observations for both *ST Gap* and *LT Gap*.

Executives and senior managers are likely to reside in the states of their firms' headquarters (Bai et al. (2020)). We extract historical location data from Bai et al. (2020) for the period until 2003 and from 10-X Header Data from Bill McDonald's website for the subsequent period. We retain the Compustat location data when the historical data is not available. Firm-years without U.S. headquarters are dropped. Finally, we combine our sample with other financials, mainly from the Compustat and CRSP databases. Firms in the utility or financial industries or without recorded asset values are excluded. All continuous variables are winsorized at the 1st and 99th percentiles.

As previously explained, we obtain 2 different data sets to separately examine the effects of increases and decreases in NCA enforcement. Table 1 summarizes the descriptive statistics for the main variables used in our models. The sample for Enforceability Up (Down) events consists of 22,091 (20,770) distinct firm-year observations with 1,908 (1,868) unique firms. Because the control observations can be used multiple times, the sample sizes in the stacked regression are inflated. The mean (median) value of the *Total Gap* is larger than that reported in prior related studies (e.g., Kini and Williams (2012), Kubick and Masli (2016)), but this pattern is not surprising considering the rapid growth of CEO pay in recent years. The distributions of variables do not have significant differences between the two panels and are comparable to prior research (Acharya, Gabarro, and Volpin (2021), Hayes, Lemmon, and Qiu (2012), and Kale et al. (2009)).

IV. Empirical Results

A. Main Results

Table 2 presents findings for the baseline model on estimating the effects of Enforceability Up or Down events. Panel A, column 1 reports results for specifications on how enhanced enforceability affects the executive pay gap without time-varying covariates. In column 2, we add a comprehensive set of other variables following Kale et al. (2009). The results from both columns show positive, highly significant coefficients on *NCA Enforceability Up*, indicating that firms enlarge the pay gap if their headquarters are in a treated state. The effect is also economically meaningful: On average, compared with the control firms, the affected firms experience a growth in pay gap of 20.9% ($= \exp(0.191) - 1$), corresponding to an absolute increase of about \$0.84 million ($= \$3.98 \text{ million} \times 20.9\%$). The effects of other variables in column 2 are generally in line with the empirical results or theoretical predictions by Kale et al. (2009); in particular, they confirm the statistical and economic significance of firm size (Gabaix and Landier (2008), Gabaix et al. (2014)). Given that the interquartile change in firm size leads to a \$3.44 million ($= \$3.98 \text{ million} \times [\exp(0.282 \times 2.21) - 1]$) larger pay gap, the impact of the enhanced enforceability is almost one-quarter of this effect and, therefore, economically substantial.

We further provide insights into the 2 components of the executive pay gap, namely *ST Gap* and *LT Gap*, in columns 3 to 6. The coefficients on *NCA Enforceability Up* continue to be positive and significant in both instances.

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TABLE 1

Summary Statistics

Table 1 reports the descriptive statistics (including the number of unique observations, mean, lower quartile, median, and upper quartile) for the variables used in the baseline regression models. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. Detailed variable definitions can be found in the Appendix

	Obs.	Mean	Lower Quartile	Median	Upper Quartile
Panel A. Enforceability Up					
Compensation Variables					
Total Gap (in 000s)	22,091	3,982.31	775.42	2,033.51	4,805.19
ST Gap (in 000s)	21,583	622.32	262.21	437.08	695.21
LT Gap (in 000s)	19,490	3,398.95	590.99	1,751.50	4,326.21
Median Industry Gap (in 000s)	22,091	2,592.10	722.04	1,666.52	3,571.50
Median Industry ST Gap (in 000s)	21,583	507.50	283.55	422.61	586.41
Median Industry LT Gap (in 000s)	19,490	2,285.86	551.83	1,465.00	3,268.68
Executive Characteristics					
CEO Age	22,091	55.62	51.00	56.00	60.00
CEO Tenure	22,091	7.23	2.00	5.00	10.00
New CEO	22,091	0.10	0.00	0.00	0.00
CEO Is Insider	22,091	0.66	0.00	1.00	1.00
Retiring CEO	22,091	0.10	0.00	0.00	0.00
Duality	22,091	0.55	0.00	1.00	1.00
No. of VPs	22,091	4.78	4.00	5.00	5.00
Propensity of Relay Succession	22,091	0.54	0.00	1.00	1.00
CFO Is VP	22,091	0.89	1.00	1.00	1.00
Firm/Industry Characteristics					
Ln (Total Asset)	22,091	7.20	6.05	7.09	8.26
Industry Homogeneity	22,091	0.11	0.06	0.10	0.14
Stk. Return Volatility	22,091	0.46	0.30	0.41	0.55
No. of Segments	22,091	2.51	1.00	2.00	4.00
Panel B. Enforceability Down					
Compensation Variables					
Total Gap (in 000s)	20,770	4,035.31	775.84	2,033.74	4,863.16
ST Gap (in 000s)	20,155	613.85	252.69	428.76	694.29
LT Gap (in 000s)	18,401	3,424.80	583.22	1,760.55	4,358.76
Median Industry Gap (in 000s)	20,770	2,563.96	698.20	1,629.51	3,547.12
Median Industry ST Gap (in 000s)	20,155	502.47	277.88	413.62	582.48
Median Industry LT Gap (in 000s)	18,401	2,254.52	539.75	1,410.83	3,222.66
Executive Characteristics					
CEO Age	20,770	55.57	51.00	56.00	60.00
CEO Tenure	20,770	7.25	2.00	5.00	10.00
New CEO	20,770	0.10	0.00	0.00	0.00
CEO Is Insider	20,770	0.66	0.00	1.00	1.00
Retiring CEO	20,770	0.10	0.00	0.00	0.00
Duality	20,770	0.55	0.00	1.00	1.00
No. of VPs	20,770	4.79	4.00	5.00	5.00
Propensity of Relay Succession	20,770	0.53	0.00	1.00	1.00
CFO Is VP	20,770	0.89	1.00	1.00	1.00
Firm/Industry Characteristics					
Ln (Total Asset)	20,770	7.20	6.00	7.07	8.27
Industry Homogeneity	20,770	0.11	0.06	0.09	0.14
Stk. Return Volatility	20,770	0.46	0.30	0.41	0.55
No. of Segments	20,770	2.53	1.00	2.00	4.00

The economic magnitudes, however, are distinct between the two dependent variables: Compared to a control firm, the average treated firm experiences an increase of about 5.9% in *ST Gap* and about 24.9% in *LT Gap.* Thus, *LT Gap* can be interpreted as the main driver of the change in *Total Gap.* This confirms the growing importance of the stock and option components in executive compensation (Graham et al. (2020)) and suggests that the observed variations in the pay gap are mainly due to long-term incentives.

We next turn our focus to reductions in NCA enforceability. We use the binary variable *NCA Enforceability Down* to capture state-level shocks that weaken NCA

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TABLE 2

Baseline Regressions

Table 2 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on the executive pay gap. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. The dependent variables reflect alternative definitions of the pay gap and are measured in year $t+1$. *NCA Enforceability Up (Down)* is measured in year t and is a binary variable that is set to 1 if a firm is headquartered in a state that has experienced an increase (decrease) in NCA enforceability over the current or previous years. Control variables related to executive characteristics (*New CEO*, *CEO Is Insider*, *Retiring CEO*, *Duality*, *No. of VPs*, *Propensity of Relay Succession*, *CFO is VP*, *Ln (CEO Age)*, and *Ln (CEO Tenure)*) are recorded in year $t+1$ while other controls in year t. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Ln (Total Gap)		Ln (ST Gap)		Ln (LT Gap)	
	1	2	3	4	5	6
Panel A. Enforceability Up						
NCA Enforceability Up	0.190***	0.191***	0.060**	0.055**	0.227***	0.218***
	(0.049)	(0.051)	(0.028)	(0.026)	(0.069)	(0.076)
New CEO		0.107*		−0.076***		0.153***
		(0.061)		(0.027)		(0.039)
CEO Is Insider		−0.200***		−0.154***		−0.188***
		(0.031)		(0.022)		(0.036)
Industry Homogeneity		0.207		−0.186*		0.347
		(0.177)		(0.108)		(0.245)
Retiring CEO		−0.085**		−0.011		−0.064
		(0.040)		(0.031)		(0.055)
Duality		0.103***		0.081***		0.129***
		(0.026)		(0.030)		(0.033)
No. of VPs		0.021*		0.030***		0.026**
		(0.011)		(0.008)		(0.010)
Propensity of Relay Succession		−0.047***		−0.053***		−0.058***
		(0.016)		(0.014)		(0.018)
Ln (Median Industry Gap)		0.041*				
		(0.023)				
Ln (Median Industry ST Gap)				0.205***		
				(0.036)		
Ln (Median Industry LT Gap)						0.055***
						(0.020)
CFO Is VP		0.050		−0.013		0.000
		(0.040)		(0.024)		(0.047)
Ln (CEO Age)		−0.399***		0.167**		−0.493***
		(0.123)		(0.081)		(0.139)
Ln (CEO Tenure)		0.066***		0.056***		0.054**
		(0.024)		(0.015)		(0.022)
Ln (Total Asset)		0.282***		0.044***		0.279***
		(0.029)		(0.011)		(0.049)
Stk. Return Volatility		0.043		−0.065		0.132
		(0.084)		(0.048)		(0.144)
No. of Segments		−0.002		0.009		−0.007
		(0.013)		(0.009)		(0.010)
Observations	83,849	83,849	81,839	81,839	74,529	74,529
R^2	0.623	0.634	0.632	0.649	0.616	0.626
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Enforceability Down						
NCA Enforceability Down	−0.102**	−0.079*	−0.059*	−0.047*	−0.040	−0.020
	(0.048)	(0.042)	(0.032)	(0.027)	(0.093)	(0.082)
Observations	75,381	75,381	73,021	73,021	67,374	67,374
R^2	0.642	0.652	0.649	0.666	0.625	0.634
Controls from Panel A	No	Yes	No	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

enforcement. In Panel B, we observe marginally significant or even insignificant negative effects of this test variable on the executive pay gap. The economic impacts on *Total Gap* and *LT Gap* caused by the downward shocks are generally smaller than those caused by upward shocks, suggesting asymmetric effects from variations in state-level enforceability. We note that *ST Gap* decreases by about 5.2%, which could relate to the fact there is greater flexibility in adjusting short-term incentives (salary and bonus). However, we caution the reader against interpreting this finding as a treatment effect since there are significant pre-trends in *ST Gap* as we show later. Our finding that a shock that reduces enforceability has comparatively weak or muted effects is consistent with previous work that examines the effect of NCA enforceability reductions on other corporate financial outcomes (e.g., Lakkis (2023), Lin et al. (2022), Mueller (2023), and Tang et al. (2021)).

In the Supplementary Material, we follow prior research and use several alternative measures of the executive pay gap and model specifications. Tables OA.4 and OA.5 indicate that our findings for the increased enforceability events do not differ across any of the alternative dependent variables, test windows, and estimators. In contrast, the effects of *NCA Enforceability Down* on the executive pay gap are completely insignificant in most tests. Overall, we posit that companies expand the relative pay gap between the CEO and the VPs following enhanced NCA enforceability, but keep it similar when enforceability becomes weaker.

B. Dynamic Effects

Our identification employs a DID method, so it is necessary to check whether it satisfies the underlying assumption of parallel trends. We extend our baseline analysis by examining the dynamic effects of a change in NCA enforceability. In particular, we decompose the periods preceding and following each event into 5 bins. The indicators are equal to 1 if a firm's headquarters are in a state that experiences or experienced the event i) either 3 or 4 years into the future ($NCA\ Enforceability^{-3,-4}$); ii) either 1 or 2 years into the future ($NCA\ Enforceability^{-1,-2}$); iii) either in the current or previous year ($NCA\ Enforceability^{0,+1}$); iv) either 2 or 3 years ago ($NCA\ Enforceability^{+2,+3}$); or v) at least 4 years ago ($NCA\ Enforceability>=^{+4}$). We re-estimate the regressions of columns 2, 4, and 6 of Table 2 after replacing the test variable *NCA Enforceability Up (Down)* with this set of binary variables.

The results reported in Table 3 show that in the Enforceability Up sample, the assumption of parallel trends holds, and the effects of the treatment on the overall pay gap get stronger over time. We further examine *ST Gap* and *LT Gap.* The statistically significant effect of increased NCA enforceability on *ST Gap* is relatively transient: It mainly exists in the first 2 periods but then becomes insignificant. By contrast, the impact of the treatment on *LT Gap* persists. The differences in timing are likely attributable to the nature of the different components in the executive pay package. Changes in long-term pay (stock and option grants) usually take longer to materialize and produce more significant effects than changes in short-term pay (salary and bonus).

In contrast, some pre-trends are evident and significant in the sample of Enforceability Down events. Specifically, for *Total Gap*, we report a negative

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TABLE 3

Dynamic Effects

Table 3 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on the executive pay gap. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. The regressions in columns 2, 4, and 6 of Panels A and B in Table 2 are re-estimated by replacing the test variable *NCA Enforceability Up (Down)* with a set of binary variables that identify periods preceding and following an increase (decrease) in NCA enforceability. These binary variables are equal to 1 if the firm is headquartered in a state that: i) experiences a change in enforceability in either 3 or 4 years in the future ($NCA\ Enforceability^{-3,-4}$); ii) experiences a change in enforceability in either 1 or 2 years in the future ($NCA\ Enforceability^{-1,-2}$); iii) has experienced a change in enforceability in either the current or previous year ($NCA\ Enforceability^{0,+1}$; iv) has experienced a change in enforceability either 2 or 3 years ago ($NCA\ Enforceability^{+2,+3}$); v) has experienced a change in enforceability 4 or more years ago ($NCA\ Enforceability^{>=+4}$). The dependent variables reflect alternative definitions of the pay gap and are measured in year $t+1$. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Enforceability Up			Enforceability Down		
	Ln (Total Gap)	Ln (ST Gap)	Ln (LT Gap)	Ln (Total Gap)	Ln (ST Gap)	Ln (LT Gap)
	1	2	3	4	5	6
NCA Enforceability$^{-3,-4}$	0.078	0.036	0.047	−0.135	−0.119**	−0.175
	(0.122)	(0.045)	(0.116)	(0.106)	(0.051)	(0.104)
NCA Enforceability$^{-1,-2}$	0.084	0.002	0.068	−0.161*	−0.084***	−0.160
	(0.075)	(0.031)	(0.084)	(0.090)	(0.024)	(0.100)
NCA Enforceability$^{0,+1}$	0.219***	0.084*	0.215**	−0.163**	−0.092**	−0.152
	(0.075)	(0.042)	(0.094)	(0.063)	(0.045)	(0.111)
NCA Enforceability$^{+2,+3}$	0.222***	0.050	0.285***	−0.180*	−0.102**	−0.097
	(0.080)	(0.031)	(0.082)	(0.106)	(0.043)	(0.121)
NCA Enforceability$^{>=+4}$	0.254***	0.060	0.256**	−0.154	−0.120**	−0.077
	(0.072)	(0.041)	(0.110)	(0.100)	(0.051)	(0.145)
Observations	83,849	81,839	74,529	75,381	73,021	67,374
R^2	0.634	0.649	0.626	0.652	0.666	0.634
Controls from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

and statistically significant effect in years −1 or − 2. The pre-trend is stronger and more persistent when analyzing *ST Gap*, as all the test variables have negative and significant coefficients both before and after a Down event. There is no evidence of any significant change in *LT Gap* around a reduction in NCA enforceability. Therefore, the shocks that reduce NCA enforceability seem to coincide with unrelated trends that lead to reductions in *ST Gap.* The violations of the parallel trends assumption call into question the reliability of the already weak findings relating to reductions in NCA enforceability.

C. Executive Pay Levels

We next examine the effects of changes in NCA enforceability on the components of the executive pay gap—CEO and VP pay—to highlight differences in the adjustment frictions of the gap. Existing studies present mixed findings on the relation between NCA enforceability and executive pay levels. Garmaise (2011) reports a reduction in executive pay after increases in NCA enforceability, whereas Kini et al. (2021) find a positive relation between increases in NCA enforceability and CEO compensation. Because the determinants of executive pay levels and pay gaps may differ, we adopt model settings from recent studies that specifically address executive pay levels (e.g., Kini et al. (2021)) and replace some control variables in the baseline

model. The change in the model specification leads to a reduction in sample size for this test.

Column 1 in Panel A of Table 4 corroborates the findings of Kini et al. (2021), who argue that the affected CEOs get higher pay to reflect higher unemployment risks. We find significant and stable increases in both the short- and long-term components of their pay. We further find that, on average, VPs also benefit from tightened mobility in the labor market, although the growth in VP pay (*Total Pay*, *ST Pay*, or *LT Pay*) is lower than the growth in CEO pay. This evidence indicates that CEOs are not the only ones who benefit from restricted mobility by receiving higher compensation. In contrast, executives generally experience no changes in compensation after events that weaken NCA enforceability. This is consistent with prior evidence that firms are reluctant to reduce CEO pay (Dittmann, Maug, and Zhang (2011)) and that firms respond to labor supply shocks by asymmetrically adjusting executive pay, such as by increasing it when personal income tax rates rise but maintaining similar levels when tax rates fall (Bennett, Coles, and Wang (2021)). The only exception, in our case, is a significant increase in VP ST Pay, which appears to be the main driver of the reduction in *ST Gap* reported in Table 3. However, as we showed in column 5 of Table 3, this is possibly an unrelated trend, as it does not appear to result from the treatment effect of *NCA Enforceability Down.* Together, these findings suggest asymmetric effects on executive pay levels following the two types of enforcement change events, which help explain the asymmetry we observe in pay gap revisions.

V. Mechanisms Underlying the Baseline Findings

A. Outside Opportunities

We argue that the mechanism underlying our findings is that firms enlarge the executive pay gap to motivate and incentivize VPs whenever VPs' external mobility becomes more restricted. Thus, the degree to which shocks to NCA enforceability impact the pay gap should depend on the VPs' pre-shock external opportunities and incentives (also in relation to their internal promotion prospects). Adjustments to the pay gap should be less significant when the ex ante relative importance of VPs' external opportunities is more limited. We consider several variables that capture variations in this dimension to test our conjecture.

We first focus on the incidence of outside hires at the state-industry level, since executive mobility often happens within the same state or industry (Ma et al. (2020), Yonker (2017)). We expect that firms belonging to the cohorts in which CEOs tend to be promoted internally will rely less on the external labor market and thus be less sensitive to mobility shocks.[4] We calculate the fraction of insider CEOs in each state and industry and trisect the sample. In this test, we exclude the ever-relocated firms that are subject to opportunistic actions. In columns 1 and 2 of Panel A, Table 5, the

[4]A potential concern is that the likelihood of promoting insider CEOs is boosted by changes in NCA enforceability that make external hiring expensive. However, Cziraki and Jenter (2022) and Chen et al. (2022) both show that firms' hiring of CEOs is not affected by NCA frictions. In our sample, we find similar results; that is, neither an increase nor a decrease in enforceability affects CEO hirings (see Panel C, Table OA.15 in the Supplementary Material).

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TABLE 4

Executive Pay Levels

Table 4 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on CEO and VP pay levels and their components. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. The dependent variables reflect alternative definitions of executive compensation, i.e., CEO or VP pay levels, and are measured in year $t+1$. *NCA Enforceability Up (Down)* is measured in year t and is a binary variable that is set to 1 if a firm is headquartered in a state that has experienced an increase (decrease) in NCA enforceability over the current or previous years. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Ln (CEO Pay)	Ln (CEO ST Pay)	Ln (CEO LT Pay)	Ln (VP Pay)	Ln (VP ST Pay)	Ln (VP LT Pay)
	1	2	3	4	5	6
Panel A. Enforceability Up						
NCA Enforceability Up	0.148***	0.046**	0.167**	0.084***	0.036**	0.115*
	(0.033)	(0.018)	(0.072)	(0.030)	(0.015)	(0.064)
Industry Homogeneity	0.174*	−0.135*	0.362**	0.139	−0.043	0.262*
	(0.101)	(0.076)	(0.177)	(0.084)	(0.052)	(0.154)
ROA	0.210***	0.083***	0.360***	0.164***	0.103***	0.230***
	(0.065)	(0.023)	(0.090)	(0.050)	(0.023)	(0.083)
Ln (Total Asset)	0.315***	0.091***	0.330***	0.284***	0.090***	0.349***
	(0.016)	(0.010)	(0.022)	(0.014)	(0.010)	(0.018)
Mkt to Book Ratio	0.116***	0.015***	0.145***	0.102***	0.011***	0.161***
	(0.008)	(0.005)	(0.013)	(0.006)	(0.003)	(0.008)
Leverage	−0.189***	−0.046	−0.216***	−0.148***	−0.000	−0.259***
	(0.057)	(0.035)	(0.058)	(0.039)	(0.025)	(0.064)
Ln (Median Industry CEO Pay)	0.044**					
	(0.019)					
Ln (Median Industry CEO ST Pay)		0.189***				
		(0.021)				
Ln (Median Industry CEO LT Pay)			0.064***			
			(0.021)			
Ln (Median Industry VP Pay)				0.041***		
				(0.013)		
Ln (Median Industry VP ST Pay)					0.170***	
					(0.016)	
Ln (Median Industry VP LT Pay)						0.054***
						(0.016)
Cash Ratio	−0.016	−0.108*	0.035	−0.043	−0.092**	−0.002
	(0.048)	(0.057)	(0.059)	(0.036)	(0.037)	(0.077)
Dividend Payer	−0.039*	−0.030**	−0.026	−0.019	−0.021**	−0.004
	(0.022)	(0.012)	(0.023)	(0.016)	(0.010)	(0.022)
Stk. Return Volatility	0.056	−0.046	0.187**	0.084***	−0.020	0.290***
	(0.051)	(0.035)	(0.082)	(0.026)	(0.020)	(0.059)
Observations	82,426	80,574	72,968	82,426	80,574	72,968
R^2	0.755	0.759	0.704	0.803	0.806	0.726
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Enforceability Down						
NCA Enforceability Down	−0.045	−0.014	−0.028	0.010	0.035***	−0.034
	(0.038)	(0.015)	(0.056)	(0.028)	(0.011)	(0.059)
Observations	74,180	71,935	65,982	74,180	71,935	65,982
R^2	0.762	0.771	0.710	0.809	0.815	0.730
Controls from Panel A	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

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TABLE 5

Mechanisms Underlying the Baseline Findings

Table 5 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on the executive pay gap. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. The regressions in column 2 of Panels A and B in Table 2 are re-estimated by using sub-sets of observations and adding interaction terms for the test variable *NCA Enforceability Up (Down)*. In Panels A and B, columns 1 and 2 report the results for the top and bottom terciles of the fraction of insider CEOs in the same industry as the firm's state, columns 3 and 4 report the results for the top and bottom terciles of the skewness of CEO pay for the state the firm belongs to, while in columns 5 and 6, the split is based on whether the CEO is also the founder of the firm, with founders required not to be interim CEOs. Panels A and B also report the *p*-values of *F*-statistics testing the differences in coefficients on *NCA Enforceability Up (Down)* between the respective partitioned subsamples. In Panel C, *NCA Enforceability Up (Down)* is interacted with measures of average VP age, managerial ability score (Demerjian et al. (2012)), and product market HHI (Hoberg and Phillips (2016)). *Young VPs* equals 1 if the average age of VPs is below the sample annual median; *High Ability* equals 1 if managerial ability is above the sample annual median in the same industry; *Low HHI* equals 1 if the HHI is below the annual median in the same industry. The dependent variable is *Ln (Total Gap)*, measured in year $t+1$. *NCA Enforceability Up (Down)* is measured in year t and is a binary variable that is set to 1 if a firm is headquartered in a state that has experienced an increase (decrease) in NCA enforceability over the current or previous years. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Ln (Total Gap)					
	Fraction of Insider CEOs		Skewness of CEO Pay		CEO is Founder	
	Top Tercile	Bottom Tercile	Top Tercile	Bottom Tercile	Founder	Nonfounder
	1	2	3	4	5	6
Panel A. State Insider, Skewness of CEO Pay, and Founder CEOs: Enforceability Up						
NCA Enforceability Up	0.115**	0.486***	0.420***	0.088	0.374***	0.194***
	(0.057)	(0.156)	(0.074)	(0.057)	(0.085)	(0.054)
p-value	(0.027)		(0.001)		(0.072)	
Observations	24,420	23,615	23,103	22,431	6888	74,353
R^2	0.678	0.630	0.659	0.695	0.666	0.636
Controls from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. State Insider, Skewness of CEO Pay, and Founder CEOs: Enforceability Down						
NCA Enforceability Down	−0.076	−0.163	−0.100	−0.116	0.133	−0.097**
	(0.088)	(0.127)	(0.065)	(0.080)	(0.313)	(0.045)
p-Value	(0.574)		(0.876)		(0.456)	
Observations	21,997	21,261	20,659	20,335	6301	66,782
R^2	0.699	0.650	0.684	0.705	0.667	0.656
Controls from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

	Ln (Total Gap)					
	Enforceability Up			Enforceability Down		
	1	2	3	4	5	6
Panel C. Average Age of VPs, Managerial Ability, and Product Market HHI						
NCA Enforceability	0.167***	0.163***	0.142**	−0.046	−0.045	−0.075
	(0.046)	(0.052)	(0.054)	(0.036)	(0.040)	(0.045)
Young VPs	0.029			0.028		
	(0.020)			(0.019)		
NCA Enforceability × Young VPs	0.048**			−0.085		
	(0.023)			(0.076)		
High Ability		0.043*			0.046***	
		(0.024)			(0.015)	
NCA Enforceability × High Ability		0.062**			−0.078	
		(0.027)			(0.071)	
Low HHI			−0.027			−0.023
			(0.021)			(0.021)
NCA Enforceability × Low HHI			0.095**			−0.062
			(0.037)			(0.050)

(continued on next page)

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TABLE 5 (continued)

Mechanisms Underlying the Baseline Findings

	Ln (Total Gap)					
	Enforceability Up			Enforceability Down		
	1	2	3	4	5	6
Panel C. Average Age of VPs, Managerial Ability, and Product Market HHI						
Observations	83,598	82,176	81,735	74,487	73,226	72,804
R^2	0.634	0.631	0.634	0.645	0.642	0.646
Controls from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

top tercile sample shows a significantly lower change in pay gap in response to increases in NCA enforceability, compared to the bottom tercile sample.

Similarly, a VP can become a CEO in her current firm (move vertically) or another one (move diagonally). However, if pay levels are not significantly different across firms, she may be less motivated to leave the current employer and more indifferent to changes in NCA enforceability. We calculate the skewness of CEO pay at time t in a focal firm's headquarter state (excluding the focal firm). Executives in states with a more skewed distribution of CEO pay are more likely to get higher compensation once they leave their current firm. We also remove the observations for ever-relocated firms, as above. In columns 3 and 4 of Panel A, the top tercile sample based on CEO pay skewness shows a greater change in the pay gap than the bottom tercile sample when enforceability gets stronger.

We subsequently relax the assumption on the prevalence of within-state mobility and consider a firm-specific cross-sectional variable based on whether a CEO is also a founder. Given their significant voting power (on average), founder CEOs are rarely forced to leave their firms. Thus, the incentives of VPs working for founder CEOs mostly arise from external tournaments, since within-firm promotion expectations are limited. We use job titles from ExecuComp to identify founder CEOs. Interim CEOs are excluded from this test because they are likely to depart shortly. In columns 5 and 6 of Panel A, we find that the increase in the pay gap is significantly larger for firms with founder CEOs than for the nonfounder sample. This is consistent with the notion that VPs working for a founder require more internal tournament incentives to compensate them for the lost outside opportunities.

For completeness, we replicate all the above tests in the Enforceability Down sample and report the results in Panel B. The above variables do not affect the relation between the pay gap and *NCA Enforceability Down* in a statistically significant way, which is consistent with the weak and largely insignificant unconditional effects of Down events reported previously.

We next consider the cross-sectional variation in three variables that reflect outside job opportunities. First, executives' career concerns are associated with their age. Younger VPs usually have more career prospects and thus are more sensitive to the loss of outside options caused by the new rules. Career concerns are weaker for older VPs because the short prospective career decreases the value of opportunities in the external job market (Gibbons and Murphy (1992)). Second, job

opportunities depend on the talents and abilities of managers (Rajgopal, Shevlin, and Zamora (2006)). More able executives with excellent past performance are more welcome in the labor market. Third, executives working in less monopolistic product markets can more easily transfer their existing industry-specific skills to competitors.

Building on the above arguments, we augment our baseline specification with interactions of *NCA Enforceability Up* with the following three binary variables. *Young VPs* equals 1 if the average age of a firm's VPs in a particular year is below the annual sample median. *High Ability* equals 1 if a firm's managerial ability is above the industry median value each year. As it is impractical and difficult to distinguish the ability of an individual executive, we use the proxy from Demerjian, Lev, and McVay (2012) that models the ability of the whole top management team. *Low HHI* equals 1 if the Herfindahl–Hirschman Index (HHI) of sales within an industry is below the annual sample median. We use the HHI data developed through textual analysis of company filings by Hoberg and Phillips (2016). Columns 1 to 3 in Panel C of Table 5 show that the effects of increased NCA restrictions on the pay gap are more pronounced in firms with younger VPs, more able managers, and lower product market concentration. The findings are in line with our argument that exogenous changes in VP mobility drive the changes in pay gaps. However, there is no evidence that these variations drive the effects of Down events on executive pay gaps, as reported in columns 4 to 6.

B. The Role of RPE

In addition to the internal tournament arising from the presence of an executive pay gap, RPE can induce tournament-style incentives by setting performance targets relative to a benchmark (Wruck and Wu (2022)).[5] Specifically, PV provisions in compensation contracts can be set based on firm performance relative to a range of selected indices or peer companies. Managers are likely to focus more on idiosyncratic firm-level outcomes so as to outperform the selected peers and get higher compensation. As the use of PV provisions is effective in providing incentives and encouraging risk-taking (Bettis et al. (2018)), the board may adjust such provisions as a substitute for reductions in external tournament opportunities (Bettis et al. (2010)). If this is the case, then executives could already be shielded from systematic risks after losing outside options, and, consequently, the required level of compensation or internal tournament incentives could remain similar or even be lower after a positive shock to NCA enforceability. This conjecture is at odds with our prediction and main findings, but it raises 2 questions: i) Is the effect of an NCA enforceability shock on the implicit incentives arising from internal tournaments lessened or crowded out in firms that rely on PV grants? and ii) is the presence of RPE provisions in compensation contracts affected by enforceability shocks?

To answer the former question, we construct a measure of RPE that captures the presence of PV equity awards. *RPE* equals 1 if a firm's executive compensation includes PV provisions according to ISS Incentive Lab data (e.g., Bettis et al.

[5]Although RPE compensates managers based on their relative performance compared to peers, few firms reciprocally select each other as peers to set RPE (De Angelis and Grinstein (2020)). Therefore, these tournament-style incentives have fundamentally different features compared to rank-order tournaments.

(2018), De Angelis and Grinstein (2020), and Wruck and Wu (2022)). The test sample is limited to the period from 1998 to 2018 due to data availability. In Panel A of Table 6, we extend the baseline findings of Table 2 for the total executive pay gap by interacting the test variable, *NCA Enforceability*, with the conditional variable *RPE*. Consistent with our previous findings, we find significant changes in the pay gap only for *NCA Enforceability Up* (column 1). For both Enforceability Up and Enforceability Down events, there are no significant estimates for either the RPE dummy or its interaction with *NCA Enforceability*. Therefore, the impact of an NCA enforceability event on the executive pay gap is not different in firms that use PV provisions.

To address the latter question, we adopt a 2-stage method (see, e.g., Albuquerque (2009) and Jenter and Kanaan (2015)) to indirectly assess whether an executive's compensation contains RPE provisions (implicit RPE).[6] In the first stage, we estimate the following model:

$$(2) \qquad Firm\,Performance_{i,t} = \gamma + \delta \times Peer\,Performance_{i,t} + \epsilon_{i,t},$$

where for a particular firm-year, we use the firm's stock return to determine the component of its performance that is attributable to systematic factors (*Systematic Performance*), which can be predicted by the equally-weighted stock performance of its peers in terms of industry and size (Albuquerque (2009), Na (2020)), that is, $\hat{\gamma} + \hat{\delta} \times Peer\,Performance_{i,t}$. *Unsystematic Performance* is then obtained as a residual, $\hat{\epsilon}_{i,t}$ $(Firm\,Performance_{i,t} - \hat{\gamma} - \hat{\delta} \times Peer\,Performance_{i,t})$, which reflects firm-specific outcomes after accounting for peer shocks. RPE should make an executive's pay less sensitive to systematic performance factors outside her control. In the second stage, we examine the relation between a CEO's or an average VP's pay and *Systematic Performance* while controlling for *Unsystematic Performance* and whether the sensitivity of executive pay to systematic performance changes after an NCA enforceability event in the following model:

$$\begin{aligned}(3) \qquad & Ln(CEO/VP\,Pay)_{c,i,t+1} \\ & = \alpha + \beta_1 \times NCA\,Enforceability\,Up/Down_{c,t,s} \\ & \quad + \beta_2 \times Systematic\,Performance_{c,i,t} \\ & \quad + \beta_3 \times NCA\,Enforceability\,Up/Down_{c,t,s} \times Systematic\,Performance_{c,i,t} \\ & \quad + \beta_4 \times Unsystematic\,Performance_{c,i,t} \\ & \quad + \beta_5 \times NCA\,Enforceability\,Up/Down_{c,t,s} \times Unsystematic\,Performance_{c,i,t} \\ & \quad + \phi \times X'_{c,i,t} + \mu_{c,i} + \rho_{c,t} + \theta_{c,s} + \epsilon_{c,i,t+1},\end{aligned}$$

where X' represents variables capturing firm or industry characteristics measured at year t, as described in Section IV.C. $\mu_{c,i}$, $\rho_{c,t}$, $\theta_{c,s}$ denote firm, year, and state FEs within each cohort, respectively.

[6]Explicit RPE plans are typically disclosed voluntarily and may not reflect the board's consideration of systematic performance. Moreover, focusing on explicit RPE reduces the available sample size. Therefore, we opt to model the presence of RPE implicitly. However, when we alternatively use explicit RPE information from the ISS database as the dependent variable, we do not observe significant changes following changes in NCA enforceability (Panel D, Table OA.15 in the Supplementary Material).

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TABLE 6

Mechanisms Conditional on RPE

Table 6 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on the executive pay gap. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. In Panel A, the regressions in column 2 of Panels A and B in Table 2 are re-estimated by adding interaction terms for the test variable *NCA Enforceability Up (Down)*. *NCA Enforceability Up (Down)* is interacted with the measure of relative performance evaluation (RPE). *RPE* equals 1 if the firm includes performance-vesting provisions in executive compensation, according to ISS Incentive Lab. Due to data availability, the test sample is limited to the period from 1998 to 2018. The dependent variable is *Ln (Total Gap)*, measured in year $t+1$. In Panel B, the regressions in columns 1 and 4 of Panels A and B in Table 4 are re-estimated by adding interaction terms for the test variable. The dependent variables are *Ln (CEO Pay)* and *Ln (VP Pay)*, measured in year $t+1$. *NCA Enforceability Up (Down)* is interacted with *Systematic Performance* and *Unsystematic Performance*, which are the systematic and unsystematic components of firm stock returns, respectively, following Albuquerque (2009) and Jenter and Kanaan (2015). *NCA Enforceability Up (Down)* is measured in year t and is a binary variable that is set to 1 if a firm is headquartered in a state that has experienced an increase (decrease) in NCA enforceability over the current or previous years. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *** indicates significance at the 1% level.

Panel A. Explicit Measurement of RPE

	Ln (Total Gap)	
	Enforceability Up	Enforceability Down
	1	2
NCA Enforceability	0.248***	0.032
	(0.061)	(0.044)
RPE	0.003	0.009
	(0.045)	(0.044)
NCA Enforceability × RPE	−0.106	−0.142
	(0.065)	(0.087)
Observations	43,243	38,259
R^2	0.519	0.539
Controls from Table 2	Yes	Yes
Firm-Cohort FE	Yes	Yes
Year-Cohort FE	Yes	Yes
State-Cohort FE	Yes	Yes

Panel B. Implicit Measurement of RPE

	Enforceability Up		Enforceability Down	
	Ln (CEO Pay)	Ln (VP Pay)	Ln (CEO Pay)	Ln (VP Pay)
	1	2	3	4
NCA Enforceability	0.146***	0.087***	−0.045	0.013
	(0.034)	(0.030)	(0.034)	(0.026)
Systematic Performance	0.118***	0.086***	0.156***	0.116***
	(0.030)	(0.018)	(0.028)	(0.015)
NCA Enforceability × Systematic Performance	−0.005	0.029	0.023	0.049
	(0.056)	(0.035)	(0.037)	(0.035)
Unsystematic Performance	0.141***	0.112***	0.146***	0.116***
	(0.008)	(0.008)	(0.009)	(0.008)
NCA Enforceability × Unsystematic Performance	0.018	−0.024	−0.031	−0.005
	(0.027)	(0.024)	(0.030)	(0.020)
Observations	81,897	81,897	73,730	73,730
R^2	0.757	0.805	0.765	0.812
Controls from Table 4	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes

The results are reported in Panel B of Table 6. As in Section IV.C, we confirm that both CEOs and VPs receive significant pay raises in the Enforceability Up sample (columns 1 and 2) but not in the Enforceability Down sample (columns 3 and 4). In all four specifications, both types of performance are positively

associated with executive pay. However, the interaction between *NCA Enforceability* and *Systematic Performance* is never statistically significant, implying that executive pay does not become significantly more or less sensitive to systematic performance after Enforceability Up or Down events. Thus, the level of RPE in executives' pay does not seem to be affected by enforceability shocks.

C. Retention Considerations

Retention costs for executives are likely to change in response to mobility shocks. For example, companies may reduce their efforts to retain executives when markets become less mobile due to increased NCA enforceability. In such cases, one might expect no changes to CEO and VP pay levels or, theoretically, even reductions to pay levels, even though the latter is rarely observed in practice (Dittmann et al. (2011), Edmans et al. (2023)). This could lead to less significant changes in the pay gap following positive enforceability shocks. The reverse, where firms enhance CEO and VP pay levels in response to an increase in retention needs resulting from weakened NCA enforceability, could also hold. This could lead to greater pay gaps after NCA Enforceability Down events. In either case, retention costs might work against us finding results and lead us to underestimate the magnitude of the tournament incentive substitution we report. So, in this section, we turn our attention to the role of retention costs.

First, we acknowledge that retention costs for executives are positively correlated with the executives' outside job opportunities. Retention becomes more expensive for firms when managers have more job-switching opportunities, assuming a scarcity of talent supply (Rajgopal et al. (2006)). Thus, the variables *Fraction of Insider CEOs*, *Skewness of CEO Pay*, *Young VPs*, *High Ability*, and *Low HHI*, which we use in Section V.A to capture differences in outside options, may also relate to retention considerations. Retention costs, such as increased pay (Bennett et al. (2021)), are arguably higher for firms in states where CEOs tend to be hired from other firms and where CEO pay is highly skewed, as voluntary moves to other firms would be more frequent and potentially more rewarding in these states. Similarly, it is more challenging and costly to retain executives who, due to their youth and high ability, have numerous outside opportunities and a willingness to change jobs. Last, a low product market concentration should be associated with significant outside opportunities for executives and high retention costs for firms.

Following the retention argument above, an *NCA Enforceability Down (Up)* event could cause a positive (negative) effect on the executive pay gap, which could be amplified in firms with high retention costs. However, our findings in Table 5 do not align with these expectations. The impact of a decrease in NCA enforceability on the executive pay gap is not affected by any of the five proxies of retention costs. Regarding Enforceability Up events, we observe that in treated firms with high retention costs, the post-event change in the pay gap is actually positive, and it is larger than the change for treated firms with low retention costs.

Second, we conduct some tests to reinforce our conclusion that a retention story does not dilute the effects of enforceability events on the executive pay gap. We consider three additional proxies of retention costs that are plausibly unrelated to, or that are not directly tied to, executives' outside opportunities. Firstly, our *Litigation*

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Industry dummy represents industries with a high incidence of litigation. Executives' reputation concerns about litigation can increase executives' voluntary turnover and thus firms' retention costs (Andrus, Withers, Courtright, and Boivie (2019)). Secondly, retaining executives is more valuable—and thus more costly—for firms with a high market-to-book ratio (*High Mkt to Book*), as these firms typically have significant growth opportunities and trade secrets (Chen et al. (2022)). Thirdly, firms that rely less on skilled labor (*Low Skill Reliance*) have lower retention costs, given their relative lack of labor (including executives) with highly valuable skills (Qiu and Wang (2021)). We find that the interactions between these three variables and the test variable *NCA Enforceability* in Table 7 are never statistically significant.

We also separately investigate whether a retention mechanism can explain changes in CEO and VP pay levels when NCA enforceability increases or decreases. The results, presented in Table OA.6, show that in most cases such a mechanism has no explanatory power. Overall, these results indicate that retention considerations or costs do not significantly affect our main findings.

TABLE 7

Alternative Mechanism: Retention

Table 7 reports the effect of a state-level change in the enforceability of noncompete agreements (NCAs) on the executive pay gap. The sample covers the S&P ExecuComp firms (financial and utility firms are excluded) for the period 1993–2018. The coefficients are estimated using the stacked-regression method by Baker et al. (2022) for a test window of $t \pm 10$ (t is the event year), using firms headquartered in never-treated states as "clean" controls. The regressions in column 2 of Panels A and B in Table 2 are re-estimated by adding interaction terms for the test variable *NCA Enforceability Up (Down)*. *NCA Enforceability Up (Down)* is interacted with measures of the degree of litigation in an industry, market-to-book ratios, and skilled worker reliance (Qiu and Wang (2021)). *Litigation Industry* equals 1 if the firm is in one of the following industries: pharmaceutical/biotechnology (SIC codes 2833–2836, 8731–8734), computer (3570–3577, 7370–7374), electronics (3600–3674), or retail (5200–5961) (Cheng and Warfield (2005)); *High Mkt to Book* equals 1 if the *Mkt to Book Ratio* is above the sample annual median in the same industry; *Low Skill Reliance* equals 1 if the skilled labor risk is below the annual median. The dependent variable is *Ln (Total Gap)*, measured in year $t+1$. *NCA Enforceability Up (Down)* is measured in year t and is a binary variable that is set to 1 if a firm is headquartered in a state that has experienced an increase (decrease) in NCA enforceability over the current or previous years. All models include firm-cohort, year-cohort, and headquarter-state-cohort fixed effects. Detailed variable definitions can be found in the Appendix. The standard errors in parentheses are clustered at the headquarter-state level. The coefficients on constants are not reported. *, and *** indicate significance at the 10%, and 1% levels, respectively.

	Ln (Total Gap)					
	Enforceability Up			Enforceability Down		
	1	2	3	4	5	6
NCA Enforceability	0.205***	0.186***	0.214***	−0.057	−0.078*	−0.120
	(0.057)	(0.054)	(0.072)	(0.041)	(0.045)	(0.084)
NCA Enforceability × Litigation Industry	−0.062			−0.105		
	(0.124)			(0.118)		
High Mkt to Book		0.232***			0.211***	
		(0.029)			(0.030)	
NCA Enforceability × High Mkt to Book		0.003			−0.030	
		(0.033)			(0.028)	
Low Skill Reliance			0.037			0.019
			(0.036)			(0.026)
NCA Enforceability × Low Skill Reliance			−0.017			−0.060
			(0.032)			(0.124)
Observations	83,849	82,989	64,648	75,381	74,604	56,925
R^2	0.634	0.638	0.644	0.652	0.657	0.665
Controls from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

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D. Firm Value Implications

So far, we have provided robust evidence that firms widen their executive pay gaps following stricter enforcement, while the effects are muted following weaker enforcement. We next evaluate whether firms' response to stricter NCA enforcement has implications for firm value.

Recent studies highlight that strict mobility restrictions caused by NCA enforcement stifle profitability and productivity because they lower the effectiveness of talent reallocation (Anand et al. (2018), He and Wintoki (2023), and Shi (2023)). At the same time, a properly designed compensation system helps develop managerial talents in the internal labor market and creates better performance (Hvide (2002), Kale et al. (2009), and Lazear and Rosen (1981)). Such effects are potentially more evident in less mobile labor markets, where executives are more likely to actively participate in rank-order tournaments. Therefore, a trade-off emerges, and the impact of the change in the executive pay gap may counteract the negative impact in firm value from NCA enforceability increases.

We examine changes in firm value in terms of monthly stock returns following increases in NCA enforcement, distinguishing between treated firms with positive and treated firms with nonpositive variations in pay gap. We consider the change in the pay gap either from year $t-1$ to t or from year $t-1$ to $t+1$. Since 1996 is the earliest treated year in our sample, the constructed data set of CRSP monthly returns starts from 1997. In each calendar month, we build a portfolio return as follows: A long position is assumed to be taken in firms with expanded pay gaps, and a short

TABLE 8

Firm Value Implications

Table 8 documents the firm value implications of a state-level increase in the enforceability of noncompete agreements (NCAs) conditional on the change in the executive pay gap. Panel A (B) considers the change in the pay gap from $t-1$ to t ($t+1$). Observations for all treated firms are retained starting from the year following the increase in NCA enforceability to build portfolios of treated stocks. In each monthly portfolio, we take a long (short) position in the subsample with increases (nonincreases) in the pay gap. The monthly portfolio returns are computed as equally weighted (column 1) or market-capitalization-weighted (market capitalization measured at the end of the previous month) (column 2) average monthly stock returns. The reported alphas are from time-series regressions over several sample periods of portfolio returns on the Fama–French 5 factors. The standard errors in parentheses are computed using the Newey–West estimators for 4 lags. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Equally Weighted Portfolio		Weighted Average Portfolio
	1		2
Panel A. Pay Gap Change from Year $t-1$ to Year t			
Alpha for holding 12 months	1.861%*		1.334%*
	(0.010)		(0.007)
Alpha for holding 24 months	1.128%**		1.246%**
	(0.006)		(0.005)
Alpha for holding 36 months	1.178%***		1.191%***
	(0.004)		(0.004)
Observations		264	
Panel B. Pay Gap Change from Year $t-1$ to Year $t+1$			
Alpha for holding 12 months	0.694%		1.651%*
	(0.007)		(0.009)
Alpha for holding 24 months	1.093%**		1.254%*
	(0.005)		(0.006)
Alpha for holding 36 months	1.199%***		1.254%***
	(0.004)		(0.004)
Observations		252	

position is assumed in firms with nonexpanded pay gaps. The portfolio return is either equally weighted or market-capitalization-weighted (the market capitalization is recorded at the end of the previous month). We use the Newey–West estimator with 4 lags to regress the monthly portfolio return on the respective Fama–French 5 factors.[7] As shown in Table 8, the portfolios often generate significant positive alphas across different holding periods, i.e., 12, 24, or 36 months. Overall, we report potential heterogeneous value effects when executive mobility is restrained. Firms that decide to enlarge their pay gaps in response to increased NCA enforcement perform significantly better on the stock market.

VI. Conclusion

We study how exogenous variations in NCA enforceability affect a firm's executive pay gap (i.e., the gap between CEO and VP pay), which the firm can use to provide tournament incentives to VPs. We find that a positive shock to enforceability causes a significant decrease in executive mobility and, more importantly, an increase in the pay gap. The implications of these findings are significant since many studies find evidence that income dispersion among top executives has substantial effects on financial decisions and other corporate outcomes (e.g., Kale et al. (2009), Kini and Williams (2012)).

Our baseline results are more pronounced for firms in states with a high proportion of outside-hired CEOs or with a more skewed distribution of CEO pay; firms with founder CEOs, younger VPs, or more capable top executives; and firms in industries with lower product market concentration. VPs in firms with these characteristics are expected to value external job opportunities more and to require more significant internal tournament incentives when these opportunities are curtailed.

In contrast, we find that the effects of reduced NCA enforcement are weak or even insignificant, as the board does not significantly adjust the executive pay gap. We present several pieces of evidence that question the value of shocks decreasing NCA enforceability in our setting and that potentially help explain these asymmetric findings. Alternative explanations, such as the inclusion of performance-vesting provisions in equity pay and the considerations surrounding retention issues, do not drive our main findings.

We document that the potential adverse effects on firm performance due to increases in NCA enforceability vary significantly between firms with and without post-shock increases in pay gaps. A portfolio that goes long in treated firms with increased pay gaps and short in the remaining treated firms can generate positive abnormal returns. Thus, a widened pay gap can protect shareholder value from the negative effects of a less mobile executive labor market.

Our findings help explain executive compensation practices in the presence of managerial mobility. In April 2024, the Federal Trade Commission (FTC) released its final rule prohibiting employers from imposing or enforcing new NCAs on workers, including top executives.[8] We anticipate firms' responses to this decision

[7]The data set is available on Kenneth R. French's Data Library.

[8]See "FTC announces rule banning noncompetes," FTC, Apr. 23, 2024.

to be muted with regard to compensation incentives, in particular, executive pay gaps, since our results indicate a substitution effect between external and internal tournament incentives only when executive mobility is constrained.

Appendix: Variable Definitions

Compensation Variables

Total Gap: The difference between the CEO's total compensation and the average compensation of the VPs. To mitigate the data inconsistency caused by the introduction of FAS 123R, total compensation data is adjusted following Coles et al. (2013) and Kini and Williams (2012). (Source: ExecuComp)

ST Gap: The difference between the CEO's short-term (ST) compensation and the average ST compensation of the VPs. ST compensation is the sum of salary and bonus. (Source: ExecuComp)

LT Gap: The difference between the CEO's long-term (LT) compensation and the average LT compensation of the VPs. Before the FAS 123R, LT compensation is the total value of the long-term incentive plan, restricted stock granted, and options granted. After the FAS 123R, LT compensation is the total value of the nonequity incentive pay, stocks granted, and estimated value of options granted (we hypothesize that the cash payment of formulaic multiyear plans in the nonequity incentive pay is nonnegligible). (Source: ExecuComp)

Median Industry Gap: The median *Total Gap* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Median Industry ST Gap: The median *ST Gap* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Median Industry LT Gap: The median *LT Gap* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Total Gap): Natural logarithm of *Total Gap.*

Ln (ST Gap): Natural logarithm of *ST Gap.*

Ln (LT Gap): Natural logarithm of *LT Gap.*

Ln (Median Industry Gap): Natural logarithm of *Median Industry Gap.*

Ln (Median Industry ST Gap): Natural logarithm of *Median Industry ST Gap.*

Ln (Median Industry LT Gap): Natural logarithm of *Median Industry LT Gap.*

Ln (CEO Pay): Natural logarithm of the total compensation of the CEO. (Source: ExecuComp)

Ln (CEO ST Pay): Natural logarithm of the ST compensation of the CEO. ST compensation is the sum of salary and bonus. (Source: ExecuComp)

Ln (CEO LT Pay): Natural logarithm of the LT compensation of the CEO. Before the FAS 123R, LT compensation is the total value of the long-term incentive plan, restricted stock granted, and options granted. After the FAS 123R, LT compensation is the total

value of the nonequity incentive pay, stocks granted, and estimated value of options granted. (Source: ExecuComp)

Ln (VP Pay): Natural logarithm of the average total compensation of the VPs. (Source: ExecuComp)

Ln (VP ST Pay): Natural logarithm of the average ST compensation of the VPs. ST compensation is the sum of salary and bonus. (Source: ExecuComp)

Ln (VP LT Pay): Natural logarithm of the average LT compensation of the VPs. Before the FAS 123R, LT compensation is the total value of the long-term incentive plan, restricted stock granted, and options granted. After the FAS 123R, LT compensation is the total value of the nonequity incentive pay, stocks granted, and estimated value of options granted. (Source: ExecuComp)

Ln (Median Industry CEO Pay): Natural logarithm of *Median Industry CEO Pay*, which is the median *CEO Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Median Industry CEO ST Pay): Natural logarithm of *Median Industry CEO ST Pay*, which is the median *CEO ST Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Median Industry CEO LT Pay): Natural logarithm of *Median Industry CEO LT Pay*, which is the median *CEO LT Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Median Industry VP Pay): Natural logarithm of *Median Industry VP Pay*, which is the median *VP Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Median Industry VP ST Pay): Natural logarithm of *Median Industry VP ST Pay*, which is the median *VP ST Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Ln (Median Industry VP LT Pay): Natural logarithm of *Median Industry VP LT Pay*, which is the median *VP LT Pay* for firms in the same Fama–French 30 industry, year, and quartile of total assets (excluding the focal firm). (Source: ExecuComp)

Executive Characteristics

CEO Age: Age of CEO. (Source: ExecuComp)

CEO Tenure: Number of years as CEO. (Source: ExecuComp, BoardEx)

CEO Is Insider: Dummy that equals 1 if the CEO has worked in the firm for at least 12 months prior to becoming CEO, and 0 otherwise. (Source: ExecuComp, BoardEx)

CFO Is VP: Dummy that equals 1 if one of the VPs is the CFO, and 0 otherwise. An executive is identified to be a CFO according to the Execucomp variable "CFO annual flag" (CFOANN = CFO). Considering that the variable often has missing values prior to 2007, we follow Kubick and Masli (2016) and classify an executive as CFO if the executive's job title includes any variants of "CFO," "financial," "finance," "treasurer," or "controller." (Source: ExecuComp)

Duality: Dummy that equals 1 if the CEO is also chairman in the same firm, and 0 otherwise. (Source: ExecuComp)

Ln (CEO Age): Natural logarithm of *CEO Age.*

Ln (CEO Tenure): Natural logarithm of *CEO Tenure.*

New CEO: Dummy that equals 1 if the CEO is in her first year in the role, and 0 otherwise. (Source: ExecuComp)

No. of VPs: Number of VPs. (Source: ExecuComp)

Propensity of Relay Succession: Dummy that equals 1 if a president or COO is distinct from the CEO or chair, and 0 otherwise, following Naveen (2006). (Source: ExecuComp)

Retiring CEO: Dummy that equals 1 if *CEO Age* is 65 or more, and 0 otherwise. (Source: ExecuComp)

Firm/Industry Characteristics

Industry Homogeneity: Mean partial correlations between the returns on firms from a particular industry and the return on an equally weighted index constructed by using all the firms from the same industry, holding the market return constant (Parrino (1997)). Estimated based on 36 monthly returns. Industry is defined as the Fama–French 30 industry. (Source: CRSP)

Ln (Total Asset): Natural logarithm of total assets. (Source: Compustat)

Stk. Return Volatility: Volatility of past 36 monthly returns. (Source: CRSP)

No. of Segments: Number of business segments in which a firm operates. (Source: Compustat)

Cash Ratio: Cash over total assets. (Source: Compustat)

Dividend Payer: Dummy that equals 1 if the firm has paid dividends in a year, and 0 otherwise. (Source: Compustat)

ROA: Net income over total assets. (Source: Compustat)

Leverage: Long-term debt plus debt in current liabilities, scaled by total assets. (Source: Compustat)

Mkt to Book Ratio: Total assets minus the book value of equity plus the market value of equity, scaled by total assets. Book value of equity is book common equity minus preferred stock and plus deferred taxes. (Source: Compustat)

RPE: Dummy that equals 1 if the firm includes performance-vesting provisions in executive compensation in a year, and 0 otherwise. (Source: ISS Incentive Lab)

Systematic Performance: The predicted value of regressing firm stock return on peer stock return, which is measured as the equal-weighted portfolio return of firms in the same industry and size quartile (excluding the focal firm). (Source: CRSP, Compustat)

Unsystematic Performance: The residual of regressing firm stock return on peer stock return, which is measured as the equal-weighted portfolio return of firms in the same industry and size quartile (excluding the focal firm). (Source: CRSP, Compustat)

Conditional Variables

Young VPs: Dummy that equals 1 if the average age of VPs is below the sample annual median, and 0 otherwise. (Source: ExecuComp, BoardEx, 10-K files, and company's official websites)

High Ability: Dummy that equals 1 if managerial ability is above the sample annual median in a same industry, and 0 otherwise. Managerial ability data is from Demerjian et al. (2012).

Low HHI: Dummy that equals 1 if the HHI is below the annual median in a same industry, and 0 otherwise. Product market HHI data is from Hoberg and Phillips (2016).

Litigation Industry: Dummy that equals 1 if the firm is in the following industries: pharmaceutical/biotechnology (SIC codes 2833–2836, 8731–8734), computer (3570–3577, 7370–7374), electronics (3600–3674), or retail (5200–5961), and 0 otherwise, following Cheng and Warfield (2005). (Source: Compustat)

High Mkt to Book: Dummy that equals 1 if the *Mkt to Book Ratio* is above the sample annual median in a same industry, and 0 otherwise.

Low Skill Reliance: Dummy that equals 1 if the skilled labor risk is below the annual median, and 0 otherwise. Skilled worker risk data is from Qiu and Wang (2021).

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S002210902510166X.

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