The downside of tournament incentives: Evidence from the trading behavior of non-promoted insiders

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Abstract

We find that several non-promoted executives remain in their firm after losing CEO tournament contests and suffering a drastic reduction in their contract's promotion-based component and a wider pay gap. We show that they use their private information to sell their holdings profitably, against the newly appointed CEOs' optimistic and noisy buy trades. They do not trade on their private information in their rare purchases and before losing the contest, to maximize their CEO promotion probabilities, consistent with the substitution hypothesis. Those who stand to lose more from missing their promotion respond more negatively to a promotion pass-over and have a higher incentive to exploit their informational advantage in both voluntary and involuntary CEO turnover events. Their loss-averting sell transactions are more profitable than their peers who left the firm and are related to investors' sentiments, their firm's subsequent underperformance, board conservatism, industry tournament incentives, and their ability to implement dissimulation strategies to thwart outsiders and market regulators. Using instrumental variable to address the reverse causality concern, we show that this strategy weakens the well-documented positive relationship between tournament incentives and firm performance. Our results hold for various other specifications and robustness checks and highlight new implications of the tournament incentives models, compensation committees, and insider trading regulations.

Keywords: Tournament Incentives; Executive Compensation; Career Outcome; Insider Trading
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1. Introduction

Firms hold occasional promotion tournaments as a contest between senior executives, whereby, only the best relative performer will win the competition to become the CEO and receive generous remuneration, perks, and privileges. The tournament incentives models posit that high-ranking non-CEO managers are willing to accept compensation contracts below the optimal level for their effort, as they incorporate the expected value of future promotional prospects (Lazear and Rosen, 1981; Main, O'Reilly and Wade, 1993; Murphy, 1999; Bognanno, 2001; DeVaro, 2006). The theory also predicts that a large pay difference among different ranks will effectively encourage employees to exert more effort, since each of them can be promoted to a higher rank and helps principals to encourage all executives to work hard and reward the most able managers. Empirically, there is a positive relationship between the pay increase they expect to receive if they successfully realize the promotion-based incentives and firm performance (Kale, Reis and Venkateswaran, 2009). However, the tournament losers who remain voluntarily in their firm after the contest, will still be under-compensated for their efforts, due to the drastic decline in the expected value of their future promotion. The question remains as to whether they will sustain their efforts to strengthen their case for promotion in the future within or outside their current firm (Campbell 2008, Chan 2018) or decrease their productivity after being passed over for promotion (Karachiwalla and Park 2016). We offer a potential explanation for this puzzle by inferring 'what they were thinking' from their trading behavior after losing the contest. We test whether they show a vote of confidence by mimicking the newly appointed CEO and buying more shares or use their private information to trade against the newly appointed CEO's positive buy trade signals and sell profitably their previously cumulated holdings[2].

We expect non-promoted executives to buy shares in their firm after losing the tournament contest if they are confident about their firm's prospects under the new leadership, as previous evidence

[2] For example, on 1st November 2016, The Toro Company (NYSE: TTC) internally promoted Mr. Olson to be the next CEO, replacing the eleven-year incumbent Mr. Hoffman, with a subsequent increase in his compensation package from $1.5 to $4 million. The other three internal candidates stayed with the firm and executed, the following year, several loss-avoiding sell trades with an average yearly abnormal returns of -13.78% and generated 40.43% (41.89%) lower yearly abnormal returns than their sell transactions executed one year (two years) before the contest. Cohan (2022) describes the complexities of the tournament contest at GE to replace Jack Welsh.

shows that insiders buy share in their company to make money (Lakonishok and Lee, 2001). Their purchases will also reflect the focus of their attention on future promotion opportunities instead of pondering over their missed promotion, and the continuation of their performance as their learning effect still lasts, and that the disincentives from promotion rejections do not fully dilute the benefit of learning from the *ex-ante* promotion incentives, despite losing their promotion incentive (Campbell 2008; Du, Li, Luo, and Ma, 2022).

However, buying stocks is risky as it implies mimicking the newly appointed CEO who may do so for several reasons. Armstrong, Blackburne, and Quinn (2021) find that new CEOs buy stocks in their own firm to signal their commitments to improve their firm's performance, and to prolong their tenure even if they subsequently underperform. Such trades are noisy and not necessarily to seek a profit, yet the market reacts positively, overvaluing the firm, and systematically generating low subsequent long-term abnormal returns. Consequently, we expect non-promoted insiders to take advantage of their private information, and adopt contrarian strategies by selling, not buying, overvalued shares and increasing their profitability. Similarly, incumbent non-promoted executives, if they are not laid off, will sell as they are not likely to support the new CEO (Boumosleh and Cline, 2022; Cohan, 2022). Offloading their vested options or personal ownership may not necessarily be profitable if they reflect their rebalancing objectives, liquidity needs, uncertainty over market outlook, and/or undertaken when their firm reached a period of relative stability (Cohen, Malloy, and Pomorski, 2012). However, they could sell for personal monetary gain using their private information, as they are closely involved in their firm's daily operations of and have superior access to price-sensitive information, with low litigation risk[3], if they time their trades before any material private information is released, if they are pessimistic about their firm's future prospects under new leadership (Lakonishok and Lee, 2001; Roulstone, 2003; Ravina and Sapienza, 2010; Cohen et al., 2012), or to signal a subsequent drop in their performance reflecting their discontent after being passed over for promotion (Du et al., 2022).

[3] Unlike most previous studies, we focus on non-CEO executives who are less subject to the regulator's scrutiny than CEOs. For example, Han, Jagannathan, and Krishnamurthy (2014) report that, unlike CEOs' sell trades, those undertaken by other insiders, including their opportunistic sales, do not materially impact the likelihood of a lawsuit in the quarter prior to stock price crashes. However, for purchases, while Knewtson and Nofsinger (2014) find that CFOs' transactions are associated with higher returns because they face lower visibility and scrutiny than CEOs, Wang et al. (2012) relate this higher profitability to CFOs' better information about future earnings rises.

We use a sample of 165,705 insider transactions undertaken by 21,723 US non-CEO executives between 1996 and 2019 to test our hypotheses. We find that 68 *per cent* non-promoted managers remain in their firm two years after losing the tournament. We document a substantial increase in their intensive sell trades in their own company, but only after the tournament because their winning probabilities is likely to be adversely affected if they executed their transactions before the tournament. These results may suggest that they unwind previously accumulated equity positions following non-promotion to reduce their undiversified portfolio, with maybe no profits (Cohen et al., 2012), and probably to bypass regulatory constraints as Lakonishok and Lee (2001) argue that insiders sell a stock for a variety of reasons, but the main motivation to purchase a stock is to seek profit. However, we find that their trades are not random. They are significantly more profitable in the year they have lost their CEO promotion than they would have generated without CEO turnover. Their loss-averting sell trades persist one year after the CEO turnover and are significantly more profitable than their peers who left the firm, suggesting that they trade using their private information. Both voluntary and involuntary CEO turnover events lead to an increase in trading profitability.

We use various proxy variables, following mainly Kale et al. (2019) findings, to support further our arguments that insiders who stand to lose more from missing the promotion, we refer to as *ex-post* expectation discrepancy, based on deprivation theory (Du et al., 2022), may respond negatively to a promotion pass-over (Lam and Schaubroeck 2000) and have a higher incentive to exploit their informational advantage with greater profitability. We find that the losing tournament effect is weaker for firms with planned CEO successor prior to the tournament, as the assignment of a CEO successor mitigates the discontent among non-promoted managers. We also find that insiders with larger pay gap relative to their CEO's, before the tournament outcome, trade on their private information more aggressively because of the higher opportunity loss. In the same logic, we show that the trading profitability is higher for younger insiders because they have a higher expected value on the promotion-based components in their remuneration contracts as their career horizons are longer, while older and closer to retirement insiders appear to place less importance on the future promotion opportunity. We further report that insiders who have stayed in the firm for a long time but never won a CEO tournament

trade with lower aggressiveness because they are unlikely to win any future CEO tournament. Similarly, we find that short investment horizon sellers have shorter career prospects because they frequently reverse their previous buy positions to reduce their ownership (Akbas, Jiang and Koch, 2020). Moreover, we report that managers with higher probability of becoming CEO but failed to be promoted trade on their private negative information more aggressively because they have higher expected value of implicit promotion-based incentives, but those who receive a larger retention bonus after losing the tournament trade on their private information less aggressively as their forgone incentives is lowered, in line with Armstrong et al. (2021). Lastly, we show that their trading profitability is decreasing with the board conservatism as better-governed firms can restrict insiders from exploiting their private information (Dai, Fu, Kang, and Lee, 2016; Jagolinzer, Larcker, and Taylor, 2011), and with the level of industry tournament incentives defined by Coles, Li and Wang (2018), as outside job prospects are imperfect substitutes for their forgone CEO promotion opportunities.

We consider the possible reverse causality induced by the probability that tournament losers trade on their private negative information more aggressively outside the CEO turnover event window. We employ a 2SLS estimator to generalize the results and assess whether the increase in insider trading profitability is significantly higher than their unconditional return predictabilities. We show that the increase in the return predictability embedded in trades after the CEO turnover persists even two years after losing the CEO promotion opportunity. Their sell, but not their buy, trades are more profitable when the newly appointed CEOs increase their holdings. We question why their buy trades, which involve relatively lower litigation risk (Dai et al., 2016), are rare. Inspired by the finding of Armstrong et al. (2021) that newly appointed CEOs are noisy traders, we find that non-promoted managers sell trades are loss-averting as they trade against overconfident CEO purchases, which result in short-term inflated stock prices but lower long-term returns. We find that they dissimulate their private negative information by making sequential sell transactions and randomly mixing with uninformative purchase transactions to thwart outsiders and market regulators. We show that the losing CEO competition effect becomes stronger after accounting for these strategies. Moreover, the sell trades of the nonpromoted executives who left their firm after the tournament do not drive our results.

To test for the firm-level informativeness, we follow Tucker and Zarowin (2006) and construct the future earnings response coefficient, and Piotroski and Roulstone (2004) to calculate the return synchronicity. We expect insiders' sell trades to be less profitable when the future earnings response coefficient is lower, and their buy trades do not vary with these two firm-level informativeness measures. We find no significant relationship between the return synchronicity and insider transaction profitability. We show that the change in insider trading profitability is robust to the inclusion of these two proxies, suggesting that trading on their firm's stock misevaluation contributes to the increase in their trading profitability, but is also a way of increasing their trading profitability post-CEO tournament context.

We investigate the informational content behind these transactions. We show that unobservable stock and market movement do not randomly drive the higher abnormal profits. Their firms strategically release more discretionary news in the month they sell shares. They trade on the future decreases in both return on asset and investor sentiment, and their firm's future underperformance, but this is not the case for their relatively rare purchases. These results suggest that insiders exert less effort and trade on the worsening in future firm performance after losing the tournament for personal gains, and probably to undermine the performance of the newly promoted CEO. We also find that the historical average insider trading profitability and the board conservatism can predict the scale of post-tournament turnover among nonpromoted directors, implying that they assess the abnormal profit they can generate from their future informed trading before deciding to leave or stay in the firm.

One main concern in the literature on insider trading is endogeneity, as the true motivations behind insiders' transactions, including private information, personal liquidity need, and portfolio diversification, are not directly observable, leading to random post-trades' returns, omitted variable bias, and, consequently, to inconsistent estimates. We base our results on three approaches to mitigate this problem. Firstly, we specify a diff-in-diff regression based on matched sample to isolate the losing CEO tournament effect within event years (-2, +1). We match our test firms with a control group without CEO turnover by total assets, average insider trading profitability, and book-to-market ratio, one year before our test firms' CEO turnover. To test the appropriateness of our matching algorithm, we follow Angrist and Pischke (2009), Cengiz, Dube, Lindner, and Zipperer (2019), and Baker, Larcker and Wang

(2021) and conduct an event-study type diff-in-diff regression to show the parallel trend assumption. Second, we apply two-stage least square (2SLS) by using the age of former CEO as instrumental variable (IV) to further generalize the finding outside our event window and assess the profitability that is solely attributed to CEO turnover. The former CEO's age is a publicly available information, not correlated with the firm's future fundamental that insiders are exploiting because former CEO has left the firm on average six years ago, but it empirically embeds predictive power for the future CEO turnover. We informally test the exclusion restriction of our IV by showing that former CEO's age contains little predictive power for non-CEO insider trading profitability outside the CEO turnover event, further stressing the exclusion restriction plausibility.

Third, we argue if our story is not driven by unobservable endogeneity. We assess whether the Kale et al. (2009) positive causal effect between the tournament incentives and firm performance is overestimated since insiders have outside options to trade on their private information to mitigate their forgone compensation incentives. We replicate their results to find persistence in the positive causal relationship between tournament incentives and firm performance in our sample period. However, when, following Kim and Lu (2011), we use the sum of the maximum marginal federal and state long-term capital gain tax rates as our IV for the total non-promoted insider transactions, the causal relationship becomes weaker when non-CEO insiders execute more trades, confirming our hypothesis that non-promoted executives trade to signal their discontent after being passed over for promotion, and our previous results are not driven by endogeneity.

Our results are also robust when we use different return proxies, control for performance-induced CEO turnover, include another fourteen control variables that proxy for the possible channels in which the age of a former CEO can indirectly affect the firm's future value, exclude tournament competitors that are not the top two highest paid non-CEO managers in the firm or older than 60, include 10b5-1 transactions, exclude firms that retain former CEOs, exclude firms that promote outsider as CEO, and when we remove firms with a COO prior to the tournament, and CFO trades. We construct pseudo-CEO turnovers to test for robustness of our diff-in-diff regressions and conduct 1,000 placebo tests for diff-in-diff and 2SLS regressions separately to rule out the possibility that our significant results

are due to luck. Lastly, we find that two alternative explanations, the low skills of the newly appointed CEOs, and higher return volatility following CEO turnover, do not drive the higher return profitability.

We base our analysis on the intersection between insider trading and tournament incentives literatures. The former has focused mainly on insider trading informativeness and profitability. The latter has established that firms hold open CEO promotion tournaments[4] by making several top employees compete for a single more senior position promotion-based prize, which is the increase in compensation (DeVaro, 2006; Kale et al, 2009). However, senior managers who lose the first CEO tournament during their time in the firm see a significant reduction in their likelihood of winning the next tournament in the same firm, resulting in a drastic decline in the overall value of their contracts as the value of their implicit promotion-based incentives is much lower, if not foregone completely. Since firms are restrained from adjusting their contracts to compensate them for the forgone compensation opportunity and restoring the explicit incentives to the optimal level even after paying retention bonus, more competent managers leave the firm to participate in other firms' tournaments rather than face compensation contract below the optimal level (Chan, Evans and Hong, 2022). This contributes to the high turnover rate among senior managers observed empirically following the appointment of a new CEO (Chan et al*.,* 2022). However, in line with Chan et al. (2022), we find that 68 *per cent* of the non-promoted managers choose to stay with the firm voluntarily, or because it is too costly to layoff. Since their contracts are now worth less, and the explicit incentives are suboptimal, they exploit aggressively their superior private information without attracting regulators' attention (Ali and Hirshleifer, 2017).[5]

We contribute to the literature from three aspects. First, we focus on two streams of literatures, tournament incentives and insider trading, which although both study the managers' behaviors, the ongoing investigations in these two domains are largely parallel and do not intersect. To the best of our knowledge, our paper provides the first empirical analysis that bridges these two literatures. While the

[4] Cvijanovic, Gantchev and Li (2021) show that 83.6% of S&P 1500 firms do not have a formal CEO succession plan and hold open CEO tournaments for competition.

[5] In conventional insider trading models, informed agents' trading aggressiveness α is increasing in their risk tolerance (Cespa, 2008), which becomes higher as their overall compensation decreases and the expected loss of losing their job is lower if regulators prosecute them for illegal insider trading. Thus, we hypothesize that non-promoted managers will tolerate higher litigation risk and trade on their private information more aggressively.

literature on tournament incentives focusses mainly on leavers after the contest (e.g., Chan et al., 2022), we expand previous evidence in tournament and insider trading literatures by investigating the trading activity and profitability of top non-CEO executives after losing the promotion contest, to assess whether they trade profitably by exploiting their informational advantage. We show that the realization of their tournament incentives affects their trading. Second, we contribute to the tournament incentives literature by documenting an unintended consequence of holding a CEO tournament that is causing more aggressive insider trading activities. We report that insider trading opportunity weakens the positive effect of tournament incentives on firm performance as documented by Kale et al. (2009). Our results imply that compensation committees must consider insider trading on private information when setting out optimal tournament incentives, as the non-promoted executives' *ex-post* trading opportunity on private information mitigates their effectiveness. We follow Chan et al. (2022) to uniquely focus on these tournament "rejectees" and show that their career concern affects their trading decisions.

Finally, we contribute to the insider trading literature by documenting one more corporate event in which insiders systematically incorporate private information into their trading decisions to seek profits. Previous empirical evidence has unanimously documented that corporate insiders actively trade on their private information regarding their firms' future to generate excess profits, resulting in post-trade return predictabilities (Lakonishok and Lee, 2001; Cohen et al., 2012; Biggerstaff, Cicero and Wintoki, 2020). Their transactions become drastically more informative before some specific corporate events, such as quarterly earnings announcement (Ali and Hirshleifer, 2017), M&A rumors (Davis, et al. (2021), worsening in industry level information environment (Contreras and Marcet, 2021), and to complement explicit forms of compensation, such as annual salary (Roulstone, 2003) or narrowly missing performance-based bonuses (Gao, 2019). We find that insiders trade also when they are dissatisfied with their promotion outcome. They adjust their trading strategies to suit their career concerns and the forgone pay rise, an unexplored area in the insider trading literature.

The remainder of the paper proceeds as follows. In Section 2, we review the relevant literature. Section 3 describes the data and the methodology. Section 4 presents the empirical results. Section 5 presents the 2SLS results, robustness, and the placebo tests. The conclusions are in Section 6.

2. Literature Review and Hypotheses development

A CEO promotion tournament involves a contest amongst senior executives to become the firm's next CEO. The winner will receive the corresponding promotion-based monetary rewards, such as remuneration, benefits, and other privileges. The increase in the winner's compensation package, referred to as the tournament incentives, is possibly the largest in her lifetime. The losers, if not laid off by the board or by the newly recruited powerful CEO (Boumosleh and Cline, 2022, Cohan, 2022), even though at a cost, but to avoid conflicts, can stay in the same firm and wait for the next chance for advancement, or leave to participate in tournaments in other firms (Lazear and Rosen, 1981; Gibbs, 1995; DeVaro, 2006). The promotion tournaments aim to encourage middle managers to exert effort, identify the most suitable senior manager for the CEO position, and improve firm performance.

Theorists have supported the logic behind the tournament-type CEO succession. Lazear and Rosen (1981), Gibbons and Murphy (1992) and Main, O'Reilly and Wade (1993) developed models on tournament incentives where senior executives endure pay below the optimal market rates because they not only value the explicit incentives such as the regular increase in their salaries, stock options and annual bonuses, but incorporate the implicit value of the future promotion opportunity, which depends on both the promotion subjective probability and the subsequent increases in their compensation packages if they eventually win it (Kale et al., 2009). Gibbons and Murphy (1992) show that an optimal incentive contract must optimize the combination of employees' career concern regarding future promotion opportunity and the current explicit incentives. Thus, for those that are close to their retirement, the subjective probability of future promotion becomes lower, which attributes to the lower expected promotion-based incentives. Consequently, they will largely place more importance on explicit incentives and not value the future promotion opportunity. In the same logic, Holmstrom and Milgrom (1994), and Baker, Gibbs and Holmstrom (1994) have documented the complementarity between explicit and implicit incentives components in designing the optimal remuneration contract. Ederhof (2011) studies the pay structure of a multinational firm in a single year and shows that firms adjust the pay structures of their mid-level managers with fewer promotion levels to reach in the corporate hierarchy by substituting the weaker promotion-based incentives with higher bonus-based

incentives, a form of explicit incentives. In the same vein, Gibbs (1995) argues that the tournament prize must rise at an increasing rate when executives are moving up to the corporate hierarchy because principles need to maintain a large enough incentive for the already relatively highly compensated senior executives. This exacerbates the pay disparity between the CEO and other non-CEO senior executives[6], reflecting the strongest implicit incentives at the top level of the hierarchy and justifying the largest compensation gap between the CEO and other senior managers observed in real life.

We argue that an additional implication of these tournament incentives models is the behavior of the promotion rejectees, as the loss of a CEO tournament lowers drastically the promotion-based component in their contract, resulting in a decrease in the overall value of their compensation plan, because of, at least, the following four reasons. First, the timing and the outcome of the next round of the tournament is uncertain (DeVaro, 2006). This is because the higher the hierarchical level of the non-promoted manager, the fewer the promotion opportunities, as the only promotion destination is the CEO position, a long-tenure job. Second, the negative image of a previous tournament loser will further lower the probability for their promotion to the CEO position in the next tournament, further lowering the expected value of promotion opportunity in their contracts, and, consequently, their contracts' overall value[7]. Third, there is a fundamental difference between implicit promotion-based and explicit performance-based awards, as the former is only possible to realize with the occurrence of a promotion, unlike the explicit incentives such as annual salary increases or bonuses which are recurring and relatively predictable incomes that managers will receive without promotion (DeVaro, 2006). Becoming the next CEO in the firm is the ultimate victory and is the only way to realize fully the CEO promotion prize. The uncertainty about the timing of the next promotion opportunity jointly with the lower probability of winning the next promotion leads to a lower value of promotion-based incentives. Finally, firms will not adjust the explicit incentives to compensate the non-promoted managers for losing the tournament because of high adjustment costs of restructuring the incentive plan at the end of

[6] For example, Adamson, Canavan and Ziemba (2020) report that CFOs make one-third of CEO pay, and have relatively lower compensation increases and a smaller proportion in the form of stocks and LTIPs.
[7] Chan et al. (2022) estimate a probit model to find the expected probability of winning a future CEO tournament decreasing from 27.4% to 9.4% after managers lose their first tournament while there is no significant increase in the number of competitors in the future tournament. Shen and Zhang (2018) find average CEO tenure of 6.6 years.

a tournament. This causes a suboptimal equity ownership level in managers' incentive contract (Morck, Shleifer and Vishny, 1988), leading firms to always have misaligned incentives because their transaction costs overweight the benefits of a properly aligned incentive (Core, Guay and Larcker, 2003).

Empirically, several studies show that firms do not adjust their incentive plans to compensate non-promoted managers because the high adjustment cost curbs firms to compensate the tournament losers *ex-post*, weakening the *ex-ante* tournament incentives (Chan et al., 2022). This lack of adjustment of compensation contracts leads also to a lower overall incentive plan and a gradual decline in tournament losers' performance rating (Gibbs, 1995). Bushman, Dai and Zhang (2016) show high adjustment costs associated with issuing equity constrain firms' abilities to restore the optimal pay-performance sensitivity. Kale et al. (2009) find that firms will systematically provide a higher-level tournament incentive proxied by the larger pay gap between the CEO and the executive team's median compensation following a new CEO's appointment. The uncertainty regarding the future CEO promotion lowers the non-promoted managers' subjective probabilities of successfully realizing the implicit promotion-based incentives in the next tournament.

However, previous studies assume a rather passive role of the tournament losers, who either accept the loss and the subsequent decrease in their compensation contract's overall value or leave the firm to participate in tournaments in other firms. We argue that they have incentives to stay to exploit their informational advantage more assertively by conducting insider trading with greater aggressiveness and not to sustain efforts after getting passed over for promotion (Du et al., 2022). Since the promotion-based incentive represents an unrealized part of their remuneration contracts, they can materialize their private information regarding the firm's true future valuation to gradually make up the discrete losses in the valuation of their positions. The existing tournament incentives studies overlooked this strategy, but it is plausible because all CEO tournament competitors are high-ranked managers closely involved in their firms' daily operations, and they are privy to price-sensitive information, which they can trade on. Although the SEC prohibits corporate insiders from trading on any material private information, anecdotal evidence and empirical studies in insider trading literature have shown that corporate insiders trade profitably (Lakonishok and Lee, 2001; Cohen et al., 2012). They trade on future

earnings (Piotroski and Roulstone, 2005), future cash flows (Jiang and Zaman, 2010), quarterly earnings announcements (Ali and Hirshleifer, 2017), when internal policies are not restrictive (Roulstone, 2003), after mandatory adoption of say-on-pay (Bourveau et al., 2021), and when they marginally missed their relative performance goals and lost their performance-based bonuses (Gao, 2019), even when the regulation became tighter after the Sarbanes-Oxley implementation.[8]

Overall, we expect promotion rejectees to trade aggressively and profitably on inside information to make up for the decreases in the overall valuation of their positions, as they are "under the shadow" relative to the CEO who is exposed to public visibility through the media, market regulators and investors scrutiny (Han et al, 2014; Knewtson and Nofsinger, 2014), the key determinants of insider trading profitability (Sabherwal and Uddin, 2019). We also expect their trading profitability and performance deterioration after losing the tournament contest to reflect the discrepancy between their promotion expectation and the tournament outcome.

3. Sample and Variable Construction

We follow prior literature (Kale et al., 2009; Kini and Williams, 2012) to identify CEO turnover event and collect manager's compensation data from Execucomp, which covers S&P 1500 firms from 1996 to 2019, with the first CEO turnover event occurring in 1997. Our initial sample consists of 269,456 manager-year observations with 4,838 CEO turnover events. We use the annual CEO flag (*ceoann*) to identify the historical CEO changes. Throughout the study, our event window is (-2, 1) relative to CEO turnover year 0, as we assume that the tournament begins in year -2, and the losing tournament effect will gradually decay outside our event window. We additionally restrict that there is only one CEO turnover in the window (-2, 2) to remove confounding event.

[8] Sarbanes-Oxley Act (SOX) came into force in 30 July 2002 (Beneish and Markarian, 2019). Gayle, Li and Miller (2022) argue that it discourages insiders from breaking the law. It also shortens the reporting deadline to SEC from 10 to 2 days after the end of the month in which insiders traded. However, SEC adopted Rule 10b5-1 to allow insiders to set up planned pre-announced trades, executed by their brokers, generally at a fixed time interval, without allegations of illegal insider trading. Still, Larcker et al (2021) report opportunistic use of 10b5-1, particularly plans with a short cooling-off period, and those adopted just before that quarter's earnings announcement. Franco and Urcan (2022) find that insiders trade profitable by using equity deferrals to circumvent Rule 10b-5 trading restrictions through the timing and content of corporate disclosures around these trades.

We define tournament competitors as those covered by Execucomp but are not CEOs in their firms, as in Kale et al. (2009) and Kini and Williams (2012). These filters select tournament competitors relatively properly because Execucomp mainly covers the top five highest-paid managers in a firm; their only promotion destination is the CEO position. We reckon the total compensation package that managers receive better measures their seniority within the firm than their job title. We exclude from the tournament competitor category insiders not covered by Execucomp in years (-2, -1) but gained coverage in years (0, 1) as they are either new joiner or low-rank managers who did not participate in the CEO tournament but covered by Execucomp after the tournament. We also omit ex-CEOs who remain with the firm after stepping down from their position, like Microsoft's Bill Gates, but have lower probability and fewer incentives to become the next CEO, and founders identified by using the job title (*titleann*). The median (mean) number of tournament contestants is 4 (3.8) in our final sample.[9]

To construct the tournament incentive measure, we first use the item total compensation (*tdc1*), adjusted to account for the regulatory change of Financial Accounting Standards Board (FASB) 123R revision, as detailed in Internet Appendix S1, following Coles, Daniel and Naveen (2006). The adjusted total compensation reflects the true managers' annual compensation. We then take the logarithm of the difference between the CEO's total compensation and the median total compensation of other non-CEO managers (Kini and Williams, 2012; Coles et al., 2014). We follow Kini and Williams (2012) and remove former CEO who remains in the firm as an executive and gets excessive perks (Cohan, 2022) when identifying the median non-CEO manager pay. We collect our instrumental variable, the former CEO's age in the last fiscal year (*age*), from Execucomp, or, if the data is missing, from BoardEx or Factiva. We extract accounting and financial data from Compustat, and stock prices and holding period returns from CRSP. We exclude non-common shares (*shrcd* is not 10 or 11) and stocks priced under $2 at the beginning of a calendar year. Internet Appendix S2 shows the sample sizes across our databases.

[9] Our results are robust if event window is extended to (-3,3), narrowed to (-1,1), restricted to cases with only one turnover in (-4,2), includes all confounding events and the three types of non-CEO managers we exclude, or we only keep the top two highest paid non-CEO managers. We do not restrict other event years than the turnover year in the event window of other CEO turnover events as this effectively implies one turnover in ten years. In unreported results, we employ the insider transaction samples reported by those who are not covered by Execucomp, we cannot observe the same increase in trading profitability for both insider purchase and sell samples.

We compile all U.S. insider transactions from January 1996 to August 2019 from Smart Insider Ltd[10]. We kept all insider open market transactions in Form 4. We exclude trades with less than 100 shares, in line with previous studies (Lakonishok and Lee, 2001; Cohen et al., 2012), and any 10b5-1 pre-scheduled trades, as their information content is likely to be trivial, but include them in robustness tests since Larcker et al. (2021) and Franco and Urcan (2022) find that insiders exploit them. We aggregate these insider trades at the insider-day level. We measure the direction of the trades by computing the net purchasing value (*NPV*) as the dollar value of the buy trades minus that of the sell trades over the total dollar value[11]. We exclude the 0.3% cases where *NPV* is 0 from our final sample.

We match Execucomp's unique manager identifier *execid* to Smart Insider's non-unique insider identifier *personid*. We use BoardEx to crosscheck the validity of our *execid-personid* match. For 48,429 distinct *execid* in Execucomp, we match 43,952 (90.8%) of them with 44,187 *personid.* We match 42,358 of 46,720 (90.7%) distinct *execid* for non-CEO managers. We discard the unmatched *execid* from our sample, as they have not reported any transactions on Form 4. After removing 29% cases with confounding events, we construct a sample of 3,428 CEO turnover events with 2,636 (77%) internal promotions, close to the 72% reported by Cziraki and Jenter (2020).[12] We find 1,259 (37%) firms did not report any insider trades in year 0, leaving 2,169 events in our final sample. We find 152,273 matched sell but only 13,022 buy trades, representing 8% of the total trades, significantly lower than the 37% reported by, say, Lakonishok and Lee (2001), or the 20% in our full database, indicating a higher propensity to sell by non-promoted insiders. The details are in Internet Appendix S3.

We compute the CRSP value-weighted market index adjusted buy-and-hold (BHAR) abnormal return for transaction *i* holding period *t* as follow:

$$BHAR_{s,t} = \prod_{s=1}^{t}\left(1 + \text{return}_{s,t+i}\right) - \prod_{s=1}^{t}\left(1 + \text{mkt}_{t+i}\right) \quad (1)$$

[10] This database (https://www.smartinsider.com/) is the same as Thomson Reuters. It gathers data from Form 5, the annual statement of change in beneficial ownership and reports any exempt trades not reported on Form 4.
[11] Our results are same using net purchasing ratio NPR based on the number of shares (Lakonishok and Lee, 2001).
[12] Our results are robust to the inclusion of the confounding events.

where $\text{return}_{s,t+i}$ is the stock's *s* holding period return, and mkt_{t+i} is the value weighted CRSP index. We measure BHAR one day after insider trade date to 365-calendar day holding period as "short-swing profit" rule in Section 16(b) of the 1934 Security Act prohibits insiders from profiting from short-term price movements. We require at least 243 trading days in the holding period. We report in Appendix A the details of our variables.

One major concern in insider trading literature is endogeneity because the true motivation behind insiders' trading decisions is not observable. The omitted variable bias will lead to an inconsistent OLS estimate for the losing tournament effect. We use an extensive set of explanatory variables to control for insider trading return and include firm and month fixed effects to proxy for time-invariant unobservable variables to eliminate potential endogeneity[13]. However, we recognize that these approaches do not completely solve the endogeneity issue. We specify a diff-in-diff regression based on a matched sample as our baseline regression to avoid the concern that unobservable market anticipation will bias our results. We match our test firms with control firms with no CEO turnover in (-2, 2) and shortest Mahalanobis distance on the average insider buy/sell profitability, logarithm of the total asset, and the book-to-market ratio in the year *t-1*. We match each treated firm with one control firm to mitigate the biasedness. We matched 192 out of 547 (35%) firm-year observations with at least one insider buy, and 1,331 of 1,775 (75%) with at least one insider sell trade in the tournament year[14]. We provide in Internet Appendix S5 detailed results that indicate that our matching strategy is successful, rejecting the hypothesis of a parallel trend returns between control and treated firms.

Our sample size varies depending on the availability of the *execid-personid* link table and our control variables. The comparative analysis of subsequent insider trading profitability across these two samples can better disentangle the incremental change solely attributable to the loss of CEO turnover within our event window. We estimate the following diff-in-diff regression to test whether the return predictability of insider buy (sell) trades remains the same or increases (decreases) in and/or after the CEO events by focusing on our event window only:

[13] Our results are robust when we replicate all diff-in-diff regressions with firm and year fixed effects.
[14] Many firms do not report insider purchase transactions in years (-2, -1). We tried various schemes to match on their past insider trading profitability, matching on year -1 yields the most suitable results.

$$BHAR\_m\_365_{i,t} = \alpha + \beta_1 Post_{i,t} + \beta_2 Treat_{i,t} + \beta_3 Post \times Treat_{i,t} + \beta_4 CEO\_IT_{j,t} + controls + \gamma + \rho + u_{i,t} \quad (2)$$

where the treatment dummy, $treat_{i,t}$, is equal to one for insider transaction *i* for our treated firms, and the post-treatment period dummy, $post_t$, is equal to one for two years from 0 to +1 post-CEO tournament outcome, depending on the specific focus period. We expect β_3 to be positive if the buy trades are profitable and negative if the sell trades are loss-avoiding, after losing the CEO tournament. We also include $CEO\_IT_{j,t}$ to proxy for the CEO trading direction for firm *j* and to capture the trading strategy that non-CEO insiders time their transactions based on the current CEO's trading activity. Armstrong et al. (2021) show that newly appointed CEOs are more likely to make noisy purchase transactions to signal their commitments to improve their firm's performance, not necessarily to seek a profit, but to prolong their tenure even if they underperform, yet the market reacts positively, overvaluing the firm. These buy trades systematically generate low long-term abnormal returns, leading non-promoted insiders to adopt contrarian strategies by selling overvalued shares and increasing their profitability.[15] To account for this strategy, we first compute the net insider trading value of a CEO in the year *t* as the difference between the aggregated value of insider sell and buy trades, which we then divide into annual quintiles to get $CEO\_IT_{j,t}$ as the quintile number, equal to zero if the CEO is not trading in year *t*. The lower $CEO\_IT_{j,t}$, the more shares the CEO has purchased in year *t*.

We include various control variables in our regression to account for firm and insider personal characteristics (Lakonishok and Lee, 2001; Cohen et al., 2012). We compute a dummy equal to one for firms that promoted an outsider CEO, and a dummy equal to one if the CEO succession was planned in (-2, -1) to assess whether such appointment reduces insiders' intensity of exploiting their private information advantage. We measure tournament incentives at the firm level by computing the natural logarithm of the difference between the adjusted CEO total compensation and the median adjusted total compensation of other insiders. At manager level, we use a dummy equal to one for high incentive managers whose total difference in the adjusted total compensation between CEO and managers is in

[15] Armstrong et al. (2021) show that the market reaction to the purchase transactions executed by CEO who succeeded in (failed to) prolong her tenure in the next year is positive (negative). Since we removed all the confounding events in our sample, all the CEOs in our post-tournament period prolonged their tenures.

the top three in their companies, given that the median and mean ranks are three, and zero otherwise[16]. We control for the firm's recent and long-term stock price momentum, growth, profitability, size, innovation level using last year research and development cost, the Amihud (2002) illiquidity measure, and the financial analyst coverage to account for the firm's information environment.

To control for some personal characteristics that can affect insiders' trading profitability, we include personal wealth risk (Beneish and Markarian, 2019) by following Core and Guay (2002) to calculate the performance-based incentives as a dollar change in manager *p*'s wealth associated with a 1% change in the firm's stock price (in $000). As in Coles, Daniel and Naveen (2006), we calculate the risk-taking incentives as a dollar change in manager *p*'s wealth associated with a 0.01 change in the standard deviation of the firm's stock returns (in $000). Finally, we control for firm's financial health using the yearly industry average S&P long-term rating, which summarizes industry risk and can predict forced CEO turnover. We include γ for month and ρ for firm fixed effects. We cluster our standard errors at firm-month level as insiders cluster their trades with colleagues (Alldredge and Blank, 2019). Subscripts *t, d m,* and *p* are for fiscal year, trading day, month, and director, respectively. We match the time dimension of the control variables on the insider trade date instead of CEO turnover event.[17]

Table 1 shows the summary statistics of insiders and firm characteristics. Panel A reports that the profitability embedded in non-promoted insiders' buy trades before the CEO tournament (-2, -1) is 5.9%, rising significantly to 30.4% in the post-event window (0, +1), suggesting that they trade on their private information while their average *total_compensation* declines significantly from $1.40 million to $1.07 million, and pay gap rises from $1.56 million to $2.08 million. The momentum, *mom*, a proxy for long term stock returns is significantly higher after the tournament, suggesting that they often buy to support the price when their stocks perform poorly. Panel B shows that their sell trades become

[16] This measure proxies for the potential increase in remuneration packages if promoted to be the next CEO. In some rare cases, some non-CEO managers have higher compensation than CEO, such as Bill Gates (*execid*: 00635) continued to be compensated significantly more than Steven Ballmer, who took over Gates' CEO position. We restrict the difference in total compensation to be zero and our result is robust with or without those outliers.
[17] Our results are robust if we match the time dimensions of these control variables by using the end of last month figure in the last fiscal year, and if we include both the one-fiscal year and one-month lagged control variables.

significantly less loss-averting in the event period[18]. They are more likely to adopt contrarian strategies by buying (selling) when the long-term and short-term momentum stock returns, as proxied by *mom* or *ret30*, are lower (higher) and book to market is higher (lower), in line with previous evidence (Lakonishok and Lee, 2001; Cohen et al., 2012). They tend also to buy (sell) in smaller firms and those with lower (high) pay gap, total compensation, *ROA*, and sell-side analyst coverage, and in less (more) liquid firms. The BHARs, not reported, are more pronounced for non-promoted insiders and depend on whether the promoted CEO is an external, CEO succession is planned, and the incentives are high. We account for these factors in our regressions.

[Insert Table 1 here]

One drawback of our diff-in-diff estimator in this research setting is that we only compare the post-tournament insider trading profitability in year (0, 1) with pre-tournament insider trading profitability in year (-2, -1). To generalize the results outside this event period, control for potential endogeneity, and compare the post-tournament insider trading profit with their unconditional ones outside the event window, we employ a 2SLS estimator. The IV should embed predictive power for the CEO turnover event one year after the event to satisfy the relevance condition, should not correlate with insiders' trades abnormal returns, which proxy for their private information regarding the firm's future fundamentals to meet the exclusion restriction. We select the former CEO age in year *t-1* as a suitable IV in our setting. Peters and Wagner (2014), Cziraki and Jenter (2020) and Jenter and Lewellen (2021) show that the CEO's age embeds significant predictive power for CEO turnover in addition to the CEO tenure and firms' performance. Inspired by these results, we hypothesize that the age of the former CEO also embeds predictive power for the future CEO turnover because the former CEO age is positively correlated with the time distance between the current year and the previous CEO turnover event[19]. The former CEO's age embeds predictability not only for the year of CEO turnover, but for one year after

[18] Internet Appendix S4 reports the post-transaction return for CEO and Other Directors. The lower abnormal return is not observed for these groups of insiders.

[19] The use of former CEO age reduced our sample size as it discards all observations in our entire sample before the first CEO turnover. The correlation between the current and former CEO is 0.25. We recognize that the former measure is more exogenous than the current CEO age. The correlation between former CEO age and current CEO tenure is 0.39. We use current CEO tenure in our 2SLS in robustness test, all coefficients remain robust but weaker.

the CEO turnover. We expect the recently left CEOs to be systematically younger than other former CEOs. In Table 9 we test the relevance condition. Although the exclusion condition is not formally testable, it is less of a concern, as the average time distance between year *t* and the year that the former CEO left the firm of six years is relatively long to affect the firm's future value and corporate policies decision making (Bhagat and Bolton, 2013). Moreover, since former CEO's age is a public information, and insiders trade on the firm's future value not been fully incorporated into the current stock price (Lakonishok and Lee, 2001), we expect our IV to satisfy the exclusion restriction. We employ the 2SLS estimator to study insider's trading propensity after losing the CEO turnover. We conduct additional tests to rule out the possible channels that our IV can influence the insiders' private information in the robustness test to further assess the exclusion restriction's plausibility. We run two first-stage regressions to overcome endogeneity in our interaction variable:

$$NPED_{i,t} = \alpha + \beta_1 age\_ceo_{j,\,t-1} + \beta_2 (age\_ceo_{j,\,t-1} \times CEO\_IT_{j,t}) + \beta_3 CEO\_IT_{j,t} + control + u_{i,t} \quad (3)$$

$$(NPED_{i,t} \times CEO\_IT_{j,t}) = \alpha + \beta_1 age\_ceo_{j,\,t-1} + \beta_2 (age\_ceo_{j,\,t-1} \times CEO\_IT_{j,t}) + \beta_3 CEO\_IT_{j,t} + control + z_{i,t} \quad (4)$$

where $NPED_{i,t}$ is a dummy equal to one for insider buy/sell trades *i* executed in the post turnover year *t,* and zero for other years. $age\_ceo_{j,t-1}$, the interaction term between our IV $age\_ceo_{j,t-1}$, and the moderator variable $CEO\_IT_{j,t}$ is our first and second joint IV to predict $NPED_{i,t}$ and $NPED_{i,t} \times CEO\_IT_{j,t}$. In the second-stage regression, we replace $NPED_{i,t}$ and $NPED_{i,t} \times CEO\_IT_{j,t}$ by the estimated $\widehat{NPED}_{i,t}$, representing the predicted probability that a given insider buys or sells in the post-tournament year *t*, and $(\widehat{NPED \times CEO\_IT})_{i,t}$ as follows:

$$BHAR\_m\_365_{i,(d+1,d+365)} = \beta_1 \widehat{NPED}_{i,t} + \beta_2 (\widehat{NPED \times CEO\_IT})_{i,t} + \beta_3 CEO\_IT_{j,t} + control + \varepsilon_i \quad (5)$$

If managers trade profitably on their private information, after losing CEO tournaments, $\beta_1$should be positive (negative) for buy (sell) trades, while β_2 should be positive for their sell trades, if they increase their selling activities when their CEOs are purchasing stocks to prolong their tenure. We include the same set of control variables and fixed effects as Equation 4.

4. Empirical results

4.1. Insider Trading Propensity around CEO tournament

We first investigate whether insiders are opportunistic or routine traders, as defined by Cohen et al. (2012), before the CEO turnover. The former are insiders who regularly trade in a clear pattern, which we define as trades in the same calendar month in the past three years, and the latter are discretionary trades that embed higher return predictability and more private information, on average. We re-classify each insider at the beginning of each calendar year based on her past three years' trading history, excluding those with no trades in the past three consecutive years. We conjucture that if non-CEO executives execute a large number of opportunistic sell (purchase) transactions, their probability of winning the CEO promotion is lower (higher). We focus on CEO turnover year (0,0) and estimate a logit model and a linear probability model with firm and year fixed effects at insider-firm level. The dependent variable is a dummy variable equal to one for newly promoted CEO, and zero for other non-promoted managers who were competing in the turnover, and the explanatory variables of interest are the number of opportunistic buy (*#_buy)* and sell (*#_sell*) trades. The regression results in Table 2 Panel A show that insiders with more opportunistic purchase (sell) transactions are more (less) likely to win the CEO competition, and the conclusion is robust using a linear probability model, in line with the substitution hypothesis. If we include all transactions in year -1 and year -2, the results for sell transaction remain robust, but there is no significant signaling effect for the buy trades using linear probability model[20]. The signaling effect is consistent with the findings in Armstrong et al. (2021).

Next, we assess whether non-promoted insiders are more likely to execute opportunistic transactions after losing the CEO tournament. We estimate Equation (2) using the matched sample and $opp\_D_{i,t}$ a dummy equal one for opportunistic trades *i* and zero for routine ones as the dependent variable. Columns (1) to (2), Panel B, show that the coefficient of the interaction term $(Treat \times Post)_{i,t}$ is insignificant, suggesting that there is no substantial change in the propensity of executing opportunistic buy trades in years 0 and +1. In contrast, the coefficients of $(Treat \times Post)_{i,t}$ and $CEO\_IT_{j,t}$ in columns (3)

[20] The results, reported in Internet Appendix S6, are not significant using all transactions, including routine trades.

to (4) for the sell trades are positive and significant. This suggests that non-promoted executives increase their propensity to sell opportunistically in year (0,1), and they do so if the newly appointed CEO is also trading. We find, but not report, that the coefficient of the control variable momentum is positive and statistically significant, suggesting that insiders adopt contrarian strategies by selling when the stock return are high, and $bm_{j,m-1}$ and $size_{j,m-1}$ are negative and significant implying that their opportunistic selling is more pervasive in small and growth stocks. The sign and significance of the remaining control variables are consistent with the existing literature (e.g., Lakonishok and Lee, 2001).

Overall, our results suggest that insiders are more likely to make opportunistic sell transactions in year (0,1) after losing the CEO competition, which are more informative than an average sell trade suggested by Cohen et al. (2012). In unreported logit regressions, we find that insiders are more likely to execute opportunistic sell, than buy, trades after losing their promotion, consistent with our hypothesis, suggesting that they mainly incorporate private information into their sell trades to compensate themselves for losing the CEO competition. These results indicate also that non-promoted insiders strategically time their transactions based on the trading activity of the newly appointed CEO.

[Insert Table 2 here]

4.2. Diff-in-Diff regression results

Table 3 Panel A reports the diff-in-diff results. The coefficient of the interaction term $(Treat \times Post)_{0,0}$ is statistically significant, implying that insiders' buy trades after losing their CEO tournament yield 24.5% higher profits that those generated without CEO turnover, *ceteris paribus*, but insignificant in the remaining buy trades columns. The negative and significant $(Treat \times Post)_{i,t}$ in Column (5) to (6) indicate that the sell trades in treated firm are systematically more loss averting of between 3.0% in years (0,0) and 4.8% in year (1,1), than those of the control firms. Using the average sell transaction value in year 0 and year 1, non-promoted insiders' sell transactions would yield $28,296 ($45,576) more profit if their transactions are made in the year 0 (year 1) than other non-CEO managers, accounting for about 11% of their average salary in year 0 and 1, higher than the $12,000 reported by

Cziraki and Gider (2021) between 1986 and 2013. Since, on average, each executes 3 sell trades per year, their yearly total abnormal profit accounts for 33% of their salary in these two years[21].

The losing tournament effect is weaker for insiders who stay with firms with CEO successor prior to the tournament because the coefficients of $COOD_{j,t}$ are in the opposite signs to the coefficients of $(Treat \times Post)_{i,t}$ for both insider purchase and sell samples, suggesting that a pre-assigned successor mitigates the discontent amongst the non-promoted executives. Moreover, insiders mainly make sell trades to compensate themselves because the losing tournament effect persists until year +1 in the insider sell sample. In contrast, the effect solely exists in the year of CEO turnover in the insider purchase sample. The short-term and long-term momentum variables, $ret_{j,t,(d-1,d-30)}$, and $mom_{j,t,(d-31,d-364)}$ are both negative and mostly significant for insider sell sample, but $mom_{j,t,(d-31,d-364)}$ is negative and significant only in column (1) for buy trade sample, suggesting that worst performing firms generate higher subsequent returns. The signs and significance of our control variables are consistent with other insider trading studies (Cohen et al., 2012; Beneish and Markarian, 2019; Contreras and Marcet, 2021).

We further consider the possibility that the motives for the CEO turnover will affect the informed insider trading behavior. We follow Gentry et al. (2021)[22] and split the treated sample and its nearest-neighbor control firm into voluntary and involuntary CEO turnover events. CEO retirement and CEO's new career opportunity are the two most common reasons for voluntary CEO turnover, and poor company performance and CEO's personal health reasons are the two most common causes for involuntary CEO turnover. We estimate the diff-in-diff regression. The results in Table 3 Panel B for voluntary and Panel C for involuntary CEO turnover events indicate that informed insider transaction activities are common in both events, but non-promoted directors are more likely to trade after involuntary CEO turnover events as evident by the larger sample size in both buy and sell transactions.

[Insert Table 3 here]

[21] The abnormal profits are 15% of their total cash compensation, excluding options to avoid double-counting.
[22] https://zenodo.org/record/5348198#.Y86W7nbP0uV. We thank Professors Gentry, Harrison, Quigley and Boivie for making these data publicly available.

4.3. Motivations behind more informed insider transactions

In this section, we assess whether insiders intentionally trade to show their discontent after being passed over for promotion, when their *ex-post* expectation discrepancy is high, referred as *forgone incentives hypothesis*, or to exploit the stock misevaluation after a major corporate change, referred as *stock misevaluation hypothesis*. In the former we expect a stronger increase (decrease) in trading profits by insiders whose tournament prizes are larger and who stand to lose more from missing the promotion. Although we control for the pay disparity in the last fiscal year using $high\_incentiveD_{p,t-1}$ as a proxy in our previous results, the historical pay disparity in year -1 is a more relevant measure for their tournament prizes had they won the tournament. A larger tournament prize indicates a larger opportunity loss, and they should trade on their private information more aggressively. We re-estimate our diff-in-diff regression with a triple interaction term $(Post \times Treat \times Pay\_rank)_{i,t}$, which we expect to be negative (positive) for insider purchase (sell) trades, if managers with high tournament prizes show a higher discontent because of their high *ex-post* expectation discrepancy, after missing the promotion by trading with greater intensity than other insiders. We also include $Pay\_rank_{p,t}$, $(Post \times Pay\_rank)_{i,t}$, and $(Treat \times Pay\_rank)_{i,t}$. In Table 4 Panel A, $(Post \times Treat \times Pay\_rank)_{i,t}$ is statistically insignificant in the buy trade sample, but positive and significant in the sell trade sample. This suggests that higher tournament incentives non-promoted insiders are more dissatisfied after being passed over for promotion; they sell on negative private information more aggressively.

Another method to reaffirm the *forgone incentives hypothesis* is to check the age effect. Gibbons and Murphy (1992) show that managers close to their retirement age have lower *ex-post* expectation discrepancy and will place less importance on the promotion-based incentives. Consequently, we hypothesize that older managers will react to the loss of tournament with less intensity, i.e., the subsequent changes in their profitability will be less dramatic than that of younger managers. To test this hypothesis, we employ the natural logarithm of the current age of managers as the moderator variable. Table 4 Panel B shows that the coefficient of $(Post \times Treat \times lnage)_{i,t}$ is insignificant in buy sample, but positive and significant in sell sample, in line with our previous findings that older managers will trade on their private information to show their discontent for the forgone

promotion-based incentives with higher aggressiveness. They did not place much implicit value on their future promotion opportunities because their career horizons are shorter, in line with Gibbons and Murphy (1992). Tournament losers from firms with non-compete agreement have limited outside job opportunity, and therefore we expect they will trade on their private negative information more aggressively because they have suffered from a larger forgone CEO promotion incentives. [23]We follow Mueller (2023) to scrape 10-K and 10-Q files from EDGAR, and create dummy variable $NoncomD_{j,t}$ equals to one if a firm mentioned non-compete agreement in the year *t*, zero otherwise. The results in Table 4 Panel C show that the coefficients of the $(Post \times Treat \times NoncomD)_{i,t}$ are all negative and significant in sell sample, in line with our hypothesis.

We then employ insider personal investment horizons to proxy for insiders' career horizons and further confirm the *forgone incentives hypothesis*. Akbas et al. (2020) show that short horizon (SH) insider sellers frequently reverse their previous buy positions to avoid overconcentration of their personal portfolios in their firms. Consequently, these insiders have shorter career horizon in their firms. We hypothesize that SH sellers will trade on their private information with lower aggressiveness after losing CEO promotion because a shorter career horizon indicates a lower expected value for the forgone CEO incentives. We modify the investment horizon measure proposed by Akbas et al. (2020) to identify SH sellers, as detailed in Internet Appendix S1. We find only 2.3% (9.2%) of our buy (sell) trades were by short-horizon insider sellers, suggesting that SH sellers are less likely to trade after they have lost the tournament. We create short-horizon dummy variable $SHD_{p,t}$ equals to one for SH insiders, and zero otherwise. We employ $SHD_{p,t}$ as the moderator and report the results in Table 4 Panel D. The coefficient of $(Post \times Treat \times SHD)_{i,t}$ is significantly positive in sell sample, suggesting that insiders who frequently offload their ownerships in their firms will trade on their private information with lower aggressiveness.

We further compute the subjective probability of insiders becoming CEO, $Probability_{p,t-1}$, by estimating a cross-section regression using only firms that had a CEO turnover in the year *t* and employ the probability in year *t-1* as the moderator, as detailed in Internet Appendix S1. The results in Table 4

[23] In untabulated results, we find the presence of non-compete agreements at the firm level will reduce the propensity of tournament losers existing the firm after a tournament.

Panel E, support further the *forgone incentives hypothesis*, as non-promoted executives with higher subjective probability of becoming CEO exploit their private negative information more aggressively in their sell trades. There is no significant effect for insider purchase transactions. Next, we consider the possibility that the board will retain executives by awarding them a large retention bonus (Armstrong et al., 2021). Executives who have received a larger retention bonus, which compensates them for their forgone incentives, should trade on their private information less aggressively. We create the dummy variable $BA_{p,t-1}$ equals to one if the change in a manager *p*'s bonus is higher than the sample median among all managers in the same firms in the same year, otherwise zero. We employ the $BA_{p,t-1}$ as moderator and report the results in Table 4 Panel F. Non-promoted executives with larger bonus increases exploit their private negative information less aggressively in their sell trades. There is no significant effect for insiders' purchase trades[24].

[Insert Table 4 here]

We perform additional tests to contrast the *forgone incentives hypothesis* and the *stock misevaluation hypothesis*[25]. Armstrong et al. (2021) suggest that the board actively monitors the motivation behind insider transactions and Dai et al. (2016) and Jagolinzer et al. (2011) find that better-governed firms can restrict insiders from exploiting their private information. Consequently, we expect conservative boards, which are associated with higher litigation risk (Khan and Watts, 2009), to mitigate insider trading on private information, and to lead to lower trading profitability. As in Khan and Watts (2009), we construct $C\_quint_{j,t}$, a quintile number based on board conservatism. We find significant negative (positive) interaction terms for the buy (sell) trades. We also find that non-promoted directors are less likely to trade on their private negative information in high litigation risk industries, as defined in Kacperczyk and Pagnotta (2021)[26]. Next, we hypothesize that executives in industries with greater industry tournament incentives, and, thus, lower decreases in the implicit component in their

[24] In unreported results, we did not find the implementation of the Sarbanes–Oxley Act in 2002 nor the implementation of Say-on-Pay law in 2011 to have a significant impact on the non-promoted executives' profits.
[25] We report the remaining results in this section in Internet Appendix S7 and the details of the construction of the variables $C\_quint_{j,t}$, $ind\_incern_{j,t}$, $FERC_{i,t}$, and $Synch_{j,t}$, used below, in Internet Appendix S1.
[26] Kacperczyk and Pagnotta (2021) report that industries with two-digit SIC code of 28, 73, 36, 38, 35, 87, 60, 99, 20, 48 are more likely to receive illegal insider trading investigate from the SEC.

compensation contracts, given alternative job opportunities, will trade on their private information with lower aggressiveness than those with limited outside career options. As in Coles et al. (2018), we construct $ind\_incern_{j,t}$. We find that the coefficients of the interaction term are significantly positive for insider sell trades, indicating the outside career option will suppress these informed insider trading activities, further reaffirming that the forgone CEO promotion opportunity motivates insiders to trade. In the same vein, we employ the natural logarithm of the current tenure of managers as the moderator variable. The results in Appendix S7 Panel D show that the coefficients of the $(Post \times Treat \times lntenure)_{i,t}$ are all statistically significant and negative for the buy sample, but positive and significant in sell sample. The results are in line with the finding that executives who stay longer in a firm are less likely to be competing in subsequent CEO tournaments because more competent non-CEO executives are more likely to leave the firm after losing the first tournament (Chan et al., 2022).

Next, we test the *stock misevaluation hypothesis* using the Tucker and Zarowin's (2006) Future Earnings Response Coefficient (FERC) and Piotroski and Roulstone's (2004) return synchronicity to proxy for stock informativeness. We create a binary variable $FERC_{i,t}$ equal to one for the top quintile of stocks whose current prices contain the most future earnings information and $Synch_{j,t}$ that equals to one for the top quintile of stocks whose current prices contain less firm-specific information and co-move strongly with the current and lagged market and industry returns. As in Wang (2019), we expect insider trading profits to be higher (lower) when the firm's share price is less (more) informative for the firm-specific information. Appendix S7 reports these results. The significance and the sign of the coefficient of $(Treat \times Post)_{i,t}$ should be robust to the inclusions of these two firm information measures as insiders' motivation to trade is not only to correct the mispricing but to show their dissatisfaction for the forgone CEO promotion opportunity. We find that the coefficient of $(Post \times Treat \times FERC)_{i,t}$ is insignificant for the buy trades, suggesting that insider purchase profitability after the CEO turnover is not affected by the level of stock price informativeness for future earnings. However, for the sell trades, it is positive and statistically significant, implying that insiders' sell trades are more loss averting when the current stock price reflects lower future earnings information in year 0. When we use $Synch_{j,t}$ as the moderator variable, we find that, although the sign and significance of $(Treat \times Post)_{i,t}$ remain consistent,

(Post×Treat×Synch)$_{i,t}$ is statistically insignificant in all columns, suggesting that insiders' trading profitability does not depend on the level of the co-movement between current firm return and the current and lagged market and industry returns, i.e., when stock price contains firm-specific information. Overall, our results provide support to the *forgone incentives hypothesis*, rather than the *stock misevaluation hypothesis*.

4.4. Informational content embeds in insider transactions

We examine the informational content of insider trading after losing the CEO competitions to confirm that the unobservable firm characteristics do not drive these more informed insider transactions. The loss of promotion opportunity will lower their total compensation packages to a suboptimal level for their effort. Although they will trade to compensate themselves, these more informed transactions cannot fully adjust their packages to the optimal level, otherwise they would not have enough incentives to compete in the tournament *ex-ante*. Therefore, they will exert less effort and their sell trades will predict a worsening in their firm's future performance. We focus on three non-mutually exclusive possibilities: insiders may trade on future operating performance changes, on the future change in the cost of capital, and/or exploit the change in investor sentiments. In unreported results, we confirm that the parallel trend assumption is satisfied using the same control firm sample. We provide details of the constructions of our variables in Appendix A and Internet Appendix S1.

We compute changes in ROA from year *t* to *t+2*, ΔROA,[27]with year *t*, the insider transaction year, to estimate future operating performance changes. To measure the changes in investor sentiment, $\Delta\text{Sentiment}$, we compute the market-to-book ratio decomposition of Rhodes–Kropf, Robinson and Viswanathan (2005). Cziraki, Lyandres and Michaely (2021) argue that the method can separate the firm-specific sentiment from industry-level sentiment and is appealing to insider trading studies because insiders are more likely to possess private information on the former than on the latter (Wang, 2019). We follow Cziraki et al. (2021) and measure the change in sentiment $\Delta\text{Sentiment}_{t-1,t+1}$ between (t-1, t+1) with year *t* as insider trading year. To measure the change of cost of capital, $\Delta r_{t,t+2}$, we follow

[27] Our results remain robust if we use the change in ROA from $(t, t+1)$ with insiders' trade in year t.

Cziraki et al. (2021) and estimate a modified Fama and French (1993) three-factor model. We re-estimate the diff-in-diff regressions in Table 5 using these three proxies as dependent variables.

Panel A shows that insider sell transaction can significantly predict a 2%, and 1.1% decrease in $\Delta ROA_{t,t+2}$ in year 0 and 1, respectively, unlike insider purchase transactions as column (1) and (2) show that $(\text{Post}\times\text{Treat})_{i,t}$ is not significant. Similarly, in Panel B, insider buy trades do not significantly predict future changes in investor sentiment, $\Delta Sentiment_{t-1,t+1}$, in year 0, while their sell transactions predict a 5.4% and 6.2% in years 0 and +1, respectively, additional decreases in the firm's market value that fundamentals do not explain. Moreover, in Panel C insider purchases do not predict the future decreases in the cost of capital, $\Delta r_{t,t+2}$, in year 0, but their sell trades predict 0.1% in its increases in both year 0 and 1, as $(\text{Post}\times\text{Treat})_{i,t}$ is significant at the 95%, and 90% in column 3 and 4, respectively.

Although we have documented that insiders sell when they are informed, their trading strategy remains unclear. We consider one possibility that they strategically release more news to better time the market. We follow Edmans *et al.* (2018) to use *Key Development* to identify the discretionary corporate announcements and include their monthly number as the moderator variable. Panel D reports the regression results and shows that the more discretionary news released in the insider sell transaction month, the higher the predictability of further worsening in ROA decreases and investor sentiment, but not in the cost of capital, in the next two years as the coefficients of $(\text{Treat}\times\text{Post}\times\text{News})_{i,t}$ are statistically negative at the 95% confidence level. These results suggest that the higher return predictability embedded in the insider sell transactions is not random. Insiders exploit strategic news releases and the worsening in future firm performance, the lower investor sentiment, but not an increase in the future cost of capital to time their trades and yield higher negative returns in their sell, but not their buy trades.

Chan et al. (2022) show that more competent managers are more likely to leave the firm because a higher explicit compensation contract does not compensate the permanent loss in their implicit promotion-based incentives. If non-promoted insiders are trading on the talent losses rather than their private information, their sell transactions should contain little future performance predictability. We split our sample depending on whether a non-CEO director leaves the firm in the next year and repeat the regressions in Table 5. Our results, reported in Internet Appendix S8, remain overall robust, meaning

that insiders are trading on their private information regarding the firm's future performance rather than the simple talent loss. We also consider that non-promoted directors' incentives to continue performing and to change their job with the same level of seniority but at a larger firm. The industry tournament incentives are imperfect substitutes for their CEO promotion opportunities. We identify firms in the top quantile of the large industry tournament incentives each year. In unreported results, we find that our previous results remain robust, but $\Delta r_{t,t+2}$ becomes insignificant for firms with high industry tournament incentives, suggesting that CEO turnover cannot predict the decreases in ROA and investor sentiment and the increase in the cost of capital without conditioning on non-promoted director sell transactions. These results suggest that tournament losers will exert lower level of effort to improve the firm performance as their total compensation packages declined in value, and industry tournament incentives can keep their efforts at the original level prior to the loss of the CEO tournament.

[Insert Table 5 here]

4.5. Insider trading activities of existing managers

We expect non-promoted executives who increase their opportunistic trading to stay with the firm, as they will view the overall level of compensation to be sufficient to maintain employment. To test this hypothesis, we first use the same diff-in-diff regression. Table 6 reports the results. In column (1) and (3), the dependent variable is $ExitD_{p,t}$, a dummy variable equals to one for exiting executives who are leaving the firm in the year (0, 2), and zero otherwise. We include the same set of control variables. The results indicate that the coefficients of $(Post\times Treat)_{i,t}$ for both samples do not explain executives' exiting probability, suggesting that exiting managers do not abnormally purchase or offload their positions in their firms before they leave. In column (2) and (4), we compare the post-transaction return between exiting and staying managers by interacting the dummy variable $LastD_{p,t}$, a dummy equal to one if the manager *p* is staying in the firm for the last year, and zero otherwise, with the interaction term $(Post\times Treat)_{i,t}$. While there is no significant difference between the two samples for the buy trades, the interaction variable is positive and significant for sell sample suggesting that exiting managers' trades are not more profitable as staying managers', and thus, they are more likely to leave the firm. On the

other hand, a higher trading profitability compensates managers for their forgone CEO promotion incentives and aligns their compensation closer to the optimal level, making them less likely to leave.

Panel B reports the results based on insider matched sample. For each exiting managers who are leaving in year (0, 2), we select a control manager in year *t-1*, which is one year before CEO turnover by matching on their total compensation, average insider trading profitability and total shares traded. We require that there is no CEO turnover event that occurred for our control sample within years (-3, 3). The coefficient of $(\text{Post}\times\text{Treat})_{i,t}$ is negative and statistically significant for both purchase and sell samples, but the post-trade profitability is not significant, as reported in columns (2) and (4). These results suggest that exiting insiders systematically make less non-informative buy and sell trades.[28]

[Insert Table 6 here]

4.6. Firm level characteristics for high turnover firms

We further compare firms that have many non-promoted directors leave in year (0, 1) with those that have less directors leave. The sample median for the proportion of exiting directors is 0.4. We define a dummy variable $\text{High\_TurnoverD}_{j,t}$ equal to one if for firm j more than 40 per cent of their tournament contenders left the firm in the next two years, and zero otherwise. We compute the average BHAR_m_365 for firm j with and without CEO transactions in the year (-3, -2). We time the BHAR_m_365 for sell transaction by -1 to correct for the direction. We control for firm level characteristics, firm risk taking incentives as the first years of new CEOs see an increase in stock return volatility leading to insider trades to be more profitable and more frequent because volatility is temporarily higher, increasing insiders' informational advantage (Pan, Wang, and Weisbach, 2015; Cziraki and Groen-Xu, 2020), corporate governance, and analyst talent, which lowers insider trading profitability (Dang et al., 2021)[29]. Appendix A details the construction of our variables. We estimate both logit and fixed effect regressions by including year dummy variable. We use robust standard error for logit and cluster standard error at year-industry level for fixed effect regressions.

[28] Under SEC rule 16a-2(b) executives need to file their trades for six months after they have left their firms.
[29] We are grateful to Dr Li for making the analyst talent data available.

The results in Table 7 show that tournament losers are more likely to leave firms with higher book-to-market value, analyst coverage, research and development costs, stock returns and cash flow volatilities. They are also smaller and have more independent managers on the board. The coefficients of historical average insider profitability remain negative and statistically significant, indicating that non-promoted directors are less likely to leave in the future firms where insider trading profitability was higher in the past. Moreover, the coefficient of $C\_score_{j,t-1}$ is positive and significant, implying that tournament rejectees are more likely to leave firms with more conservative board, suggesting that a higher non-promoted director turnover rate among firms that have more rigorous insider trading rules.

[Insert Table 7 here]

4.7. Insider trading and the effect of the tournament incentives

In this section, we revisit the empirical finding in Kale et al. (2009) by considering insider trading opportunity as a substitute for CEO promotion opportunity. We have established that tournament contenders do not trade on their private negative information opportunistically before the tournament because the insider trading behavior will lower their winning probability. Once the loss of the tournament has been revealed, tournament rejectees will engage in informed insider trading. These results suggest that the presence of insider trading opportunity weakens the positive effect of tournament incentives on firm performance because part of the tournament prize can be compensated after losing the tournament by the tournament losers. To measure the total non-CEO insider trading activity, we construct the variable $all\_IT_{j,t}$ which is the total number of insider transactions executed by non-CEO managers for firm *j* in year *t*, to proxy for the firm's prevailing insider trading intensity. Next, we use the following refined firm-year fixed effect regression version of Kale et al. (2009) using Tobin's Q and ROA to proxy for the firm performance.

$$\begin{aligned} firm\_performance_{j,t} = \alpha + \beta_1 pay\_gap_{j,t} + \beta_2 rd_{j,t} + \beta_3 sale_{j,t} + \beta_4 sale^2_{j,t} + \beta_5 capital\text{-}to\text{-}sale_{j,t} + \\ \beta_6 advertising\text{-}to\text{-}sale_{j,t} + \beta_7 dividend\text{-}yield_{j,t} + \beta_8 leverage_{j,t} + \\ \beta_9 lnage_{j,t} + \beta_{10} skt\_ret\_volatility_{j,t} + \rho + \delta + \varepsilon_i \end{aligned} \quad (6)$$

where $pay\_gap_{j,t}$ proxies for tournament incentives as previously specified. ρ is firm fixed effect, and δ is year fixed effect. We cluster the standard error at the firm level. Appendix A defines the remaining variables. $pay\_gap_{j,t}$ represents the tournament incentives, and β_1 should be statistically significant and positive according to Kale et al. (2009) because the higher tournament incentives, the better the firm performance. Unlike Kale et al. (2009), we correct the CEO compensation figure for FASB 123R revision. We estimate a 2SLS regression with two first-stage regressions. Kale et al. (2009) applied the median value of tournament incentives for firms in the same sales quintiles and the same two-digit SIC industry as the firm as their instrumental variable because it is a significant determinant of the amount of each firm's tournament incentives. Since compensation structures depend also on the firms' size, we use the median value of tournament incentives in the same size, proxied by sales, and industry as our IV. Our second stage regression is as follows:

$$firm\_performance_{j,t} = \alpha + \beta_1 \widehat{pay\_gap}_{j,t} + \beta_2 (\widehat{pay\_gap \times all\_IT})_{j,t} + \beta_3 all\_IT_{j,t} + control + \varepsilon_{j,t} \qquad (7)$$

If the presence of high insider trading activity weakens the positive relationship between the tournament incentives and the firm performance, β_2 will be negative and statistically significant. The above regression specification implicitly assumes that $all\_IT_{j,t}$ is exogenous. One source of endogeneity is reverse causality as insiders may purchase (sell) more in outperforming (underperforming) firms, as they understand their firms' future valuation. Thus, simply using one IV for the tournament incentives is not sufficient to conclude the causal relations. We use an additional IV to proxy for $all\_IT_{j,t}$ to relax this assumption. We follow Kim and Lu (2011) and use the sum of maximum state and federal marginal personal income tax rates (hereafter called tax rate) as our second instrumental variable. Kim and Lu (2011) argue that personal income taxes may affect the personal portfolio composition and the timing of stock transactions and option exercises as, *ceteris paribus*, managers in a high tax state may prefer more tax-exempt securities to stock, thus causing lower stock ownership. We expect tax changes to also lead to changes in share ownership as managers may sell (hold) more shares when they anticipate a tax increase (decrease). Moreover, the variation in state tax laws across states and years is exogenous to a firm's future performance. We collect the sum of maximum state and federal marginal long-term capital

gain tax rates from Feenberg and Coutts (1993)[30] from 1997 until 2019, assuming a married representative taxpayer with joint filing and top tax bracket in her state. Insiders are subject to capital gains tax on any capital return from trading stocks, and high rates will reduce their propensity to trade.

Table 8 reports the results. For brevity, we omit the first-stage regression result and report only the first-stage F statistics. In column (1) and (2), we replicate the finding in Kale et al. (2009). The coefficient of $pay\_gap_{j,t}$ is positive and statistically significant at the 99% confidence level in both columns, indicating that tournament incentives' positive effect on the firm performance persists in our sample period. In column (3) and (4), we employ the median industry tournament incentive as the IV and interact the insider trading intensity with the predicted tournament incentive. The coefficient of $\widehat{pay\_gap}_{j,t}$ is positive and statistically significant. The result further highlights the finding in Kale et al. (2009) that there is a causal relationship between tournament incentives and firm performance. A higher pay disparity between the CEO and other managers motivates them to exert more effort to compete for the next CEO position and consequently improve the firm performance. More importantly, the interaction term is negative and statistically significant, suggesting that that insider trading opportunity weakens tournament incentives' positive effect on the firm performance. In column (5) and (6), we employ the tax rate as our IV to predict the number of insider trades $all\_IT_{j,t}$. The significance of Sanderson-Windmeijer F statistics to test the null hypothesis of under-identification of each of our three endogenous variables in the first stage regression, implies that all three endogenous variables are identified. In an unreported result, we find that the coefficient of the tax rate, used as the only IV to explain $all\_IT_{j,t}$ in the first-stage regression, is negative and statistically significant at the 99% level with 11.4 first-stage F statistics[31], meaning that a higher tax rate is associated with fewer insider transactions. The coefficient of $\widehat{pay\_gap}_{j,t}$ is positive and statistically significant, in line with Kale et al. (2009). However, the coefficient of the interaction term is negative and statistically significant with a magnitude of around a third of that of $\widehat{pay\_gap}_{j,t}$, suggesting that the tournament incentive's effect on firm performance will be overestimated by a third if the possibility that executives can trade on their

[30]We thank Prof. Feenberg for making these data publicly available on https://users.nber.org/~taxsim/state-rates/
[31] Stock and Yogo (2005) weak identification test also supports our conclusion that the tax rate can explain the variation in the number of insiders' transactions.

private information to realize their implicit promotion-based compensation is overlooked. The coefficient of all_IT$_{j,t}$ is also positive and statistically significant, suggesting that insider trading improves firm's performance, mitigating any agency problems by aligning managers' and shareholders' interest. Overall, our results confirm that insider trading opportunity weakens the positive effect of tournament incentive on firm performance and insiders consider their unrealized promotion prize when they trade, consistent with our previous findings.

[Insert Table 8 here]

5. Robustness Test

5.1. Reverse causality concern

We subject our results to various robustness checks. We estimate 2SLS regressions using the last fiscal year's former CEO age as our IV based on the universal sample to generalize our results outside the tournament period to further reaffirm that our results are not affected by the potential endogeneity, are robust to the alternative estimation method, and do not hinge on the underlying matched sample. We compare non-promoted managers' transaction profitability with their unconditional return to investigate whether their post-tournament transaction return is significantly different from their transaction returns outside a CEO turnover event before tournament began. We focus on the isolated CEO turnover and exclude transactions in year +2 to have a cleaner sample with no confounding events to be consistent with diff-in-diff regression, even though our results are robust to their inclusion. We also conduct a test on the predictive power of insider trading on tournament outcome to alleviate further the reverse causality concern. We find, but not report for brevity, that the coefficients of age_ceo$_{j,t-1}$ in our first-stage regressions are all statistically significant with the expected signs, indicating that it is an appropriate instrumental variable for CEO turnover event. It is positive and statistically significant for periods (0,0), suggesting that the older the former CEO, the higher the likelihood of a CEO turnover in the next fiscal year, in line with our hypothesis. For periods (1,1), it becomes negative and statistically significant, suggesting that the recently left CEO is younger than the average former CEO age among all firms covered by Execucomp. The first stage F statistics, computed without the interaction term

$\widehat{\text{NPED}\times\text{CEO\_IT}}_{i,t}$ reported at the bottom of Panel A Table 9, are all above 10, which is the minimum value to alleviate the weak instrument concern[32], providing significant support for the relevance condition. The Anderson-Rubin F-statistic rejects the null hypothesis and indicates that the endogenous regressor $\text{NPED}_{i,t}$ is statistically significant. The results indicate that, after losing the CEO competition, insiders indeed incorporate more private information into their transactions. The Anderson-Rubin F-statistic is robust to the presence of weak instrumental variable (Andrews, Stock and Sun, 2019) and thus reaffirm our findings. In unreported results, we also check for a potential weak instrument using the Stock and Yogo (2005) test and the Shea Partial R-squared values. We find that our IV does not suffer from weak instrument problem. The Difference-in-Sargan C-statistic rejects the null hypothesis that the $\text{NPED}_{i,t}$ is exogenous to insider's profitability. As we have only one endogenous variable and one instrumental variable, this C-test is equivalent to a Hausman test comparing 2SLS estimates with fixed effect (FE) estimates. Its significance confirms the need to apply 2SLS rather than the FE estimator.

Table 9 Panel A reports the second-stage regression results. For insider purchase sample, we omit to report the coefficient of $\widehat{NPED\times CEO\_IT}_{i,t}$, which is insignificant, suggesting that when non-promoted managers make purchase transactions, they do not consider the current CEO trading activity. The coefficient of $\widehat{NPED}_{i,t}$ is positive and statistically significant in period (0,0), implying that a 1% increase in the probability of the occurrence of CEO turnover event in year 0 leads to a 0.626% increase in the BHAR_m_365. The results are consistent with our diff-in-diff findings, suggesting that non-promoted insiders incorporate more positive private information into their buy trades, but only in event year (0,0), where also the trades executed by insiders from firms that hired an outsider CEO will trade on their private information with relatively lower aggressiveness, as $\text{OutsiderD}_{j,t}$ is negative.

The endogeneity problem is likely to be more severe in insiders' sell than buy trades, because many insiders do not sell to seek profit (Cohen et al., 2012). The coefficients of $\widehat{NPED}_{i,t}$ are negative

[32] The first stage F-statistics are all relatively large for our insider sell sample because of the large sample size and the two fixed effects and/or the high predictive power embedded in our IV for our endogenous variable. If our IV and endogenous variable are high predictable, then the amount of exogenous variation left for the second-stage regression will be small. To address this concern, we separately estimate all the first-stage regression and check the within R-squared whenever the first stage F-statistics is larger than 200. After using the firm and month fixed effects, the within R-squared in the first-stage regression is generally around 0.4, making our IV suitable.

and statistically significant, suggesting that insiders incorporate more private negative information into their sell trades to compensate themselves for the forgone promotion-based incentives. The interaction term's coefficient is positive and statistically significant in both year 0 and +1, indicating that their sell trades are systematically loss averting when the newly appointed CEO increases her holding, suggesting that managers strategically time their sell trades against the current CEO's noisy transactions. For an otherwise-average insider sell trade, a 1% increase in the predicted probability of the transaction in year 0 leads to a decrease in returns by 1.117% (= 2.911%-1.794%) in (0,0) and by 0.6% if the 1% increase is in year 0 and +1. $(NPED\widehat{\times CEO\_IT})_{i,t}$ is larger in year 0, implying that the CEO trading direction plays a more prominent role in insiders' trading decision-making process in year 0 and 1. $COOD_{j,t}$ coefficient is positive and significant in year 1 for the sell sample, suggesting that non-promoted insiders of firms with a CEO successor prior to the tournament trade on their private negative information with less aggressiveness than their counterparts from firms with no pre-assigned CEO successor.

The asymmetry effect of CEO trading activity proxied by $CEO\_IT_{j,t}$ in the insider purchase and sell samples is due to the noisy buy trades of the newly-appointed CEOs to prolong their contracts, not to make profits, as suggested by Armstrong et al. (2021). CEO purchase transactions embed a strong signaling effect for the stock undervaluation and the outside investors will adjust the stock price upward even if the signal is false (Wu, 2019). The short term buying pressure from these uninformed investors will temporarily boost the stock price, setting up a premise for the non-promoted executives to sell their shares at an inflated price. The price will be gradually corrected in the long term making their sell trades loss-avoiding. Moreover, non promoted executives will not benefit from trading against CEO's sell trades to cover their buy trades as new CEO do not sell shares in the first year of their appointment, and, in unreported results, the interaction term is insignificant for insider purchase sample.

We investigate whether the return profitability of CEO purchase transaction will decrease to negative in the long term as suggested by Wu (2019). In Internet Appendix S10, we estimate a fixed effect regression using the regression specification of equation (5) without $COOD_{j,t}$, $Outsider_{j,t}$, and $high\_incentiveD_{j,t-1}$. We find no signficant change in CEO buy trades in year 0 return profitabilities in 30-day holding period, but the return predictability is 11.1% significantly lower than their average buy

trades in 365-day holding period. The return reversal is clearer in year 1. CEO purchases generate a statistically significant 2.2% higher abnormal return in 30-day period, indicating that their buy trades boosted stock prices. However, these buy trades yield significant 10.4% lower profits confirming that these CEO buy trades are nosiy, and the market corrects the inflated prices to a lower level. Our results confirm that non-CEO managers adopt contrarian strategies by trading profitably against their CEO.

Overall, the diff-in-diff estimation results are in line with our hypothesis that non-promoted managers make more informative purchase and sell transactions after losing the CEO promotion. The 2SLS results confirm that insiders incorporate more negative private information into their sell transactions in all post-event years, consistent with our diff-in-diff regression results. Additionally, we apply the 2SLS estimator with the same IV based on the matched insider sell sample. Internet Appendix S9 reports the results. The last fiscal year's former CEO age still remains a valid predictor for CEO turnover because the first stage F statistics are all above 10, highlighting that our IV's relevance condition is valid in the smaller sample. The signs and levels of significance of $\widehat{\text{NPED}}_{i,t}$ are consistent with the 2SLS estimates based on the universal sample. Insiders incorporate more negative information into their sell trades in all two post-event years. For the insider purchase sample, only 770 cases have non-missing former CEO age. The coefficient is insignificant, and we omit it in our regression output.

5.2. Insider sequential sell transactions around dissimulation strategy

Huddart, Hughes and Levine (2001) argue that the implementation of the U.S security law increases the market scrutiny of insiders' transactions and reduces insider dealing profitability by strictly regulating corporate insiders to disclose publicly their transactions two days after execution. Despite a potential lessening of their returns by as much as a half because of the improved market efficiency, trading on private information remains a profitable strategy. To mitigate their litigation risk, insiders will dissimulate their private information by randomly trading in a manner inconsistent with their informational agent role. If their private information is long-lived,[33] they will intentionally make noisy transactions to thwart outsiders who intend to follow them. Biggerstaff et al. (2020) report that

[33]Insiders with short-lived information, which is revealed quickly to the market, cannot adopt this strategy.

insiders incorporate their private negative information into multiple/sequential sell trades, executed at most 30 days apart, to minimize the price impact, and the return of the last transaction in a sequence is more negative than isolated sell trades. The dissimulation strategy is only effective to disguise the negative private information embedded in sell trades, not the positive one in buy trades. We test whether the losing tournament effect persists after accounting for the possibility that insiders intentionally split their private negative information into sequential sell trades within ten, fifteen, or thirty calendar days, relative to isolated sells, and randomly mix with buy trades. When a sequence contains both purchase and sell transactions, we aggregate the trading value to compute the sequence's trading direction. If the total value is negative, we define all transactions in the sequence as sequential sells. We then adjust the BHAR_m_365 for all trades in a sequence using the BHAR_m_365 from the last trade in a sequence, or by extending the holding period from the beginning to the 365 calendar days after the last trade. We implicitly assume insiders will close all their positions 365 days after the last trade.

In un-tabulated univariate statistics, we find that 48.9% of all sell trades are sequential sells, which typically last for 23 days with an average of eight transactions, and only 7% contain both buy and sell trades, due to the short-swing rule which prevents insiders from realizing profit from two offsetting transactions in the first six months after the first trade. All our results are robust if we remove buy trades and solely focus on sequential sell trades. We re-estimate Equation (5) with the adjusted BHAR_m_365 based on all sequential and isolated sell transactions. Our overall results reported in Table 9 Panel B remain unchanged, but the coefficients of $\widehat{\text{NPED}}$ become more negative in all two post-event years for sells, implying that the losing tournament effect is stronger after controlling for insider dissimulation strategy. We further test for robustness by substituting the BHAR_m_365 from the last trade in a sequence for all sequential trades in the same sequence. We also extend the holding period for sequential sells from 1 day after the first trade to 365 days after the last trade. Since the holding horizon varies depending on the sequence length, we compute the daily average BHAR_m_365×252, the median number of trading days in a 365-calendar day holding period. The coefficients of $\widehat{\text{NPED}}$, not reported for brevity, remain negative and statistically significant.

[Insert Table 9 here]

5.3. Additional robustness tests

One of the main assumptions behind our results is that our IV, the last year former CEO's age, and the private information that non-CEO managers are exploiting are not correlated. The former CEO's age *per se* will not affect a firm's valuation as it bears no impact on its future cash flow, but we recognize the possibility that former CEOs may affect her firm's future valuation through the adaption of corporate decisions with long-lasting effects. Although there is no reason to believe that the preference for a long-last policy is systematically related to manager age, this possible violation of exclusion restriction will lead to an inconsistent estimate and weakens our conclusions. We alleviate this potential concern by including a set of proxy variables for corporate performance in our 2SLS regression.

In the first robustness test, we add to Equation (5) fourteen additional control variables that embed predictive power for the firm's future fundamental and are possibly determined by the personal preferences of CEOs in different age groups to better demonstrate the validity of the exclusion restriction and the robustness of our results. In addition to our controls in Table 7, we add the segment sales-based Herfindahl index, $\text{firm\_focus}_{j,t-1}$, to control for firm diversification, the natural logarithm of the current age of non-CEO managers, $\text{lnage}_{j,t}$, and $\text{analyst\_talent}_{j,t-1}$, and $\text{CEO\_tenure}_{j,t-1}$ to control for the tenure of CEO in the last fiscal year to show that our IV is not simply capturing the current CEO tenure. Table 10 Panel A reports the result without the interaction term $\widehat{\text{NPED}\times\text{CEO\_IT}}_{i,t}$ for the insider purchase sample which is insignificantly. In column (1), the coefficient of $\widehat{\text{NPED}}_{i,t}$ is 1.448 and significant at the 95% confidence level. For insider sell samples, the sign and significance of $\widehat{\text{NPED}}_{i,t}$ and $\widehat{\text{NPED}\times\text{CEO\_IT}}_{i,t}$ are consistent with our previous results. We find, but do not report, similar results when firm characteristics are at the end of the year that the former CEO left the company.

As the second robustness test, we consider that former CEO's age will only affect non-CEO's trading profitability through CEO turnover. Therefore, if we regress the BHAR_m_365 on former CEO's age by using years other than years 0 and 1, the coefficient of CEO's age should be statistically insignificant if the exclusion restriction holds. In un-tabulated results, we re-estimate the regressions in Table 10 by substituting the former CEO's age for the $\widehat{\text{NPED}}_{i,t}$with the same set of control variables.

We find that its coefficient is statistically insignificant for buy and sell samples, strengthening the plausibility of exclusion restrictions further. We recognize that some firms retain their former CEOs on the board after they left their role.

In the third robustness test, we refine our year 0 sample into the transactions-day level. We have shown that managers are more likely to incorporate more positive (negative) private information into their purchase (sell) transactions in year 0. The conclusion hinges crucially on the assumption that we do not mis-specify the insider transactions prior to the tournament outcome as post-tournament transactions. We rely on Execucomp item *becomeceo* to identify the specific date for the CEO turnover. For the *becomeceo* date that is one calendar year apart from the fiscal year, we manually check and correct it by crosschecking BoardEx. We reclassify the transactions before the succession of the new CEO as pre-tournament trades and re-estimate Equation (5). In an un-tabulated result, the coefficients of $\widehat{\text{NPED}}_{i,t}$ are 0.733 and -3.078 and are statistically significant at the 90% and 95% confidence level for insider purchase and sell samples in year 0, respectively.

We also employ alternative holding periods and Fama-French Four-Factor model (Fama and French, 1993) to compute alpha over 30-, 180- and 360- calendar holding periods, as alternative measures of abnormal returns using Kenneth French's Data Library[34] as follows:

$$\text{return}_{j,t} - \text{rf}_t = \alpha + \beta_1(\text{MKT}_t - \text{rf}_m) + \beta_2\text{SMB}_t + \beta_3\text{HML}_t + \beta_4\text{MOM}_t + \epsilon_t \qquad (8)$$

where α, the risk-adjusted return, is estimated from one day after the transaction date over the next 30/180/365 calendar days. $return_{j,t}$ is the daily return adjusted for dividend, rf_m is the risk-free rate proxied by the one-month T-bill rate. MKT_t is the CRSP value-weighted market index. We time the daily α by 22, 126, and 252 for these 3 holding periods. Additionally, we report the raw cumulative return $ret_{t+1,t+i}$ and the NYSE value-weighted size-decile adjusted return $BHAR\_size_j$. Table 10 Panel B reports only the coefficient of $\widehat{\text{NPED}}_{i,t}$ for brevity from re-estimating Equation (5). For the buy trades,

[34] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. We thank Professor French for making these data publicly available.

it is mainly insignificant, while for the sell trades, it is mainly negative and significant, suggesting that these trades are loss avoiding for the 180 and 365 holding periods. The remaining results did not change.

In the fourth robustness test, we only keep the top two highest paid managers in each year for each firm. We recognize that the likelihood of them competing in an CEO turnover is the highest, and we re-estimate the diff-in-diff regression and 2SLS regression. Panel C shows that our conclusions remain robust despite losing more than half of our sample. The results show that our conclusions do not hinge on the assumption that all top 4 highest paid non-CEO managers are tournament contenders. Our results remain robust if we additionally impose that tournament contenders must be younger than 60. In the fifth robustness test, we only keep the opportunistic transactions, and show in Panel D that our conclusions remain robust, suggesting that insiders will better time their opportunistic transactions after losing the CEO turnover. In the sixth unreported robustness test, we find that our results are robust to the inclusion of all 10b5-1 transactions, to the exclusion of all CFO transactions and to the exclusion of firms that retain previous CEO.

We further test the validity of our diff-in-diff regression results over a $(-2, +1)$ period around pseudo-CEO turnovers, which are arbitrarily set as three years before or after the actual CEO turnover. We use the same pair of treated and matched firms but remove firms that had a CEO turnover in the pseudo-event window. We find, but not report for brevity, that the coefficient of the interaction term $\text{Post}\times\text{Treat}_{i,t}$ in Equation (2) remains insignificant for both purchase and sell samples, supporting the validity of the parallel trend assumption and the credibility of our diff-in-diff design. Our results remain also robust when we exclude all external CEO promotion samples and re-estimate Table 3 to Tale 5.

Finally, although the use of 2SLS estimator has greatly eliminated the probability that chance drives our results, we re-estimate Equation (5) using 1,000 placebo tests for insider purchase and sell samples separately to reaffirm the robustness of our results and our IV validity. Each test entails randomly selecting 400 firm-year observations with at least one insider purchase transaction and 1,600 firm-year observations with at least one insider sell transaction considered as CEO turnover year for insider purchase and sell sample, respectively, the nearest hundreds for the actual numbers, of 386 and 1,601 in year 0, of distinct CEO turnover firm-year observations. We remove firm-year observations

with actual CEO turnover event and the following two years from our sample pool. For each firm-year observation, we match the insider trading transactions in the given year and set $NPED_{i,t}$ to be one for all insider transactions in the year. We replicate Equation (5) without $Outsider_{j,t}$ and $COOD_{j,t}$ and report the coefficient of $\widehat{NPED}_{i,t}$ and the first-stage F statistics in Table 10 Panel E. If our results are due to chance or unobservable factors, a relatively large proportion of our placebo tests will have a higher first-stage F statistics and the coefficients of $\widehat{NPED}_{i,t}$ will be statistically positive (negative) for insider purchase (sell) sample. In Column (1) the mean $\widehat{NPED}_{i,t}$ for the insider buy sample, is statistically indifferent from zero, and for the insider sell sample, it is positive and statistically insignificant with a right-skewed distribution. Column (5) to (7) show that no single (only 8 cases, out of 1,000 placebo tests) insider purchase (sell) with both a significant positive (negative) coefficient of $\widehat{NPED}_{i,t}$ and a first-stage F-statistics larger than 10, and none is statistically different from the corresponding one-sided binomial test-statistic theoretical levels of 1%, 5% and 10%. We find 34 tests that report a first-stage F-statistics larger than 10 with a maximum of 19 and a negative significant coefficient at the 90% confidence level. In Table 9, our first-stage F is mostly larger than 10, indicating our IV will not randomly be significant, and it does not contain predictive power outside CEO turnover event.

We also conduct 1,000 placebo tests for our diff-in-diff regression. We first randomly select 1,000 firm-year observations without CEO turnover and not in any CEO turnover window. We then match these treated firms with one control firm with placement in the same year *t* using the same matching algorithm. We assume year *t* to be the event year. We estimate a diff-in-diff regression by using the observations of matched sample for $years_{t-2,\,t}$. We conduct placebo tests for insider purchase and sell samples separately. We restrict the treated firm cannot match to itself in the last year. We report the placebo test results in Table 10, Panel F. The average coefficient of the interaction term is negative (positive) for insider purchase (sell) sample. Column (5) to (7) show that, as in Panel E, no percentage of placebo tests is statistically significant at any significance level based on a one-sided binomial test-statistic. Overall, these results indicate that if we use a randomly selected sample of firms without CEO turnover events, we cannot replicate our main findings obtained from both diff-in-diff regression and 2SLS. The placebo tests further indicate that our IV is only relevant to explain years close to the CEO

turnover, and it is extremely unlikely that we will obtain a significantly positive (negative) $\widehat{NPED}_{i,t}$ for buy (sell) trades while satisfying our IV relevance condition. The profitability of an average insider transaction embedded in purchase (sell) trades is unlikely to increase (decrease) without a CEO turnover.

[Insert Table 10 here]

5.4. Alternative explanations

We recognize that the non-promoted managers may stay with the firm after losing the CEO competition because they target other higher-ranking positions within the firm with an attractive increase in the salary, which mitigates their incentives to respond negatively to a promotion pass-over by offloading their holdings using their private information. This possibility is trivial because Execucomp mainly reports the top four highest-paid managers whose career path is already at the top of the corporate hierarchy, and any increase in their compensation package will not be as significant as the CEO promotion reward. To rule out this possibility, we focus on isolated CEO promotion from year 0 to 7. We rank managers by their total compensation package in their firms, with rank one being the highest among all CEO competitors, and then compare their pay rank and total compensation between years -1 and 4. We find, but not report, that non-promoted managers' pay rank decreases significantly by 1.4, compared to 0.6 in the same 5-year period without losing CEO turnover for control firms, as they receive \$0.73 million pay rise after losing the CEO turnover, compared to \$0.57 million if they have not lost the CEO competition, although the \$0.16 million difference is economically small.

We estimate new regressions using one or two-years change in the natural logarithm value of the total compensation as the dependent variable, and insider, firm, and year fixed effects, and previously stated control variables. We focus on a dummy variable that equals to one for year (0, 4) and zero otherwise. We find, but not report, no significant change in the total compensation of non-promoted executives in both first and second year after losing the CEO promotion, in line with Kale et al. (2009) and Chan et al. (2022), suggesting that losers are not compensated for the dimmer career prospects.

Although we employ various techniques to show that the increase in insider trading profitability is associated with the forgone CEO promotion opportunity, we rule out two alternative explanations. First, the increase in insider sell transaction profitability is due to treated firms appointing new CEOs

with skills below control firms', and, therefore, non-promoted directors are more likely to yield higher loss-averting sell transactions. We borrow the CEO skill measure from Daniel et al. (2020)[35] which we including as a moderator in Table 4. The results in Internet Appendix S11 Panel A show that although $skill_{j,t}$ has the expected positive significant coefficient for the sell sample, the inclusion of the proxy does not eliminate the significantly negative coefficients of $(Treat \times Post)_{i,t}$, suggesting that new CEO's skill is unlikely to explain their loss-averting sell trades' decreases.

Second, Cziraki and Groen-Xu (2020) show that firms systematically have higher return volatility after changing CEOs. Insider trades may be more profitable and more frequent because volatility is temporarily higher, increasing insiders' informational advantage. Although we have included return volatility as a control variable in Table 10 Panel A, we further rule out the alternative story by solely focusing on firms that have low volatility after CEO changes. We select firms with the lower-than-median return volatility in its 2-digit SIC industry in event year 0, and re-estimate the diff-in-diff regression by focusing on these firms and their nearest neighbors. In Internet Appendix 11 Panel B, we show that our baseline results remain robust and significant, indicating the return volatility is unlikely to be the main driver for informed trading behavior.

6. Conclusion

We investigate the causal relationship between losing the promotion opportunity and the non-promoted executives trading behavior. We eliminate the endogeneity by using a matched sample to specify a diff-in-diff regression. We find that they systematically avoid trading on their private negative information when competing for the CEO position in year (-2, -1), to avoid affecting adversely their winning probabilities, but after losing the tournament context, they predominantly sell, not buy, profitably against the nosiy buy trades of the newly promoted CEO. Their trading profitability reflects their *ex-post* expectation discrepancy of the forgone promotion opportunity, investors' sentiments, and their decrease in effort, which results in their firm's future declining performance, and holds after accounting for the different levels of firm-level price information informativeness. Finally, we show

[35] https://sites.temple.edu/lnaveen/data/. We thank Professor Naveen for making these data publicly available.

that this insider trading opportunity weakens the positive relationship between the tournament incentives and firm performance as insiders use their transactions to realize the tournament incentives prior to the tournament. Our results are robust to various econometric and estimations specifications.

Our results may be affected by other factors we have not considered in our analysis. Non-promoted executives could be trading just before material news is announced or for other non-identifiable reasons. While data on news announcements is not available in machine readable form, we tried to control indirectly for the other not directly observable motives. We have used non-CEO executives' personal and company characteristics as controls, but we could not find enough observations for an exogenous shock, such as sudden death of current CEO, that will affect their personal career horizon only. The extent to which these factors will better eliminate endogeneity and alter or confirm our results is the subject of further research.

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Table 1: Summary Statistics

This table reports the summary statistics for the main sample with matched firm. Panel A (B) reports the sample averages for the non-CEO insider purchase (sell) trades around CEO turnover event. $OutsiderD_{j,t}$ is a dummy equal to one if the promoted CEO is an outsider. $COOD_{j,t}$ is a dummy equal to one if the CEO succession was planned in $(-2,-1)$. *pay_gap_firm* is the natural logarithm of the difference between the adjusted CEO total compensation (*tdc1*) and the median adjusted total compensation of non-CEO insiders, deflated to 2010 CPI. *ret30* and Mom are days -30 to -1 and -364 to -31 stock price momentum. *bm*, *ROA*, *rd*, and *marketcap* proxy for growth, profitability, research and development cost, and size of the firm, respectively. $illiq_{j,m-1}$ is the Amihud (2002) illiquidity measure. $numest_{j,m-1}$ is financial analyst coverage. $Delta_{p,t-1}$ ($Vega_{p,t-1}$) is dollar change in manager *p*'s wealth associated with a 1% change in the firm's stock price in $000 (standard deviation of the firm's returns). $Rating_{j,t-1}$ is the yearly industry average S&P long-term rating from Compustat. $CEO\_IT\_Net\_Value_{j,t}$ is the net insider trading value of the current CEO. $high\_incentiveD_{p,t-1}$ is equal to one for high (in the top three) incentive managers and zero otherwise; Appendix A details the variables. ***, **, * (^{a}, ^{b}, ^{c}) indicate the sample mean (differences in means and medians) between the pre- (-2, -1) and post- (0, 1) event is statistically different at the 99%, 95% and 90% confidence level, respectively. All variables except insider purchase size and shares are winsorised at the top 99% and the bottom 1% level.

	Event Window (-2, -1)			Event Window (0, 1)			Event Window (-2, -1)			Event Window (0, 1)		
Variable	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N
	Panel A: Non-CEO Insider Purchase transactions						Panel B: Non-CEO Insider Sell Transactions					
BHAR_m_365	0.059**	-0.059	834	0.304$^{***\,a}$	0.119^{a}	818	0.057***	0.012	17,137	0.026$^{***\,a}$	-0.005^{a}	12,676
pay_gap_firm ($000s)	1,560***	696	742	2,079$^{***\,a}$	674	832	3,507***	2,183	16,194	3,340$^{***\,a}$	2,147^{a}	13,019
Non-CEO comp ($000s)	1,403***	893	834	1,070$^{***\,a}$	681^{a}	832	2,308***	1,400	17,153	2,1434$^{***\,a}$	1,346^{a}	13,062
illiq (000s)	0.271***	0.042	831	0.576$^{***\,a}$	0.087^{a}	832	0.049***	0.007	17,146	0.032$^{***\,a}$	0.005^{a}	13,062
marketcap ($million)	2,425***	834	834	1,765$^{***\,c}$	545^{a}	832	12,092***	2,751	17,153	14,112$^{***\,a}$	3,361^{a}	13,062
Mom	0.059***	0.050	801	0.000^{b}	0.042	831	0.320***	0.264	16,798	0.288$^{***\,a}$	0.240^{a}	13,059
ret30	-0.067***	-0.056	717	-0.021$^{***\,a}$	-0.029^{a}	709	0.059***	0.053	14,452	0.056$^{***\,a}$	0.048^{a}	11,048
bm	0.787***	0.597	833	0.883$^{***\,b}$	0.752^{a}	832	0.419***	0.334	17,143	0.418***	0.337^{a}	13,062
numest	7.753***	6.000	834	5.905$^{***\,a}$	5.000^{a}	832	12.497***	11.000	17,153	12.492***	11.000	13,062
ROA	0.029***	0.025	834	-0.009$^{**\,a}$	0.005^{a}	832	0.064***	0.062	17,150	0.061$^{***\,a}$	0.060	13,062
rd	0.028***	0.000	834	0.034***	0.001^{a}	832	0.058***	0.000	17,153	0.078$^{***\,a}$	0.005^{a}	13,062
delta (in $000)	174***	16	805	25$^{***\,a}$	11^{a}	767	229***	66	16,295	154$^{***\,a}$	57^{a}	12,345
vega (in $000)	19***	6	803	11$^{***\,a}$	5	760	49***	18	16,293	48***	16^{a}	12,342
$OutsiderD_{jt}$	0.000	0.000	834	0.369$^{***\,a}$	0.000^{a}	832	0.000	0.000	17,153	0.295$^{***\,a}$	0.000^{a}	13,062
$COOD_{jt}$	0.000	0.000	834	0.133$^{***\,a}$	0.000^{a}	832	0.000	0.000	17,153	0.186$^{***\,a}$	0.000^{a}	13,062
$high\_incentiveD_{p,t-1}$	0.388***	0.000	834	0.453$^{***\,a}$	0.000^{a}	832	0.537***	1.000	17,153	0.562$^{***\,a}$	1.000^{a}	13,062
$rating_{j,t-1}$	1.325***	1.353	825	1.319***	1.366	821	1.380***	1.431	17,069	1.392$^{***\,a}$	1.439^{a}	12,645
$CEO\_IT\_Net\_Value_{i,t}$ ($000s)	-819***	0.000	834	300$^{***\,a}$	-42^{a}	832	-15,509***	-3,498	17,153	-2,581$^{***\,a}$	0,000^{a}	13,062
Nean No Shares traded	12,255***	2,882	834	10,176***	2,000^{a}	832	33,382***	11,191	17,153	27,781$^{***\,a}$	10,000^{a}	13,062
Mean trade value ($000s)	156***	38	834	163***	19^{a}	832	1,039***	355	17,153	944$^{***\,a}$	327^{a}	13,062
Average No of Observations	417			416			8,576			6,531		

Table 2: Insider trading propensity after losing the CEO competition.

Panel A reports the logit and linear probability models estimating the likelihood of a manager *p* becoming CEO in year *t.* The dependent variable is one for CEO, and zero otherwise, using all tournament competitors and for CEO turnover year *t* only. Sample is at manager-firm level. Variables $\#\_buy_{p,t}$ and $\#\_sell_{p,t}$ represent the number of opportunistic insider purchase and sell transactions made by insiders *p* in year *t*, following Cohen et al. (2012). Other independent variables included but not reported are $ret30_{j,t-1,(d-1,d-30)}$, $mom_{j,\ t-1,(d-31,d\ -364)}$, $bm_{j,t-1}$,$illiq_{j,t-1}$,total $asset_{j,t-1}$, $roa_{j,t-1}$,tobin's $Q_{j,t-1}$,$leverage_{j,t-1}$. Standard errors in Panel A are clustered by firm in brackets. Panel B reports the linear probability regression output. The dependent variable is $opp\_D_{i,t}$ equal to one for insider transactions executed by opportunistic traders, and zero otherwise. Standard errors reported in parentheses in Panel B are computed based on robust standard errors clustered at the firm-month level. Appendix A defines all our variables. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

Panel A: Opportunistic insider trading and the probability of winning CEO promotion				
	Logit		Linear Probability Model	
	$CEOD_{i,t}$	$CEOD_{i,t}$	$CEOD_{i,t}$	$CEOD_{i,t}$
$age_{p,t-1}$	-0.030**	-0.031**	-0.003	-0.003
	(0.015)	(0.015)	(0.002)	(0.002)
$tenure_{p,t-1}$	0.046*	0.040	0.006	0.005
	(0.026)	(0.026)	(0.004)	(0.004)
$COOD_{j,t-1}$	2.992***	2.996***	0.400***	0.400***
	(0.194)	(0.192)	(0.034)	(0.035)
$\#\_buy_{p,t-1}$	0.341***		0.046*	
	(0.103)		(0.027)	
$\#\_sell_{p,t-1}$	-0.118**		-0.013***	
	(0.051)		(0.005)	
$\#\_buy_{p,(t-2,t-1)}$		0.178**		0.022
		(0.070)		(0.015)
$\#\_sell_{p,(t-2,t-1)}$		-0.057**		-0.006**
		(0.026)		(0.003)
$delta_{p,t-1}(\times 0.01)$	0.029	0.038	0.005	0.006
	(0.037)	(0.038)	(0.005)	(0.005)
$vega_{p,t-1}(\times 0.01)$	0.068	0.066	0.106***	0.103***
	(0.157)	(0.161)	(0.033)	(0.033)
$lncompen_{p,t-1}(\times 0.01)$	0.029***	0.029***	0.006***	0.006***
	(0.005)	(0.005)	(0.001)	(0.001)

Other Control	Yes	Yes	Yes	Yes
Fixed Effect			Firm, Year	Firm, Year
Sample	1,466	1,466	1,364	1,364
R^2	0.38	0.37	0.43	0.42
Panel B: Opportunistic Insider trading propensity after losing the CEO competition				
	Insider Purchase Transactions		Insider Sell Transactions	
Year *t*	(0,0)	(1,1)	(0,0)	(1,1)
$Post_{i,t}$	-0.050**	-0.073	-0.025***	-0.066***
	(0.023)	(0.054)	(0.008)	(0.011)
$Treat_{i,t}$	-0.064**	-0.107**	-0.006	-0.015
	(0.027)	(0.044)	(0.010)	(0.010)
$(Treat \times Post)_{i,t}$	0.043	-0.024	0.025**	0.047***
	(0.029)	(0.084)	(0.012)	(0.016)
$CEO\_IT_{j,t}$	-0.025*	0.031**	0.008***	0.006**
	(0.013)	(0.015)	(0.003)	(0.003)
Constant	0.674	1.668*	1.295***	1.391***
	(0.614)	(0.942)	(0.100)	(0.111)
Control Variables	Yes	Yes	Yes	Yes
Sample	987	715	30,879	28,462
Within R^2	0.17	0.22	0.36	0.37
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month

Table 3: Difference-in-difference regression output

The dependent variable is BHAR_m_365. $(Post \times Treat)_{i,t}$ is a dummy variable equals to one for firms that have a CEO turnover in year *t*, and zero otherwise. Other variables are described in Appendix A. In Panel A, we only include sample in pre-CEO turnover period (-2, -1) and post-CEO turnover period (t, t+i). In Panel B and Panel C, we split the entire treated sample with its nearest neighbor control firm into voluntary and involuntary CEO turnover event according to Gentry *et al.*(2021). Standard errors in parentheses are based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level. All regressions include control variables and firm and month fixed effects.

	Insider Purchase			**Insider Sell**		
Year *t*	(0,1)	(0,0)	(1,1)	(0,1)	(0,0)	(1,1)
Panel A: Baseline Regression						
$Post_{i,t}$	0.105	-0.002	0.152	0.021***	0.007	0.042***
	(0.073)	(0.051)	(0.181)	(0.008)	(0.009)	(0.011)
$Treat_{i,t}$	-0.320***	-0.349***	-0.342**	0.017*	0.011	0.008
	(0.108)	(0.117)	(0.133)	(0.010)	(0.010)	(0.010)
$(Treat \times Post)_{i,t}$	0.082	0.245**	-0.177	-0.038***	-0.030**	-0.048***
	(0.110)	(0.101)	(0.256)	(0.013)	(0.015)	(0.017)
$CEO\_IT_{j,t}$	0.036	0.015	0.108**	0.010***	0.009***	0.013***
	(0.029)	(0.024)	(0.044)	(0.003)	(0.003)	(0.003)
$COOD_{jt}$	-0.442***	-0.421***	-0.440*	0.060***	0.069***	0.054**
	(0.135)	(0.145)	(0.227)	(0.018)	(0.021)	(0.025)
$ret_{j,t,(d-1,d-30)}$	-0.811**	-0.333**	-0.963**	-0.171***	-0.185***	-0.131***
	(0.317)	(0.152)	(0.447)	(0.032)	(0.032)	(0.036)
$mom_{j,t,(d-31,d-364)}$	-0.182***	-0.102	-0.105	-0.035***	-0.039***	-0.036**
	(0.070)	(0.079)	(0.100)	(0.012)	(0.012)	(0.014)
$size_{j,m-1}$	-0.909***	-0.766***	-0.764***	-0.275***	-0.263***	-0.276***
	(0.159)	(0.116)	(0.243)	(0.012)	(0.011)	(0.014)
$delta_{p,t-1}$ (×0.01)	0.002***	0.135***	0.129**	0.002**	0.001*	0.002**
	(0.000)	(0.051)	(0.053)	(0.001)	(0.001)	(0.001)
$vega_{p,t-1}$ (×0.01)	-0.257***	-0.240***	-0.201*	-0.015***	-0.007**	-0.009**
	(0.092)	(0.087)	(0.119)	(0.004)	(0.003)	(0.004)
$lncompen_{p,t-1}$	0.018	0.033	0.027	0.032***	0.026***	0.035***
	(0.035)	(0.029)	(0.035)	(0.007)	(0.006)	(0.007)
$rating_{j,t-1}$	3.996***	3.207***	3.963***	-0.100	0.011	-0.147*
	(0.950)	(0.596)	(1.375)	(0.076)	(0.078)	(0.084)
Sample	2,126	1,833	1,328	45,776	36,829	33,658
Within R^2	0.38	0.37	0.39	0.15	0.15	0.14
Panel B: Voluntary CEO Turnover Event						
$Post_{i,t}$	-0.102	-0.134	0.208	0.167***	0.083***	0.205***
	(0.082)	(0.098)	(0.221)	(0.050)	(0.027)	(0.068)
$Treat_{i,t}$	-0.261	-0.134	-0.000	0.109**	0.053*	0.059
	(0.228)	(0.180)	(0.280)	(0.044)	(0.030)	(0.043)
$(Treat \times Post)_{i,t}$	0.224**	0.320**	-0.371	-0.156***	-0.058*	-0.177**
	(0.112)	(0.161)	(0.266)	(0.064)	(0.035)	(0.080)
Sample	440	365	288	4,101	3,306	3,143
Within R^2	0.44	0.58	0.63	0.27	0.29	0.38
Panel C: Involuntary CEO Turnover Event						
Posti,t	-0.019	-0.025	-0.169**	0.026**	0.017	0.042***
	(0.045)	(0.056)	(0.075)	(0.012)	(0.014)	(0.015)
Treati,t	-0.222*	-0.352**	-0.125	0.043***	0.026*	0.018
	(0.130)	(0.141)	(0.150)	(0.013)	(0.014)	(0.013)
(Treat×Post)i,t	0.242***	0.241***	0.371***	-0.036***	-0.045**	-0.048**
	(0.072)	(0.085)	(0.138)	(0.016)	(0.019)	(0.021)
Sample	1,116	930	716	27,249	22,041	20,573
Within R^2	0.34	0.35	0.28	0.17	0.18	0.16

Table 4: Insider heterogeneity and their trading intensity

This table reports the fixed effect diff-in-diff regression results with BHAR_m_365 as the dependent variable. In Panel A, the moderator variable is $Pay\_rank_{p,t}$, the rank of non-promoted manager sorted by their total compensation in year -1 among all tournament competitors. In Panel B, we use $Lnage_{p,t}$, the natural logarithm of the age of the insider p in year t. In Panel C, we use $NoncomD_{p,t}$, a dummy variable equals to one if firm j disclosed a non-compete agreement in its 10-K or 10-Q in year t, zero otherwise. In Panel D, we employ $SHD_{p,t}$, a dummy variable equals to one for short-horizon insiders identified by following Akbas et al (2020), and zero otherwise. In Panel E, the moderator variable is $Probability_{p,t-1}$, the estimated subjective probability of insiders becoming CEO based on their personal characteristics. In Panel F, we use $BA_{p,t-1}$, the bonus award in t-1 for insider p. We include firm and month fixed effects and control variables described in Table 1 and Appendix A and Internet Appendix S1 details the moderators. Robust standard errors in parentheses are at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

	Insider Purchase		**Insider Sell**	
Year t	(0,0)	(1,1)	(0,0)	(1,1)
	Panel A: Tournament Prize			
$(Treat\times Post)_{i,t}$	0.248*	-0.072	-0.076***	-0.091***
	(0.150)	(0.363)	(0.022)	(0.027)
$(Post\times Treat\times Pay\_rank)_{i,t}$	-0.007	-0.083	0.018***	0.019***
	(0.031)	(0.078)	(0.006)	(0.007)
Sample	1,590	1,100	34,883	28,988
	Panel B: Age Effect			
$(Treat\times Post)_{i,t}$	-1.988	0.634	-0.743**	-1.032***
	(1.412)	(2.459)	(0.322)	(0.384)
$(Post\times Treat\times lnage)_{i,t}$	0.556	-0.133	0.183**	0.250***
	(0.356)	(0.631)	(0.081)	(0.096)
Sample	1,415	1,074	32,158	29,552
	Panel C: Non-compete agreements			
$(Treat\times Post)_{i,t}$	0.079	0.093	0.011	-0.035**
	(0.078)	(0.119)	(0.018)	(0.018)
$(Post\times Treat\times NoncomD)_{i,t}$	0.348	-0.180	-0.078**	-0.012**
	(0.249)	(0.175)	(0.037)	(0.051)
Sample	1,833	1,328	37,875	33,658
	Panel D: Investment Horizon			
$(Treat\times Post)_{i,t}$	0.167***	0.177*	-0.034**	-0.053***
	(0.074)	(0.104)	(0.016)	(0.017)
$(Post\times Treat\times SHD)_{i,t}$	-0.177	0.090	0.070**	0.080*
	(0.252)	(0.541)	(0.035)	(0.044)
Sample	1,833	1,328	36,829	33,658
	Panel E: Predicted probability of becoming CEO			
$(Treat\times Post)_{i,t}$	0.039	0.080	0.051**	0.029
	(0.162)	(0.545)	(0.024)	(0.027)
$(Post\times Treat\times Probability)_{i,t}$	-0.443	1.655	-0.158***	-0.185***
	(0.639)	(1.084)	(0.057)	(0.070)
Sample	715	625	24,689	24,356
	Panel F: Bonus award effect			
$(Treat\times Post)_{i,t}$	0.153*	0.093	-0.041***	-0.068***
	(0.081)	(0.118)	(0.015)	(0.017)
$(Treat\times Post\times BA)_{i,t}$	0.145	0.101	0.103***	0.128***
	(0.106)	(0.178)	(0.029)	(0.032)
Sample	1,593	1,103	35,154	31,969

Table 5: Post CEO turnover insider trading and changes in firm and investor features

This table reports the fixed effect regression output based on matched sample in Table 4. In Panel A, the dependent variable is the change in return on asset between year t and year t+2. In Panel B, the dependent variable is the change in investor sentiment measured as firm-specific component from the market-to-book decomposition of Rhodes–Kropf et al. (2005). The change in investor sentiment $\Delta\text{Sentiment}_{-1,1}$ is measured between year t-1 to year t+1. In Panel C, we obtain the $\Delta r_{t,t+2}$ by following Cziraki et al. (2021) to estimate a modified Fama and French (1993) Three-Factor model. In Panel D, we additionally include the moderate variable $\text{News}_{j,m}$, that is the number of discretionary news released by the company in the insider trading month *m* for firm *j*, defined by following Edmans et al. (2018). We include the control variables in Equation (2), omitted for brevity. Standard errors reported in parentheses are computed based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level. All regressions include control variables and firm and month fixed effects.

	Insider Purchase		Insider Sell	
	(1)	(2)	(3)	(4)
Year *t*	(0,0)	(1,1)	(0,0)	(1,1)
Panel A: Future Firm Performance				
Dependent Variable	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$
$\text{Post}_{i,t}$	-0.001	0.015	-0.001	-0.003
	(0.012)	(0.012)	(0.003)	(0.003)
$\text{Treat}_{i,t}$	-0.087***	-0.069***	0.015***	0.019***
	(0.022)	(0.019)	(0.004)	(0.004)
$(\text{Post}\times\text{Treat})_{i,t}$	0.007	-0.018	-0.020***	-0.011**
	(0.015)	(0.025)	(0.005)	(0.005)
Within R-square	0.15	0.19	0.07	0.06
Sample	1,727	1,271	35,582	32,628
Panel B: Investor Sentiment				
Dependent Variable	$\Delta\text{Sentiment}_{t-1,t+1}$	$\Delta\text{Sentiment}_{t-1,t+1}$	$\Delta\text{Sentiment}_{t-1,t+1}$	$\Delta\text{Sentiment}_{t-1,t+1}$
$\text{Post}_{i,t}$	-0.086	-0.284**	-0.003	0.037**
	(0.064)	(0.113)	(0.014)	(0.017)
$\text{Treat}_{i,t}$	0.038	0.104	0.034**	0.034**
	(0.134)	(0.137)	(0.016)	(0.017)
$(\text{Post}\times\text{Treat})_{i,t}$	0.046	0.038*	-0.054**	-0.062**
	(0.121)	(0.219)	(0.023)	(0.026)
Within R-square	0.07	0.18	0.07	0.10
Sample	1,728	1,288	35,894	31,232

Panel C: Change in Cost of Capital				
Dependent Variable	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$
$Post_{i,t}$	-0.000	0.007**	-0.000	-0.000
	(0.013)	(0.003)	(0.000)	(0.000)
$Treat_{i,t}$	-0.085***	0.008***	-0.001	-0.001
	(0.022)	(0.002)	(0.000)	(0.000)
$(Post \times Treat)_{i,t}$	0.005	-0.004***	0.001**	0.001*
	(0.016)	(0.003)	(0.000)	(0.001)
Within R-square	0.14	0.21	0.05	0.05
Sample	1,727	1,334	37,001	33,727

Panel D: Discretionary News Release and Sell Transaction Predictability						
	(0,0)	(1,1)	(0,0)	(1,1)	(0,0)	(1,1)
	$\Delta ROA_{t,t+2}$	$\Delta ROA_{t,t+2}$	$\Delta Sentiment_{t-1,t+1}$	$\Delta Sentiment_{t-1,t+1}$	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$
$(Treat \times Post)_{i,t}$	-0.014***	0.001	-0.020	-0.014	0.001**	0.001
	(0.005)	(0.004)	(0.026)	(0.034)	(0.000)	(0.002)
$(Treat \times Post \times News)_{i,t}$	-0.002**	-0.001**	-0.010**	-0.012**	-0.000	-0.000
	(0.001)	(0.00)	(0.004)	(0.005)	(0.000)	(0.000)
$News_{j,m}$	-0.000	-0.000	0.002	0.002	0.0001**	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Within R-square	0.06	0.09	0.08	0.07	0.06	0.07
Sample	35,582	32,521	31,232	32,872	37,001	33,727

Table 6: Insider trading after CEO turnover for exiting managers

This table reports the fixed effect regression output for exiting managers who left the firm in year (0,2). The dependent variable in column (1) and (3) is $ExitD_{p,t}$, a dummy variable equal to one for managers that leave the firm in the year (0, 2), and zero otherwise. The dependent variable in column (2) and (4) is BHAR_m_365 as defined before. The moderator variable in column (2) and (4) is $LastD_{p,t}$,a dummy variable equal to one if a manager is staying in the firm for the last year, and zero otherwise. In Panel A, we employ the same matched sample as Table 4. In Panel B, we match each exiting managers using their total compensation, average insider trading profitability and total shares traded in year *t-1* with a manager from firms that do not have CEO turnover in year (-3,3) using the shortest Mahalanobis distance. We include the control variables in Equation (2), omitted for brevity. Our observations are between event year (-2, 1). Standard errors reported in parentheses are based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

	Insider Purchase		**Insider Sell**	
	(1)	(2)	(3)	(4)
Year *t*	(0,1)	(0,1)	(0,1)	(0,1)
Panel A: Firm Matched Sample				
Dependent Variable	$ExitD_{p,t}$	BHAR_m_365	$ExitD_{p,t}$	BHAR_m_365
$Post_{i,t}$	0.044	0.120	0.038***	0.026***
	(0.029)	(0.075)	(0.007)	(0.008)
$Treat_{i,t}$	-0.057	-0.323**	0.012	0.024**
	(0.045)	(0.109)	(0.009)	(0.010)
$(Post\times Treat)_{i,t}$	-0.011	0.088	0.008	-0.027**
	(0.042)	(0.114)	(0.013)	(0.013)
$LastD_{p,t}$		-0.137		0.023*
		(0.013)		(0.013)
$(Post\times Treat\times LastD)_{i,t}$		-0.128		0.049**
		(0.163)		(0.025)
Control Variable	Yes	Yes	Yes	Yes
Within R-square	0.04	0.39	0.02	0.17
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Sample	2,134	2,126	46,002	45,773
Panel B: Insider Matched Sample				
Dependent Variable	$ExitD_{p,t}$	BHAR_m_365	$ExitD_{p,t}$	BHAR_m_365
$Post_{i,t}$	0.228***	0.186***	0.287***	0.030***
	(0.041)	(0.071)	(0.011)	(0.010)
$Treat_{i,t}$	0.995	-0.189	0.888***	0.038**
	(0.057)	(0.154)	(0.019)	(0.017)
$(Post\times Treat)_{i,t}$	-0.316***	-0.070	-0.250***	-0.027
	(0.072)	(0.123)	(0.019)	(0.019)
Within R-square	0.36	0.35	0.35	0.18
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Sample	949	947	17,442	17,389

Table 7: Firm-level characteristics and the scale of non-CEO director turnover

This table reports the firm level Logit and Linear Probability regression results. The dependent variable $High\_TurnoverD_{j,t}$ is a dummy equals to one if firm *j* has more than 40% of their tournament contenders leave the firm in year (0, 1), and zero otherwise. We include in all regressions, year dummy and year fixed effect and omit the coefficients these other lagged independent for brevity: Illiq, roa, tobin'sQ, dividend yield, leverage, capital intensity, institutional ownership, independent committee, and analyst talent. $(Mean\_BAHR\_with\_CEO)_{j,(t-3,t-2)}$ is the average BHAR for 365 holding period with CEO trades between year (-2, -1). We time the BHAR for sell transactions by -1 to correct the direction. Standard errors reported in parentheses are computed based on robust standard errors for logit regression and clustered at the year-industry level for fixed effect regression.. We provide details of the control variables in Appendix A. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

	Logit		**Linear Probability Model**	
	$High\_TurnoverD_{j,t}$	$High\_TurnoverD_{j,t}$	$High\_TurnoverD_{j,t}$	$High\_TurnoverD_{j,t}$
$(Mean\_BHAR\_with\_CEO)_{j,(t-3,t-2)}$	-1.169***		-0.253***	
	(0.191)		(0.046)	
$(Mean\_BHAR\_without\_CEO)_{j,(t-3,t-2)}$		-1.089***		-0.238***
		(0.205)		(0.049)
$C\_score_{j,t-1}$	0.003***	0.003*	0.001**	0.001**
	(0.001)	(0.002)	(0.000)	(0.000)
$mom_{j,(d-364,d-31),t-1}$	0.354**	0.274	0.074*	0.058
	(0.181)	(0.192)	(0.045)	(0.047)
$bm_{j,t-1}$	0.566***	0.687***	0.126***	0.152***
	(0.169)	(0.183)	(0.040)	(0.043)
$numest_{j,t-1}$	0.023**	0.027***	0.005**	0.006**
	(0.010)	(0.010)	(0.002)	(0.003)
$size_{j,t-1}$	-0.162***	-0.173***	-0.035**	-0.037***
	(0.058)	(0.062)	(0.014)	(0.015)
$rd_{j,t-1}$	1.807**	1.963**	0.402**	0.435**
	(0.782)	(0.889)	(0.178)	(0.192)
$skt\_ret\_volatility_{j,t-1}$	9.684**	11.088**	2.233**	2.505**
	(4.661)	(4.984)	(1.083)	(1.195)
$cash\_flow\_vol_{j,t-1}$	10.999***	12.889***	2.524***	2.943***
	(3.649)	(4.084)	(0.881)	(0.940)
$independent\_manager_{j,t-1}$	1.169***	1.416***	0.252***	0.300***
	(0.394)	(0.423)	(0.096)	(0.097)
Sample	1,953	1,764	2,016	1,814

Table 8: Insider trading and tournament incentives

The data covers all firm-year observations in Execucomp in 1996-2019. The control variables in all six columns are $rd_{j,t}$, $sales_{j,t}$, $sales^2_{j,t}$, $capital\text{-}to\text{-}sales_{j,t}$, $advertising\text{-}to\text{-}sales_{j,t}$, $dividend\text{-}yield_{j,t}$, $leverage_{jt}$, $lnage_{j,t}$ and $skt\_ret\_voilatility_{j,t}$. The regression specification is a shorter version of Kale et al. (2009). Appendix A defines all variables in the table. In column (1) and (2), we regress Tobin's Q and ROA on all control variables with firm and year fixed effects, respectively. In column (3) to (6), we conduct a 2SLS regression with two first-stage regressions. Our endogenous variables are $pay\_gap_{j,t}$ and the interaction term between $pay\_gap_{j,t}$ and our insider trading intensity measure which is $all\_IT_{j,t}$. In the first stage regression, we employ the median $pay\_gap_{j,t}$ in the same sales quintiles and the interaction term between the $all\_IT_{j,t}$ and $pay\_gap_{j,t}$ as our two IVs in column (3) and (4). In column (5) and (6), we use the sum of the maximum federal and state long-term capital gain tax rates as the IV for $all\_IT_{j,t}$, and use the product between the tax rate and median $pay\_gap_{j,t}$ as the IV for the endogenous interaction term. In the second stage, we regress the Tobin's Q and ROA on all control variables with predicted $\widehat{pay\_gap}_{j,t}$, $\widehat{all\_IT}_{j,t}$ and predicted interaction term. We cluster our standard error at firm level and report it in the parentheses. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. We winsorised all variables at the top 99% and bottom 1% level. All columns include firm and year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	Fixed Effect		2SLS-Second Stage			
			One IV		Two IVs	
Dependent Variable	Tobin's $Q_{j,t}$	$ROA_{j,t}$	Tobin's $Q_{j,t}$	$ROA_{j,y}$	Tobin's $Q_{j,t}$	$ROA_{j,y}$
$pay\_gap_{j,t}$	0.014***	0.001***				
	(0.005)	(0.000)				
$\widehat{pay\_gap}_{j,t}$			0.084***	0.002*	0.168**	0.015**
			(0.016)	(0.001)	(0.086)	(0.007)
$\widehat{pay\_gap \times all\_IT}_{j,t}$			-0.008***	-0.003***	-0.037*	-0.005**
			(0.002)	(0.000)	(0.022)	(0.002)
$all\_IT_{j,t}$	0.021***	0.002***	0.088***	0.004***		
	(0.002)	(0.001)	(0.014)	(0.001)		
$\widehat{all\_IT}_{j,t}$					0.383**	0.029*
					(0.179)	(0.015)
Other Control Variable	Yes	Yes	Yes	Yes	Yes	Yes
First-Stage F-$\widehat{pay\_gap}_{j,t}$ only			334.37***	345.28***	209.57***	209.60***
Sanderson-Windmeijer F-$\widehat{pay\_gap}_{j,t}$					11.04***	11.14***
Sanderson-Windmeijer F-Interaction					10.37***	10.46***
Sanderson-Windmeijer F -$\widehat{all\_IT}_{j,t}$					9.06***	9.11***
Sample	35,806	35,822	35,806	35,822	34,258	34,274

Table 9: 2SLS regression result for purchase and sell transactions

Panel A reports the output of the 2SLS regression. The dependent variable in the first stage regression is $NPED_{i,t}$, a dummy variable equal to one for the non-promoted managers' buy/sell trades in the tournament year (0,0) and (1,1), zero for years outside the event window and (-2, -1). We exclude transactions in year +2 to remove confounding events and CEO observations and insider transactions conducted by non-competitors. Appendix A details the variables. The instrumental variable is the last fiscal year's previous CEO age. We calculate *ret30, mom, bm, numest, illiq* and *size* at the end of last month relates to the insider transaction date that will be used in the second stage of IV regression. Panel B extends the holding period for sequential sells from 1 day after the first transaction to 365 days after the last transaction, using the daily average BHAR_m_365×252, the median number of trading days in a 365-calendar day holding period. We report robust standard errors clustered at the Firm-Month level in parentheses. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All regressions include firm-month fixed effects. We do not report the coefficients of the mostly insignificant control variables $numest_{j,m-1}$, $pay\_gap_{j,t-1}$, $illiq_{j,m-1}$, $rd_{j,t-1}$, $bm_{j,m-1}$, $rating_{j,t-1}$, $delta_{p,t-1}$, and $roa_{j,t-1}$; All variables are winsorised at the top 99% and the bottom 1%.

	Insider Purchase		**Insider Sell**	
Year *t*	(0,0)	(1,1)	(0,0)	(1,1)
Panel A Second Stage - *Dep Variable is BHAR_m_365, Endogenous Variables are* $(NPED)_{i,t}$ *and* $(NPED \times CEO\_IT)_{i,t}$				
$\widehat{NPED}_{i,t}$	0.626*	-0.790	-2.911**	-0.793***
	(0.369)	(0.538)	(1.332)	(0.259)
$\widehat{NPED \times CEO\_IT}_{i,t}$			1.794***	0.193**
			(0.695)	(0.079)
$CEO\_IT_{j,t}$	0.069***	0.080***	-0.038	-0.012
	(0.022)	(0.028)	(0.023)	(0.008)
$OutsiderD_{j,t}$	-0.244**	0.032	0.944*	0.367***
	(0.102)	(0.193)	(0.570)	(0.104)
$COOD_{j,t}$	0.017	-0.109	-0.008	0.110***
	(0.032)	(0.083)	(0.012)	(0.042)
$high\_incentiveD_{p,t-1}$	-0.011	0.024	-0.010	0.025***
	(0.028)	(0.053)	(0.012)	(0.004)
$ret30_{j,t,(d-30,d-1)}$	-0.470***	-1.110***	-0.171***	-0.151***
	(0.119)	(0.366)	(0.050)	(0.033)
$mom_{j,t,(d-364,d-31)}$	-0.156***	-0.485***	-0.006	-0.011
	(0.055)	(0.160)	(0.023)	(0.014)
$size_{j,m-1}$	-0.358***	-0.800***	-0.285***	-0.247***
	(0.060)	(0.186)	(0.025)	(0.012)
$vega_{p,t-1}$(×0.01)	-0.094**	-0.018	0.003	-0.011**
	(0.047)	(0.070)	(0.007)	(0.005)
$Lncompen_{p,t-1}$	0.070**	0.149**	0.034**	0.053***
	(0.035)	(0.062)	(0.015)	(0.008)
Sample	2,416	2,630	37,554	40,606
Difference in Sargan C (χ^2)	3.31*	2.067	58.08***	26.94***
First-Stage F-$\widehat{NPED}_{i,t}$	27.42***	25.20***	101.78***	508.45***
Anderson-Rubin Wald Test, F statistic	3.68*	2.27	29.93***	11.51***
Panel B: Dissimulation Strategy Results: t+1 after the first and t+365 after the last transaction				
$\widehat{NPED}_{i,t}$	0.623*	-0.428*	-2.945**	-0.979**
	(0.367)	(0.236)	(1.331)	(0.427)
Control Variables	Yes	Yes	Yes	Yes

Table 10: Robustness Test

In Panel A, we extend the control variables in Equation (5) and report the 2nd stage of 2SLS regressions. Panel B reports the coefficients of $\widehat{NPED}_{i,t}$ using alternative holding returns measures including raw cumulative return $ret_{t+1,t+i}$ and the 4-factor α multiplied by the median number of trading days of 22, 126, 252 in the three holding periods, respectively, calculated by running regression $r_{jt} - rf_t = \alpha_{it} + \beta_1(r_{crsp,t} - rf_t) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_t$ from the day after insider transaction day to 3/6/12 month. $r_{crsp,t}$ is CRSP value-weighted market index and UMD_t is up-minus-down factor (momentum). In Panel A, we do not report the coefficients of tobin's $Q_{j,t-1}$, $institution\_ownership_{j,q-1}$, $cash\_flow\_vol_{j,t-1}$, $advertising\text{-}to\text{-}sale_{j,t-1}$, $dividend\text{-}yield_{j,t-1}$, $lnage_{i,t}$ and for buy trades, the interaction term $\widehat{NPED \times CEO\_IT}_{i,t}$ as they are insignificant. We report the cluster standard errors at the firm-month level parentheses. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level. In Panel C, we only keep two top highest paid non-CEO managers for each firm in each year. In Panel D, we only keep opportunistic transactions defined by following Cohen et al. (2012). Panel E reports the 1,000 placebo test results for the average coefficient of $\widehat{NPED}_{i,t}$, its standard error and its skewness. Columns (4) to (6) report the percentage of placebo test with positive (negative) coefficient of $\widehat{NPED}_{i,t}$ for purchase (sell) sample and first-stage F statistics larger than 10. Column (7) reports the percentage of sample with a first-stage F statistics larger than 10. Panel F reports the 1,000 placebo test results for the diff-in-diff regression coefficient of the interaction term, and in columns (5) to (7) the percentage of our placebo test with positive (negative) coefficient of the interaction term for purchase (sell) samples and is statistically significant at the 99%, 95% and 90% confidence level, respectively. In Panel D and E none of the proportions are statistically different from the corresponding theoretical level using a binomial one-sided test-statistic. All columns include control variables and firm and month fixed effects.

Panel A: Extended Set of Control Variables

	Insider Purchase		Insider Sell	
	(0,0)	(1,1)	(0,0)	(1,1)
2nd Stage -*Dep Variable is BHAR_m_365, Endogenous Variables are* $(NPED)_{i,t}$ *and* $(NPED \times CEO\_IT)_i$				
$\widehat{NPED}_{i,t}$	1.448**	-7.027	-0.531*	-0.780*
	(0.574)	(7.323)	(0.316)	(0.473)
$\widehat{NPED \times CEO\_IT}_{i,t}$			0.324**	0.249**
			(0.146)	(0.119)
$CEO\_IT_{j,t}$	0.089*	0.148	-0.004	-0.012
	(0.046)	(0.113)	(0.007)	(0.012)
$capital\text{-}to\text{-}sale_{j,t-1}$	-0.410**	-0.607**	-0.019	-0.056***
	(0.201)	(0.301)	(0.022)	(0.020)
$leverage_{j,t-1}$	-0.694	-0.047	-0.135**	-0.102*
	(0.490)	(1.456)	(0.062)	(0.053)
$skt\_ret\_volatility_{j,t-1}$	17.409*	16.884	-0.208	-0.848
	(9.555)	(21.345)	(0.643)	(0.694)
$capital\_intensity_{j,t-1}$	4.162*	-0.745	-0.003	-0.018
	(2.123)	(4.691)	(0.209)	(0.222)
$firm\_focus_{j,t-1}$	0.268	-1.504	-0.075***	-0.015
	(0.262)	(1.795)	(0.028)	(0.035)
$independent\_director_{j,t-1}$	-0.880	-0.765	0.092*	0.164***
	(0.574)	(1.457)	(0.054)	(0.060)
$independent\_committee_{j,t-1}$	0.252	0.877	0.200***	0.145***
	(0.234)	(0.723)	(0.038)	(0.042)
$analyst\_talent_{j,t-1}$	0.492	2.288	-0.220***	-0.209***
	(0.690)	(2.652)	(0.052)	(0.050)
$CEO\_tenure_{j,t-1}$	0.116***	-0.291	0.015***	-0.001
	(0.044)	(0.352)	(0.003)	(0.011)
Sample	1,104	1,169	23,872	25,399
First-Stage F-$\widehat{NPED}_{j,t}$	34.31***	1.23	266.55***	34.54***
Anderson-Rubin Wald F Test	6.13***	5.60***	14.43***	3.19**

Panel B: The coefficient of $\widehat{NPED}_{i,t}$ using Alternative Return Measure				
BHAR_m_30	-0.054	-0.041	-0.236	-0.060
	(0.065)	(0.059)	(0.175)	(0.057)
BHAR_m_180	0.197	-0.079	-2.026**	-0.379**
	(0.213)	(0.145)	(0.881)	(0.171)
$\alpha_{t+1,t+30}$(×22)	0.041	-0.147*	-0.293	-0.035
	(0.074)	(0.077)	(0.207)	(0.068)
$\alpha_{t+1,t+180}$(×126)	0.066	0.016	-1.812**	-0.124
	(0.165)	(0.135)	(0.763)	(0.157)
$\alpha_{t+1,t+365}$(×252)	0.088	-0.045	-1.765*	-0.466**
	(0.214)	(0.160)	(0.923)	(0.208)
$ret_{t+1,t+30}$	-0.116	-0.059	-0.316	-0.079
	(0.096)	(0.083)	(0.218)	(0.069)
$ret_{t+1,t+180}$	0.269	-0.199	-2.929**	-0.374**
	(0.340)	(0.236)	(1.211)	(0.191)
$ret_{t+1,t+365}$	0.903	-0.845	-3.436**	-0.472*
	(0.815)	(0.557)	(1.740)	(0.278)
BHAR_size_30	-0.016	-0.092	-0.335*	-0.072
	(0.082)	(0.075)	(0.201)	(0.059)
BHAR_size_180	0.427	-0.226	-2.104**	-0.415**
	(0.324)	(0.228)	(0.923)	(0.174)
BHAR_size_365	0.952	-0.840	-2.647*	-0.744***
	(0.781)	(0.557)	(1.373)	(0.257)
Panel C: Alternative numbers of tournament contenders (two non-CEO managers)				
Diff-in-Diff regression				
$(Post×Treat)_{i,t}$	0.239*	-0.289	-0.047**	-0.038*
	(0.133)	(0.363)	(0.023)	(0.023)
Sample	657	504	16,301	15,323
2SLS				
$\widehat{NPED}_{i,t}$	0.467	-0.553	-3.162*	-1.050**
	(0.940)	(1.047)	(1.906)	(0.424)
Sample	813	957	17,047	18,597
Panel D: Opportunistic transactions only				
Diff-in-Diff regression				
$(Post×Treat)_{i,t}$	0.051	0.208	-0.033**	-0.038**
	(0.123)	(0.157)	(0.016)	(0.018)
Sample	948	675	26,350	23,959
2SLS				
$\widehat{NPED}_{i,t}$	0.246	0.020	-3.976*	-0.588**
	(0.216)	(0.265)	(2.388)	(0.299)
Sample	2,474	2,431	26,664	28,795

Panel E: Placebo Test for 2SLS							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				% significant coefficient with valid IV significance first-stage F (>10)			
	Mean	Median	SD	Skewness	1%	5%	10%
$\widehat{NPED}_{i,t}$ -Buy	6.007	158.87	28.904	0.00	0.00	0.00	0.40
$\widehat{NPED}_{i,t}$ -Sell	2.174	135.57	11.848	0.20	0.40	0.80	3.40

Panel F: Placebo Test for Diff-in-Diff regression							
				% significant positive (negative) for buy (sell)			
	Mean	Median	SD	Skewness	1%	5%	10%
$(Post×Treat)_{i,t}$-Buy	-0.049	-0.038	0.218	-0.328	0.70	3.20	5.80
$(Post×Treat)_{i,t}$-Sell	0.132	0.123	0.126	0.428	0.60	1.00	1.40

Appendix A: Definition of Variables

Variable Notation	Data Source	Definition
$BHAR\_m\_365_{(d+1,\ d+365)}$	CRSP	365-calendar day Buy-N-Hold return adjusted by using the CRSP value-weighted market index, computed as: $BHAR_{mn} = \prod_{t=1}^{d}[1 + R_{jt}] - \prod_{t=1}^{d}[1 + R_{mt}]$
$NPV_{p,d}$	Smart Insider	Net purchasing value in day *d* executed by insider *p*, calculated as the ratio of net dollar amount of insider trades over the total dollar amount of insider transactions.
$opp\_D_{i,t}$	Smart Insider	Dummy variable equal to one for opportunistic insider transactions, defined, following Cohen et al. (2012), as a trade executed by insiders who had made at least one transaction in the same calendar year in the past three consecutive years. We reclassify insiders at the beginning of each calendar year.
$NPED_{i,t}$	Execucomp	Dummy variable equals one for non-promoted insider buy or sell trades in the event year *t* zero for years other than *t*. *t* takes the value of 0, 1 in the study.
$pay\_gap_{j,t-1}$	Execucomp	The natural logarithm of the difference between the CEO total compensation (*tdc1*) and the median total compensation of other non-CEO managers covered by Execucomp in firm *j* in the last fiscal year.
$lncompen_{p,t-1}$	Execucomp	The natural logarithm of *tdc1* adjusted by following Coles et al. (2014) and Brockman et al. (2016).
$rating_{j,\ t-1}$	Compustat	The average monthly S&P long-term issuer credit rating of firms in the same Fama-French 48 industry in the last fiscal year. Following Peters and Wagner (2014), we assign AAA a value 2 to CC a value of 23, then scale them by 9, so that a unit increase in the scaled rating corresponds to a change in rating from AAA to BBB or BBB to CCC.
$high\_incentiveD_{p,t-1}$	Execucomp	A dummy variable that is equal to one for high incentive managers, defined as managers *p* whose compensation differences between their CEOs and themselves are the largest three in firm *j* in year *t-1*.
$pay\_rank_{p,t-i}$	Execucomp	The rank of non-promoted manager sorted by their total compensation in year -1 among all tournament competitors in the same firm.
$mom_{j,(d-31,d\ -364)}$	CRSP	The cumulative raw return from (d-395, d-31), insider transaction occurs in day d. If there are less than 243 trading days in the event window, the variable is set to be missing.
$ret30_{j,(d-1,d-30)}$	CRSP	The cumulative raw return from (d-30, d-1), insider transaction occurs in day d. If there are less than 20 trading days in the event window, the variable is set to be missing.
$bm_{j,m-1}$	CRSP, Compustat	The book-to-market ratio calculated as the ratio of last fiscal year's book value over the market capitalization in the last trading day in December. Book value is equal to stockholder equity + deferred taxes and investment tax credit (Compustat: txditc, zero if missing) - preferred stock value. Stockholder equity is parent stockholder equity (Compustat: seq), or total common equity (Compustat: ceq) plus total preferred stock capital (Compustat: pstk) or the difference between the total asset (Compustat: at) and total liability (Compustat: lt), in that order, as available. Preferred stock value is preferred stock redemption value (Compustat: pstkrv), or preferred stock liquidation value (Compustat: pstkl), or total

		preferred stock capital (Compustat: pstk), or zero, in that order as available. Negative bm ratio is restricted to zero. The ratio is calculated for firm *j* at the end of the last month.
$leverage_{j,t}$	Compustat	Long term debt plus debt in current liability) over the total assets (Compustat: (dltt+dlc)/at)
$illiq_{j,m-1}$	CRSP	Amihud's (2002) measure of illiquidity for firm *j* at the end of the last month. The measure is calculated as the monthly average of the daily ratio of absolute stock return to dollar volume.
$size_{j,m-1}$	CRSP	The logarithm of market capitalization defined as adjusted stock price times adjusted shares outstanding for firm *j* at the end of the last month. The number is reported in a million.
$roa_{j,t-1}$	Compustat	Return on asset calculated as the net income (Compustat: ni) after taking out preferred dividend (Compustat: dvp), over the total asset (Compustat: at) for firm *j* at the end of the last fiscal year.
$age\_ceo_{j,\ t-1}$	Execucomp	In fiscal year *t-1,* we identify the former CEO of firm *j*. The variable is her age in year *t-1*. If Execucomp does not report the age of manager any year, we use the age of the same manager in other years.
$numest_{j,m-1}$	I/B/E/S	Analyst coverage defined as the number of analysts that report a forecast for the next 1-fiscal year earnings per share for firm *j* at the end of the last month. For no earning forecast, the variable is set to zero.
$rd_{j,t-1}$	Compustat	Research and development expense calculated as the research and development expense (Compustat: xrd) over sales (Compustat: sale) for firm *j* at the end of the last fiscal year. It is zero if missing in Compustat.
$delta_{p,t-1}$	Execucomp	Dollar changes in wealth associated with a 1% change in the firm's stock price (in $000) for manager *p*. Calculated according to Coles et al. (2013).
$vega_{p,t-1}$	Execucomp	Dollar changes in wealth associated with a 0.01 change in the standard deviation of the firm's returns (in $000) for manager *p*. Calculated according to Coles et al. (2013).
$OutsiderD_{j,t}$	Execucomp	Dummy that is equal to one for insider transactions for firms that appointed outside CEO (who did worked in the company in the years (-5, -2)) during the year $(0, 1)$, and zero otherwise.
$COOD_{j,t}$	Execucomp	Dummy that is equal to one for firms that had a COO during the years $(0, 1)$, and zero otherwise. We define COO as the manager who is younger than the incumbent CEO and whose job title (*titleann*) contains *chief operating office* or *chief operation officer* or *chief operations officer* or *chf operations officer* or *chf operation officer* or *che operating officer* or *coo* or *president* or/and *pres*
$CEO\_IT_{j,t}$	Execucomp, Smart Insider	The number of quintiles of the net CEO selling value for firm *j* in year *t.* Net CEO selling value is the total value of selling transaction minus the total value of buying transaction executed by CEO in year *t* for firm *j*. If there is no CEO insider transaction in year *t*, the number is set to be 0.
$lnage_{p,t}$	Execucomp	The natural logarithm of the current age of the manager *p* in year *t.*
total $asset_{j,t-1}$	Compustat	Logarithm of the total asset (Compustat: at) in the last fiscal year, used to match our treated firms.
$FERC_{j,t}$	CRSP, Compustat	Dummy that is equal to one for firms in the top quantile of future earnings response coefficient calculated according to Tucker and Zarowin (2006), and zero for other firms.
$Synch_{j,t}$	CRSP	Dummy that is equal to one for firms in the top quantile of return synchronicity calculated according to Piotroski and Roulstone (2004), and zero for other firms.

tobin's $Q_{j,t-1}$	Compustat	Market value of equity plus book value of debt-deferred tax over book value of total assets (Compustat: (at+csho×p"rcc_f"-ceq-txdb)/at))
capital-to-sale$_{j,t-1}$	Compustat	Net fixed asset (Compustat: ppent) to sales (Compustat: sale).
advertising-to-sale$_{j,t-1}$	Compustat	Advertising expenditure (Compustat: xad) to sales (Compustat: sale), zero otherwise.
dividend-yield$_{j,t-1}$	Compustat	The dividends per share by ex-date divided (Compustat: dvpsx_f) by the close price for the fiscal year (Compustat: prcc_f).
all_IT$_{j,t}$	Smart Insider	The total number of non-CEO insider transaction for firm *j* in year *t*, zero otherwise.
sale$_{j,t-1}$	Compustat	The natural logarithm of the sale (Compustat: sale).
skt_ret_volatility$_{j,t-1}$	CRSP	Variance of 60 monthly returns preceding the sample year *t-1*
capital_intensity$_{j,t-1}$	Compustat	Capital expenditure (Compustat: capx) over total asset (Compustat: sale)
firm_focus$_{j,t-1}$	Compustat-Segment	Dummy that is equal to one if the firm operates only in one segment and decreases as the firm diversifies (Kini and Williams, 2012), using Compustat segment sales according to their four-digit SIC code.
cash_flow_vol$_{j,t-1}$	Compustat-Quarterly	It is the seasonally adjusted standard deviation of cash flows over assets defined as EBITDA (Compustat: saleq- cogsq- xsgaq) over total asset (Compustat: atq) for a five-year window (*t, t+4*). We require there are at least a three-year data to compute this variable. For each of the four quarters in the year, we compute the mean values across the five-year window and then subtract these quarterly mean values to obtain the seasonally adjusted cash flows (Kini and Williams, 2012).
institution_ownership$_{j,q-1}$	Thomson Reuter 13F Holding	Percentage of shares owned by institution investors over total shares outstanding in the last quarter.
independent_manager$_{j,t-1}$	Boardex	Percentage of independent managers on the company board.
independent_committee$_{j,t-1}$	Boardex	Percentage of independent managers on the company compensation committee.
analyst_talent$_{j,t-1}$	I/B/E/S	The average talent of financial analysts that cover firm *j* in the last fiscal year. It is the innate ability of sell-side analysts measured by the analyst fixed effect from the regression on analysts' forecast accuracy. Calculated according to Dang et al. (2021)
$\alpha_{t+1,t+i}$	CRSP, French Data Library	The regression intercept: $r_{i,t} - rf_t = \alpha_{i,t} - \beta_1(r_{crsp,t} - rf_t) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_t$ from the day after insider transaction day to 30/180/365 calendar days. rf_t is the risk-free rate, $r_{crsp,t}$ is CRSP value-weighted market index, SMB_t is small-minus-big factor (size), HML_t is high-minus-low factor (value), and UMD_t is up-minus-down factor (momentum).
CEO_tenure$_{j,t-1}$	Execucomp	Computed as the difference between year *t* and the year the manager became CEO (Execucomp: *becameceo*). For missing *becameceo*, it is the number of annual observations the manager became CEO.
News$_{j,m}$	Key Development	The number of discretionary news (Edmans *et al.*, 2018), released in insider trading month *m* for firm *j*.

Internet Appendix

The downside of tournament incentives: Evidence from the trading behavior of the non-promoted insiders

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Internet Appendix S1: Data Cleaning Process Details and Variable Construction

Coles, Daniel and Naveen (2014) point out that Execucomp's total compensation figure is not comparable before and after 2006 because of the passage of Financial Accounting Standards Board (FASB) 123R revision to the stock and options accounting and an expanded compensation disclosure requirement regarding the manager compensation disclosure. We follow Coles et al. (2014), Kini and Williams (2012) and Brockman, Lee and Salas (2016) to correct our pre- and post-2006 total compensation item *tdc1*[36]. Specifically, the stock option was valued using the Black-Scholes formula for the pre-2006 period but reported its fair value for the post-2006 period. A small number of firms still report their proxy statements in the old reporting format in 2006, we use the reporting flag to identify (*old_datafmt_flag*) these firms. Then, we correct the post-2006 period option value using the same set of Black-Scholes assumption that Execucomp used for the pre-2006 period. The following are the Black-Scholes assumptions we used:

1. Strike price per share is specified in its proxy statement. (*expric*)
2. Market price per share is equal to the strike price per share unless specified in its proxy statement. (*mktprice*)
3. Option grant terms: Options are assumed to be granted on July 1st of the particular year for which data were reported. The option's nominal term is the period between July 1st of the year of grant and the expiration date (*exdate*) reported in its proxy statement. We further round the nominal term is to the nearest year figure. However, the option's term was reduced to 70% of its nominal term as managers rarely hold her stock option until its expiration year. The expiration date is not available on Execucomp for post-2006 reporting format. Therefore, we follow Kini and Williams (2012) to assume all options have seven years until expiration.
4. Risk-free rate corresponding to the option's maturity is the historical annual series of treasury constant maturity with 7-year term downloaded from the Federal Reserve[37].
5. Stock price volatility: Individual stock price volatility is the annualised volatility calculated using the last 60 months. The stock volatility of all companies is winsorised at the top and bottom 5%. To calculate the volatility, Execucomp requires at least 12-month return data. For stocks that are traded less than 12 months, Execucomp the average volatility value for the firms in the S&P 1500 index.
6. Future dividend yield. Execucomp uses the average dividend yield in the last three years to calculate the estimated future dividend yield. It is then winsorised at the top and bottom 5%.

Using these assumptions, we replicate the Black-Sholes option value for 2005, and the correlation between our Black-Sholes value and the Black-Sholes value calculated by Execucomp is

[36] Our results remain robust if we do not correct for the FSBA change and use raw figures reported by Execucomp.
[37] https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15

95.9%[38]. We further recalculate all option awards for both pre- and post-2006 period by using the same set of Black-Sholes assumptions to ensure consistency. Secondly, we follow Brockman et al. (2016) to value the ex-ante value of stock awards. We multiply the number of performance shares granted to the CEO (*shrtarg*) by the firm's fiscal year-end stock price (Compustat *prcc_f*). Finally, we recalculate the *tdc1* for all firm-year observations that reported in the pre-2006 old format (item *old_datafmt_flag=1*) by summing salary (*salary*), to bonus (*bonous*), other annual compensation (*othann*), restricted stock grant (*rstkgrnt*), all other total (*allothtot*), the fair value of stock awards (*shrtarg*×*prcc_f*) and Black-Scholes value of option grant (*option_awards_blk_value*). For *tdc1* reported in post-2006 new format (item *old_datafmt_flag=0*), we sum salary (*salary*), bonus (*bonous*), non-equity incentive plan compensation (*noneq_incent*), fair value of stock awards (*stock_awards_fv*), all other compensations (*othcomp*), deferred earnings (*defer_rpt_as_comp_tot*) and Black-Scholes value of option grant.

To build a link table between Execucomp and Smart Insider, we first obtain all historical cusip codes using the CRSP/Compustat link table. Second, for a given manager in Execucomp, we match the manager with all the managers who have traded the security with the same cusip. Third, we calculate the Damerau-Levenshtein (DL) distance and vectoral decomposition (VD) of texts with single gram and root weighting scheme between the name of the manager provided by Execucomp and reported by Smart Insiders. We sort these matches by DL distance and VD score to manually verify each pair of *execid-personid* match.

To identify short horizon seller, we modify the investment horizon measure proposed by Akbaset et al., (2020). Firstly, we define HOR as:

$$\mathrm{HOR}_{\mathrm{p,j,t}} = \frac{\sum_{\mathrm{Year-8}}^{\mathrm{Year-1}} \mathrm{NPV_t}}{\mathrm{N}}$$

That is, for each year, we compute the annual NPV for each insider *p* in firm *j* in year *t* in the last eight calendar years. Then, we compute the average NPV by summing the annual NPV and divide by the number of calendar years that an insider has traded in the last eight calendar years. HOR can only take a value between -1 and +1, which are the bounds of the NPV. If an insider only sold (bought) in the last eight years, then each of its NPV is -1 (1), and therefore, the average will be -1 (1) as well. We define SH sellers as those whose $\mathrm{HOR}_{\mathrm{p,j,t}}$ is negative but larger than the median $\mathrm{HOR}_{\mathrm{p,j,t}}$ after excluding the $\mathrm{HOR}_{\mathrm{p,j,t}}$ of -1 which accounts for more than 50% of the insider sell sample. We restrict SH sellers must have traded at least in three different years in the past eight years.

We estimate the probability of becoming CEO from a cross-section regression. In each year *t,* we obtain a list of firms that have a CEO turnover event and keep all insiders except the former founders/co-founders, former CEOs and new joiners. We then estimate the following cross-section regression:

[38] Kini and Williams (2012) report a correlation of 96.8% for 2005. The difference is possibly due to different risk-free rate sources, which they do not report.

$$CEOD_{p,t} = \alpha + \beta_0 lncompen_{p,t-1} + \beta_1 age_{p,t-1} + \beta_2 tenure_{p,t-1} + \beta_3 exp_{p,t-1} + \beta_4 maleD_p + \beta_5 COO_{p,t-1} + \beta_6 COO\_firm_{j,t-1} + \beta_7 bm_{j,t-1} + \beta_8 momentum_{j,t-1} + \beta_9 roa_{j,t-1} + \beta_{10} outsider_{j,t} + e_t$$

The dependent variable is a dummy variable one for the manager who became CEO in the year, and zero for insiders who failed to become CEO. $lncompen_{p,t-1}$ is the adjusted total compensation in the year before, $tenure_{p,t-1}$ is the number of year the manager worked for the firm. $exp_{p,t-1}$ is the number of year the manager has worked for any firm in the entire Execucomp. $maleD_p$ is a dummy variable equal to one for male, and zero for female $COO_{p,t-1}$ is a dummy variable equal to one for COO as identified using manager's title, and zero otherwise. $COO\_firm_{j,t-1}$ is a dummy variable equal to one if the firm had a COO before the turnover, and zero otherwise. Other variables are as defined before. $outsider_{j,t}$ is a dummy equal to one if the firm hired an external CEO in year *t*, and zero otherwise. We use the estimated coefficient to calculate the estimated probability $Probability_{p,t}$ of a given insider *p* to become the CEO in the year *t*, and re-estimate the cross-section every year using only the firm that had a CEO turnover in year *t*. We intentionally use public information only to estimate these coefficients because we assess that tournament contenders in other firms will not have access to the private information that the board of directors in the CEO turnover firms possessed at the time of CEO turnover. These tournament contenders will estimate their subjective probabilities of winning the CEO competition in their firms using the latest CEO promotion winner's characteristics from other firms, in line with Kale et al.(2009).

We follow Tucker and Zarowin (2006) and Wang (2019) to construct the FERC by first estimating the following equation:

$$R_{j,t} = \alpha + \beta_0 X_{j,t-1} + \beta_2 X_{j,t} + \beta_3 (X_{j,t+1} + X_{j,t+2} + X_{j,t+3}) + \beta_3 R_{j,t+3} + \varepsilon_{j,t}$$

where $X_{j,t}$ is the basic annual earnings per share excluding extraordinary items (*epspx*), adjusted for stock splits and stock dividends and deflated by the stock price at the beginning of the fiscal year *t.* $R_{j,t}$ is the firm's annual return beginning at the fiscal year *t.* $R_{j,t+3}$ is a three-year future return for the firm from fiscal year *t+1* to *t+3.* The coefficient of the sum of the future three-year earnings per shares β_3 is the FERC. We truncate all variables at the top and bottom 1%. A higher β_3 means the current stock return impounds more future earnings information and is more informative for future earnings and *vice versa.* We follow Wang (2019) to estimate a rolling panel regression using the trailing 36 months across each two-digit SIC industry. We restrict that there are at least 8 (24) months in $R_{j,t}$ ($R_{j,t+3}$) for a stock to be included in the regression and create binary variable FERC that is one for the top quintile of the β_3 and zero otherwise.

We follow Piotroski and Roulstone (2004) and estimate the stock return synchronicity from the following equation:

$$\mathrm{FirmRET}_{j,t} = \alpha + \beta_1 \mathrm{MktRET}_{j,t} + \beta_2 \mathrm{MktRET}_{j,t-1} + \beta_3 \mathrm{IndRET}_{k,t} + \beta_4 \mathrm{IndRET}_{k,t-1} + \varepsilon_{i,t}$$

where $\mathrm{MktRET}_{j,t}$ is the market return proxied by the CRSP value-weighted buy-and-hold market return in year t. $\mathrm{IndRET}_{k,t}$ is the value-weighted average industry buy-and-hold return identified using the two-digit SIC code in year *t*. We estimate the regression for each firm-year observation with weekly return data and restrict a minimum of 45 weekly observations each year. The synchronicity is measured as $\ln\left(\frac{R^2}{1-R^2}\right)$. The R^2 is the R square of the above regression. A higher $\mathrm{Synch}_{i,t}$ indicates the current firm return comove strongly with the current and lagged market and industry returns, which further indicates the stock price contains less firm-specific information.

To measure the change in investor sentiment denoted as $\Delta\mathrm{Sentiment}$, we compute the market-to-book ratio decomposition of Rhodes–Kropf, Robinson and Viswanathan (2005) defined as the residual from the following regression

$$\ln(\mathrm{market\_value})_{j,t} = \alpha + \beta_{1z,t} \ln(\mathrm{book\_value})_{j,t} + \beta_{2k,t} \ln(\mathrm{net\_income})^{+}_{j,t} + \beta_{3k,t} I_{(<0>)} \ln(\mathrm{net\_income})^{+}_{j,t} + \beta_{4k,t} \mathrm{leverage}_{j,t} + \varepsilon_i$$

where subscript *k* indexes for Fama-French 12 industries, *j* for firms and *t* for year. We estimate the regression for each industry-year. $I_{(<0>)}$ is a dummy variable equal to one for loss-making firms, and zero otherwise. The firm-specific residual obtained from the regression is the part of the firm's market value not explained by fundamentals or by changes in the market valuation common across firms in the same industry. We follow Cziraki et al. (2021) to measure the change in sentiment between $(t-1, t+1)$ with year *t* as insider trading year.

To measure the change of cost of capital, we estimate the following modified Fama and French (1993) three-factor model by following Czirakiet al. (2021)

$$r_{j,t} - r_{f,t} = \alpha_{-j} + \alpha_{\Delta j} D_t + b_{-j}(r_{m,t} - r_{f,t}) + b_{\Delta j} D_t (r_{m,t} - r_{f,t}) + s_j \mathrm{SMB}_t + s_{\Delta j} D_t \mathrm{SMB}_t + h_{-j} \mathrm{HML}_t + h_{\Delta j} D_t \mathrm{HML}_t + e_t$$

where $r_{j,t}$ is the monthly stock return, $r_{f,t}$is the return on 1-month U.S Treasury bill, $r_{m,t}$ is the CRSP value-weight market index, SMB_t and HML_t are the returns on the size and book-to-market ratio portfolios. D_t is a dummy variable that equals one if the year is in $(0,1)$, and zero for years in $(-3,-1)$. We use years $(-3,2)$ to estimate the cost of capital prior and after the CEO turnover. The expected change of cost of capital is obtained using the estimated coefficient of $\hat{\alpha}_{\Delta i}$ plus the product between $\hat{b}_{\Delta j}$,

$\hat{s}_{\Delta j}$, $\hat{h}_{\Delta j}$ and the corresponding average factor premium estimated using all firms in CRSP database between 1993 and 2019[39].

$$\Delta r_{t,t+2} = \hat{\alpha}_{\Delta j} + \hat{b}_{\Delta j}\overline{(r_{m,t}-r_{f,t})} + \hat{s}_{\Delta j}\overline{SMB}_t + \hat{h}_{\Delta j}\overline{HML}_t$$

To measure the board conservatism, we follow the Khan and Watts (2009) to compute the C_Score, which is based on Basu (1997). We first estimate the annual cross-sectional regression model as follows:

$$X_i = \beta_1 + \beta_2 D_j + R_j(\mu_1 + \mu_2 Size_j + \mu_3 MB_j + \mu_4 Lev_j) + D_j R_j(\lambda_1 + \lambda_2 Size_j + \lambda_3 MB_j + \lambda_4 Lev_j) + (\delta_1 Size_j + \delta_2 MB_j + \delta_3 Lev_j + \delta_4 D_j Size_j + \delta_5 D_j MB_j + \delta_6 D_j Lev_j) + \varepsilon_j$$

X_i is the income before extraordinary items (*ib*) scaled by the lagged market value of equity (*csho*prcc_f*). D_j is a dummy variable equals one for firm-years with negative cumulative returns, zero otherwise. R_j is the 12-month cumulative abnormal return for the firm in the same fiscal year. $Size_j$ is the natural log of market value of equity. MB_j is the ratio of market value of equity to book value of equity (*ceq*) at the end of the year. Lev_j is the leverage, defined as long-term debt (*dltt*) plus short-term debt (*dlc*) over the market value of equity. After estimating the regression, we calculate the C_Score as following:

$$C\_Score = \hat{\lambda}_1 + \hat{\lambda}_2 Size_j + \hat{\lambda}_3 MB_j + \hat{\lambda}_4 Lev_j$$

We further sort all firms in Compustat in the same industry into quantiles in each year to construct the moderator variable $C\_quint_{j,t}$ that representing the quantile number.

We follow Coles et al. (2018) to identify industry tournament incentives for non-CEO directors. In year *t*, we categorize all firms with the same two-digit SIC code into quantiles by their sizes. For each firm, we compute the median non-CEO director's total compensation as the representative non-CEO pay because one firm has more than one non-CEO directors. We measure the industry tournament incentives by the compensation gap between the second highest-paid non-CEO's total compensation among the same industry and size firm and the non-CEO's total compensation at the focal firm. We compute the natural logarithm of the pay gap $ind\_incen_{j,t}$ as industry tournament incentives, the larger the $ind\_incen_{j,t}$, the greater the tournament incentives are. For firms that have negative industry tournament in their size quantile, we use the next larger size quantile to compute the $ind\_incen_{j,t}$. For firms that are in the top size quantile and have negative $ind\_incen_{j,t}$, the $ind\_incen_{j,t}$ is set to be zero.

[39] The average factor premium in our sample is 0.007 for $\overline{(r_{m,t}-r_{f,t})}$, 0006 for $\overline{SMB_t}$ and 0.002 for $\overline{HML_t}$

Internet Appendix S2: Sample size across different database

	Unique *execid*	Unique *personid*	Sample Size
Raw Execucomp Sample	48,429		269,456
Match with *execid-personid* link table	43,952	44,187	277,113
Match with CRSP both insider purchase and sale, including CEO	26,570	26,617	257,033
Match with CRSP both insider purchase and sale, excluding CEO	24,275	24,310	188,960
Remove new joiner, previous CEO, co-founders/founders	21,723	21,764	165,705
Valid insider purchase sample for Non-Promoted Manager in (0,0)	536	537	860
Valid insider purchase sample for Non-Promoted Manager in (0,1)	844	845	1,492
Valid insider sell sample for Non-Promoted Manager in (0,0)	3,107	3,110	7,935
Valid insider sell sample for Non-Promoted Manager in (0,1)	4,527	4,532	15,443

Internet Appendix S3: CEO Turnover Summary

The table shows a summary of CEO turnover event, insider transactions in different fiscal years. We use Execucomp historical annual CEO flag (*ceoann*) to identify CEO turnover events. In column (2), we report the number of internal promotions after removing the confounding events. We define an external CEO promotion if the incoming CEO has not worked for the firm within the event window of (-5, -2). In column (4), we report the number of CEO Turnover after removing confounding events. In column (5) to (8), we exclude all CEO transactions and transactions occurred in the confounding events. In column (7) and (8), we report the yearly average insider transaction value. We aggregate insider purchase and sell transactions at the daily frequency by using the closing price at the transaction day times the number of shares bought/sold to compute the individual transaction value.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fiscal Year	No. Isolated CEO Turnover	No. Isolated internal Promotions	No. Isolated Non-CEO Manager	Isolated CEO Turnover with Insider Trading	Matched non-CEO Insider Purchase Sample	Matched non-CEO Insider Sell Sample	Average non-CEO Insider Purchase Value ($000)	Average non-CEO Insider Sell Value ($000)
1996			10,045		711	4,011	138.23	1,408.52
1997	136	65	10,184	65	840	5,468	156.54	910.07
1998	146	31	10,586	95	1,170	5,277	113.10	964.49
1999	122	23	9,951	87	1,188	5,061	109.77	1,322.45
2000	160	34	9,269	104	988	6,297	181.07	1,517.59
2001	179	33	9,250	112	559	6,786	94.05	867.65
2002	113	23	9,451	73	708	5,700	75.42	686.37
2003	137	25	9,677	87	503	7,922	93.61	910.97
2004	131	24	8,766	82	327	8,923	150.71	960.54
2005	147	29	7,281	97	294	7,603	345.33	1,043.40
2006	132	33	8,765	88	329	9,267	278.93	987.41
2007	170	46	10,488	119	646	9,960	221.14	923.73
2008	197	54	10,046	122	1,001	6,287	161.35	825.85
2009	153	29	9,506	93	588	5,811	63.87	608.25
2010	123	32	9,289	77	298	7,125	123.84	736.35
2011	150	24	9,132	89	566	8,035	238.71	792.32
2012	164	32	9,006	110	485	8,672	81.88	876.73
2013	160	45	8,918	107	248	9,644	531.51	966.48
2014	152	47	8,805	107	296	7,208	171.67	1,068.98
2015	150	40	8,448	104	399	5,129	301.97	1,087.62
2016	162	31	8,052	110	282	3,889	176.48	1,005.09
2017	144	40	7,588	96	214	4,125	254.86	1,057.52
2018	142	18	7,311	53	72	1,328	175.32	1,232.57
2019	158	34	6,550	92	310	2,745	259.11	1,204.34
All	3,428	2,636	216,364	2,169	13,022	152,273	162.88	969.29

Internet Appendix S4: Post-transaction returns of other directors

This table reports the BHAR_m_365 for CEO and Others insider transaction sample. For each treated firm, we collect the CEO transactions and all other directors' transactions excluding tournament competitors. We compute and report the post-transaction return proxied by BHAR_m_365, we winsorize the BHAR_m_365 at the top 99% and the bottom 1% level.

	Purchase Sample				Sell Sample			
Event Year	-2	-1	0	1	-2	-1	0	1
CEO	0.069	0.079	0.254	0.028	0.091	0.041	0.034	0.042
No.	128	202	281	84	3,963	4,515	1,139	1,222
Others	0.142	0.233	0.106	0.120	0.067	0.044	0.054	0.054
No.	585	1,153	1,049	762	4,919	8,483	8,238	5,897

Internet Appendix S5: Test on Parallel Trend Assumption

Panel A reports the summary statistics at firm level for both the treated firms and control firms in the pre-CEO turnover period (-2, -1) and Panel B shows summary statistics of BHAR in event window (-2, +1). Firms that have CEO turnover event in year t are matched with firms on the average insider purchase/sell profitability, logarithm of the total asset and the book-to-market ratio in the fiscal year t-1 using Mahalanobis distance. Column (3) and (6) reports the t-test results by assuming unequal variance between treated and control firms for insider purchase and sell transaction, respectively. In Panel C, we follow Angrist and Pischke (2009) and Cengiz et al. (2019) to conduct an event-study type diff-in-diff regression and formally test on the parallel trend assumption. Variable Pre_t equals to 1 for treated firms in year *t,* and zero otherwise. Year *t* refers to the year in our event window with year *0* as the CEO turnover occurred. Variable Post_t is defined with the same logic. The coefficients of Pre_{-1} should be statistically insignificant for the parallel trend assumption to hold. We drop one pre-treated period to avoid perfect multicollinearity. Column (1) and (2) focuses on insider purchase and sell transactions, respectively. We control for firm, year, and cohort fixed effects. Standard errors are clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

Panel A: Summary Statistics in Pre-Treatment Period (-2, -1) at firm level						
	Insider Purchase Transactions			Insider Sell Transactions		
	(1)	(2)	(3)	(4)	(5)	(6)
	Treated Firms	Control Firms	Difference (1)-(2)	Treated Firms	Control Firms	Difference (4)-(5)
ΔBHAR_m_365$_{(-2,-1)}$	0.124	0.111	0.013	-0.055	-0.058	0.003
	(0.030)	(0.033)	(0.045)	(0.005)	(0.005)	(0.008)
total asset$_{j,t-1}$	7.322	7.238	0.083	8.000	7.943	0.056
	(0.085)	(0.081)	(0.118)	(0.029)	(0.028)	(0.040)
mom$_{j,\ t,(d-31,d\ -364)}$	0.148	0.184	-0.036	0.176	0.192	-0.015
	(0.025)	(0.020)	(0.033)	(0.007)	(0.007)	(0.010)
bm$_{j,m-1}$	0.634	0.634	0.000	0.492	0.488	0.003
	(0.019)	(0.022)	(0.029)	(0.007)	(0.007)	(0.010)
roa$_{j,t-1}$	0.027	0.033	-0.006	0.053	0.055	-0.002
	(0.001)	(0.000)	(0.007)	(0.002)	(0.002)	(0.003)
Non-CEO total comp ($000s)	1,231	1,325	-94.04	2,115	1,971	144***
	(59.62)	(92.52)	(110.06)	(20.24)	(17.69)	(26.89)
Transaction Value	156,920	89,887	67,032***	1,004,076	1,039,358	35,285
	(16,169)	(19,477)	(25,314)	(18,873)	(20,050)	(27,535)
N Matched Firm-Year	192	192		1331	1331	

N Transactions.	834	889		17,153	17,804	
Panel B: Summary Statistics of BHAR in pre- and post-event period						
$BHAR\_m\_365_{(t=-2)}$	-0.017	-0.002	-0.015	0.069	0.070	-0.001
	(0.029)	(0.022)	(0.037)	(0.004)	(0.004)	(0.006)
$BHAR\_m\_365_{(t=-1)}$	0.085	0.115	-0.030	0.047	0.040	0.007
	(0.029)	(0.021)	(0.036)	(0.004)	(0.004)	(0.006)
$BHAR\_m\_365_{(t=0)}$	0.405	0.213	0.192***	0.032	0.043	-0.011*
	(0.032)	(0.026)	(0.041)	(0.004)	(0.006)	(0.007)
$BHAR\_m\_365_{(t=+1)}$	0.075	0.279	-0.204***	0.014	0.038	-0.024***
	(0.038)	(0.050)	(0.062)	(0.004)	(0.004)	(0.006)
Panel C. event-study type diff-in-diff regression						
	(1)	(2)		(3)	(4)	
	BHAR_m_365	BHAR_m_365		BHAR_m_365	BHAR_m_365	
Pre_{-2}		-0.120			0.030	
		(0.073)			(0.019)	
Pre_{-1}	0.108			-0.030		
	(0.080)			(0.019)		
$Post_0$	0.211*	0.171**		-0.061**	-0.031*	
	(0.119)	(0.072)		(0.026)	(0.018)	
$Post_1$	0.079	0.048		-0.082***	-0.052**	
	(0.151)	(0.080)		(0.032)	(0.025)	
Control	Yes	Yes		Yes	Yes	
Sample	2,309	2,309		47,094	47,094	
Within R^2	0.38	0.38		0.30	0.30	

Internet Appendix S6: Insider trading and the probability of becoming CEO

This table reports linear probability models estimating the likelihood of a manager *p* becoming CEO in year *t.* The dependent variable is one for CEO, and zero otherwise. We estimate regressions using all tournament competitors defined previously and for CEO turnover year *t* only. Sample is at manager-firm level. Variables $\#\_buy_{p,t-1}$ and $\#\_sell_{p,t-1}$ represent the number of insider purchase and sell transactions made by insiders *p* in year *t-1*. $age_{p,t-1}$ and $tenure_{p,t-1}$ represent the age and tenure of insiders *p* in year *t-1*, respectively. $COOD_{p,t-1}$ is equal to one if the manager *p* is chief operating officer or president in year *t-1,* and otherwise zero. We define all other variables in Appendix A and winsorised at the 1% level. We include firm and year fixed effects. We report clustered standard errors by firm in brackets. ***, **, and * significant at the 99%, 95% and 90% confidence level, respectively.

	$CEOD_{p,t}$	$CEOD_{p,t}$
$age_{p,t-1}$	-0.005**	-0.004**
	(0.002)	(0.002)
$tenure_{p,t-1}$	0.006*	0.006*
	(0.003)	(0.004)
$COOD_{p,t-1}$	0.435***	0.434***
	(0.032)	(0.032)
$\#\_buy_{p,t-1}$	0.044	0.041
	(0.027)	(0.028)
$\#\_sell_{p,t-1}$	-0.006	-0.005
	(0.004)	(0.005)
$\#\_buy_{p,t-2}$		0.009
		(0.033)
$\#\_sell_{p,t-2}$		-0.000
		(0.006)
$delta_{p,t-1}(\times 0.01)$	0.012**	0.012**
	(0.006)	(0.006)
$vega_{p,t-1}(\times 0.01)$	0.062**	0.061**
	(0.031)	(0.031)
$lncompen_{p,t-1}$	0.000***	0.000***
	(0.000)	(0.000)
$ret30_{j,t-1,(d-1,d-30)}$	0.522***	0.525***
	(0.167)	(0.167)
$mom_{j,\ t-1,(d-31,d\ -364)}$	0.036	0.036
	(0.054)	(0.054)
$bm_{j,t-1}$	0.132*	0.131*
	(0.075)	(0.075)
$illiq_{j,t-1}$	0.038	0.040
	(0.076)	(0.076)
total $asset_{j,t-1}$	-0.118***	-0.118**
	(0.046)	(0.046)
$roa_{j,t-1}$	-0.113	-0.113
	(0.213)	(0.212)
tobin's $Q_{j,t-1}$	0.017	0.017
	(0.020)	(0.021)
$leverage_{j,t-1}$	0.059	0.057
	(0.130)	(0.130)
Constant	0.880**	0.880**
	(0.401)	(0.404)
Sample	1,364	1,364
Within R^2	0.45	0.45

Internet Appendix S7: Insider trading and price informativeness around CEO turnover

This table reports the fixed effects regression output based on the matched sample. The dependent variable is BHAR_m_365 in year (0,0) in columns 1 and 3 and (1,1) in 2 and 4. We match each treated firm with CEO turnover event in year *t* with one control firm using Mahalanobis distance on the average insider purchase/sell profitability, logarithm of the total asset and the book-to-market ratio in the fiscal year *t-1*. We restrict that the control firm sample does not have any CEO turnover in (-2, 2). In Panel A, the moderator variable is $\text{C\_quint}_{j,t}$, the quintile number based on the board conservatism, following Khan and Watts (2009), for all firms in the same industry in each year. In Panel B, the moderate variable is $riskD_j$, a dummy variable equal to one if the firm is in high illegal insider trading industry, as outlined in Kacperczyk and Pagnotta (2021), and zero otherwise. In Panel C, the moderate variable is $ind\_incen_{j,t}$, the natural logarithm of the industry tournament incentives, as outlined in Coles et al. (2018). In Panel D, we use $Lntenure_{p,t}$, the natural logarithm of the tenure of the insider *p* in year *t* in firm *j*. In Panel E, the moderator variable is future earnings response coefficient (FERC) calculated according to Tucker and Zarowin (2006) and the $NPED_{i,t}$. $FERC_{j,t}$ is a dummy variable equals to one for firms in the top quantile of $FERC_{j,t}$ in year *t,* and zero otherwise. In Panel F, the moderator variable is the return synchronicity (Synch) calculated according to Piotroski and Roulstone (2004). $Synch_{j,t}$ is a dummy variable equals to one for firms in the top quantile of $Synch_{j,t}$ in year *t* in the same two-dig sic industry, and zero otherwise. Appendix A defines all variables in the table. We include the same set of control variables as in Equation (2). The robust standard errors clustered at the firm-month level are in parentheses. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorized at the top 99% and the bottom 1% level.

	Insider Purchase		**Insider Sell**	
	(1)	(2)	(3)	(4)
	Panel A: Board Conservatism			
$(\text{Treat}\times\text{Post})_{i,t}$	0.652***	0.074	-0.741***	-0.105***
	(0.200)	(0.536)	(0.026)	(0.003)
$(\text{Treat}\times\text{Post}\times\text{C\_quint})_{i,t}$	-0.150**	-0.113	0.262***	0.024**
	(0.065)	(0.140)	(0.010)	(0.011)
Sample	1,833	1,328	36,829	33,658
	Panel B: High illegal insider trading industry			
$(\text{Treat}\times\text{Post})_{i,t}$	0.089	0.213	-0.023	-0.041**
	(0.128)	(0.149)	(0.018)	(0.020)
$(\text{Treat}\times\text{Post}\times\text{riskD})_{i,t}$	0.198	-0.417*	-0.021	0.069**
	(0.159)	(0.238)	(0.026)	(0.034)
Sample	1,833	1,328	36,829	33,658
	Panel C: Industry Tournament Incentives			
$(\text{Treat}\times\text{Post})_{i,t}$	0.191	-0.156	-0.070***	-0.134***
	(0.212)	(0.196)	(0.026)	(0.033)
$(\text{Treat}\times\text{Post}\times\text{ind\_incen})_{i,t}$	0.012	0.051	0.012***	0.021***
	(0.036)	(0.034)	(0.013)	(0.005)
Sample	1,833	1,328	37,879	34,495
	Panel D: Tenure Effect			
$(\text{Treat}\times\text{Post})_{i,t}$	0.370***	0.758***	-0.096**	-1.444***
	(0.122)	(0.268)	(0.038)	(0.050)
$(\text{Post}\times\text{Treat}\times\text{lntenure})_{i,t}$	-0.151*	-0.443***	0.043**	0.057***
	(0.087)	(0.166)	(0.019)	(0.025)
Sample	1,833	1,328	36,829	33,658
	Panel E: Future Earnings Response Coefficient			
$(\text{Treat}\times\text{Post})_{i,t}$	0.163*	0.196	-0.036**	-0.034*
	(0.095)	(0.124)	(0.018)	(0.020)
$(\text{Post}\times\text{Treat}\times\text{FERC})_{i,t}$	-0.011	-0.095	0.099***	0.029
	(0.186)	(0.179)	(0.036)	(0.047)

Sample	1,400	1,079	30,879	28,415
	Panel F: Return Synchronicity			
$(Treat \times Post)_{i,t}$	0.234**	0.011	-0.031**	-0.038**
	(0.103)	(0.170)	(0.019)	(0.019)
$(Post \times Treat \times Synch)_{i,t}$	-0.142	0.222	0.028	0.014
	(0.136)	(0.191)	(0.033)	(0.040)
Sample	1,828	1,323	31,131	28,542

Internet Appendix S8: Insider trading informativeness based on exiting directors.

This table reports the fixed effect regression output based on matched sample in Table 4. In Panel A, the dependent variable is the change in return on asset between year t and year t+2. In Panel B, the dependent variable is the change in investor sentiment measured as firm-specific component from the market-to-book decomposition of Rhodes–Kropf et al. (2005). The change in investor sentiment $\Delta\text{Sentiment}_{-1,1}$ is measured between year t-1 to year t+1. In Panel C, we obtain the $\Delta r_{t,t+2}$ by following Cziraki et al. (2021) to estimate a modified Fama and French (1993) Three-Factor model. We include the control variables in Equation (2), omitted for brevity. We split the sample base on whether the firm has at least one non-CEO director that is leaving in the next year. Standard errors reported in parentheses are computed based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorized at the top 99% and the bottom 1% level.

	Insider Sell (No Exiting)		**Insider Sell (With Exiting)**	
	(1)	(2)	(3)	(4)
Year *t*	(0,0)	(1,1)	(0,0)	(1,1)
	Panel A: Future Firm Performance			
Dependent Variable	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$	$\Delta\text{ROA}_{t,t+2}$
$\text{Post}_{i,t}$	0.003	0.000	-0.005	0.004
	(0.005)	(0.005)	(0.004)	(0.005)
$\text{Treat}_{i,t}$	0.008**	0.019***	0.039***	0.040***
	(0.004)	(0.004)	(0.011)	(0.010)
$(\text{Post}\times\text{Treat})_{i,t}$	-0.014**	-0.015*	-0.014**	-0.026***
	(0.007)	(0.008)	(0.007)	(0.008)
Other Control	Yes	Yes	Yes	Yes
Within R-square	0.11	0.08	0.07	0.10
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Sample	18,424	15,647	17,023	16,426
	Panel B: Investor Sentiment			
Dependent Variable	$\Delta\text{Sentiment}_{t-1}$	$\Delta\text{Sentiment}_{t-1,t+1}$	$\Delta\text{Sentiment}_{t-1,t+1}$	$\Delta\text{Sentiment}_{t-1,t+1}$
$\text{Post}_{i,t}$	-0.028	0.104***	0.047**	0.041*
	(0.022)	(0.024)	(0.018)	(0.024)
$\text{Treat}_{i,t}$	0.087***	0.077***	0.060**	0.026
	(0.025)	(0.026)	(0.026)	(0.027)
$(\text{Post}\times\text{Treat})_{i,t}$	-0.039	-0.100**	-0.124***	-0.064*
	(0.035)	(0.042)	(0.036)	(0.038)
Other Control	Yes	Yes	Yes	Yes
Within R-square	0.11	0.11	0.15	0.17
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Sample	18,612	15,766	16,765	16,172
	Panel C: Change in Cost of Capital			
Dependent Variable	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$	$\Delta r_{t,t+2}$
$\text{Post}_{i,t}$	-0.001***	-0.002**	0.000	0.001***
	(0.000)	(0.001)	(0.000)	(0.001)
$\text{Treat}_{i,t}$	-0.001	-0.001	-0.001	-0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Post}\times\text{Treat})_{i,t}$	0.002***	0.002**	0.001**	0.001
	(0.001)	(0.001)	(0.000)	(0.001)
Other Control	Yes	Yes	Yes	Yes
Within R-square	0.05	0.05	0.14	0.08
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Sample	19,038	16,804	17,485	16,789

Internet Appendix S9: 2SLS regression result for matching sample

The table reports the regression output of 2SLS regression on sample obtained by nearest neighbor matching. The dependent variable in the first stage of the regression is $NPED_{i,t}$, a dummy variable equals to one for the purchase/sell transactions of promotion rejectees in $(0,0)$ and $(1,1)$ with year 0 the CEO turnover event depending on the year *t* and zero for years outside the event window and (-2, -1). We state the year t at the top of the table. In all columns, we obtain the sample by the nearest neighbor matching using Mahalanobis distance. We match firms with CEO turnover event in year *t* with firms on the average insider purchase/sell profitability, logarithm of the total asset and the book-to-market ratio in the fiscal year *t-1*. We match each treated firm with one control firm. We restrict that the control firm sample does not have any CEO turnover in (-2, +2). Our instrumental variable is the previous CEO's age in the last fiscal year. We include the same set of control variables as in Equation (2). We report the robust standard errors clustered at the firm-month level in parentheses. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorized at the top 99% and the bottom 1% level.

	Insider Sell	
	(1)	(2)
	First Stage	
Year *t*	(0,0)	(1,1)
Dependent Variable	$NPED_{i,t}$	$NPED_{i,t}$
$age\_ceo_{j,t-1}$	0.019^{***}	-0.023^{***}
	(0.002)	(0.002)
Control Variable	Yes	Yes
	Second Stage	
Dependent Variable	BHAR m 365	BHAR m 365
Endogenous Variable		
$\widehat{NPED}_t$	-0.543^{*}	-1.132^{**}
	(0.309)	(0.467)
$NPED \times \widehat{CEO\_IT}_{i,t}$	0.564^{***}	0.331^{**}
	(0.200)	(0.157)
Control Variables		
$CEO\_IT_{j,t}$	0.004	-0.024
	(0.011)	(0.016)
Other Control Variable	Yes	Yes
Sample	18,368	18,831
Fixed Effect	Firm, Month	Firm, Month
Difference in Sargan *C* (χ^2)	37.23^{***}	18.35^{***}
First-Stage F-$\widehat{NPED}_{i,t}$	163.75^{***}	225.09^{***}
Anderson-Rubin Wald Test, F-Statistics	20.82^{***}	8.71^{***}

Internet Appendix S10: CEO purchase transaction trading profitability after CEO turnover

The dependent variable is Buy-N-Hold abnormal return calculated for 30, 180 and 365-calenday holding periods, respectively. The variable with interest $yearD_{i,t}$ is a dummy variable equals to one for focal year, and zero otherwise. We only include CEO purchase transaction in the table. Standard errors in parentheses are based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorized at the top 99% and the bottom 1% level. All regressions include control variables and firm and month fixed effects. Control variables that are omitted for brevity are $bm_{j,m-1}$, $roa_{j,t-1}$, $vega_{p,t-1}$, and $rd_{j,t-1}$. Appendix A defines all control variables in the table.

	Year 0			Year 1		
	BHAR_m_30	BHAR_m_180	BHAR_m_365	BHAR_m_30	BHAR_m_180	BHAR_m_365
$yearD_{i,t}$	-0.014	-0.029	-0.111**	0.022**	-0.011	-0.104**
	(0.012)	(0.034)	(0.055)	(0.011)	(0.030)	(0.043)
$pay\_gap_{j,t-1}$	0.006**	0.021***	0.016	0.006**	0.022***	0.021*
	(0.003)	(0.007)	(0.012)	(0.003)	(0.007)	(0.012)
$ret30_{j,t-1,(d-1,d-30)}$	-0.008	0.050	0.363**	-0.018	0.001	0.394**
	(0.040)	(0.106)	(0.175)	(0.035)	(0.099)	(0.178)
$mom_{j,\ t-1,(d-31,d\ -364)}$	-0.028**	-0.048	-0.112**	-0.029**	-0.051	-0.114**
	(0.012)	(0.034)	(0.047)	(0.011)	(0.033)	(0.052)
$illiq_{j,m-1}$	0.012	0.234***	0.423***	0.011	0.233***	0.408***
	(0.015)	(0.047)	(0.066)	(0.015)	(0.048)	(0.067)
$size_{j,m-1}$	-0.042***	-0.223***	-0.392***	-0.038***	-0.231***	-0.390***
	(0.011)	(0.032)	(0.051)	(0.011)	(0.036)	(0.051)
$delta_{p,t-1}(\times 0.01)$	0.001*	0.004***	0.008***	0.001**	0.004***	0.008***
	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
$lncompen_{p,t-1}$	0.017**	0.064***	0.144***	0.017**	0.066***	0.108***
	(0.008)	(0.021)	(0.042)	(0.008)	(0.021)	(0.030)
$rating_{j,\ t-1}$	0.079	0.332*	0.612**	0.111	0.449**	0.875***
	(0.075)	(0.193)	(0.269)	(0.075)	(0.200)	(0.283)
Constant	0.038	0.434	0.701	-0.035	0.332	0.535
	(0.114)	(0.307)	(0.481)	(0.112)	(0.311)	(0.462)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sample	4193	5116	5061	4193	5116	5086
Fixed Effect	Firm, Month	Firm, Month	Firm, Month	Firm, Month	Firm, Month	Firm, Month
Within R^2	0.029	0.114	0.174	0.027	0.158	0.160

Internet Appendix S11: Alternative Explanation

This table reports the fixed effect regression output based on the matched firms with CEO turnover event in year *t* with firms with no CEO turnover in (-2, 2) on the average insider purchase/sell profitability, logarithm of the total asset and the book-to-market ratio in the fiscal year *t-1* using Mahalanobis distance. The dependent variable is BHAR_m_365. In Panel A, the moderator variable is $skill_{j,t}$, the skill of the current CEO defined by Daniel *et al.* (2020). In Panel B, the sample is only based on treated firms that have the lower-than-median stock return volatility during its CEO turnover year in its 2-digit SIC industry and their corresponding control firms. We include firm and month fixed effects and control variables described in Table 1 and the main level of moderators. Standard errors in parentheses are based on robust standard errors clustered at the firm-month level. ***, **, and * denote significance at the 99%, 95% and 90% confidence level, respectively. All variables are winsorised at the top 99% and the bottom 1% level.

	Insider Purchase		Insider Sell	
	(1)	(2)	(3)	(4)
Year *t*	(0,0)	(1,1)	(0,0)	(1,1)
	Panel A: Newly-Appointed CEO Ability			
Dependent Variable	BHAR_m_365	BHAR_m_365	BHAR_m_365	BHAR_m_365
$(Treat \times Post)_{i,t}$	0.167*	0.133	-0.074***	-0.051**
	(0.094)	(0.304)	(0.028)	(0.025)
$(Treat \times Post \times skill)_{j,t}$	-0.156	3.254**	-0.091	-0.341**
	(0.730)	(1.646)	(0.352)	(0.134)
$skill_{j,t}$	0.171	0.710*	0.213***	0.193***
	(0.176)	(0.427)	(0.032)	(0.036)
Within R-square	0.51	0.51	0.21	0.23
Sample	777	811	22,815	21,955
	Panel B: Low Volatility Firms			
Dependent Variable	BHAR_m_365	BHAR_m_365	BHAR_m_365	BHAR_m_365
$Post_{i,t}$	0.077	-0.152**	0.013	0.067***
	(0.063)	(0.065)	(0.013)	(0.017)
$Treat_{i,t}$	-0.138	-0.153	0.026**	0.024**
	(0.190)	(0.148)	(0.013)	(0.012)
$(Post \times Treat)_{i,t}$	0.269**	0.265**	-0.038**	-0.072***
	(0.134)	(0.126)	(0.018)	(0.022)
Within R-square	0.37	0.47	0.15	0.16
Sample	796	627	22,932	21,217