


# Independent Director Tenure and Corporate Governance: Evidence from Insider Trading

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## Abstract

Executives trade more profitably and opportunistically over the course of the tenure of independent directors (IDs). IDs' increased connections with and hence allegiance to executives are likely the channel through which ID tenure can affect executive trading. Executive opportunism is mitigated by disciplinary factors that include the presence of a firm's internal trading policy, blockholders, and IDs with legal expertise as well as the risk of shareholder-initiated derivative lawsuits. These results point to an association between long-tenured IDs and weakened corporate governance.

## I. Introduction

Board effectiveness is of central interest in corporate governance. Of the issues surrounding corporate governance, board independence has experienced a surge in interest over the last two decades.<sup>1</sup> In addition, the market (in terms of both supply and demand) for independent directors (IDs) has changed substantially; both the tenure of IDs and the share of long-tenured IDs on the board have been increasing (see [Figures 1](#) and [2](#)). Echoing this situation, concerns abound among academics, regulators, and market participants about the independence of IDs and of the board

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<sup>1</sup>See Weisbach (1988) for an earlier study. Coles, Daniel, and Naveen (2008) argue for varying board structures for different firms. Masulis (2020) presents the latest survey on this topic.

FIGURE 1  
Distribution of Independent Director Tenure over Different Sample Periods

Figure 1 plots the distribution of independent director (ID) tenure in the sample firms over four different time periods. The label "1990s" refers to the 2-year period of 1998 to 1999, during which the median tenure of all IDs was 5 years. The label "2000s" refers to the 5-year period of 2000 to 2004, whereas the label "2005s" refers to the 5-year period of 2005 to 2009; during these two periods, the median tenure of all IDs was 6 years. The label "2010s" refers to the 5-year period of 2010 to 2014, whereas the label "2015s" refers to the 4-year period of 2015 to 2018; during these two periods, the median tenure of all IDs increased to 7 years.

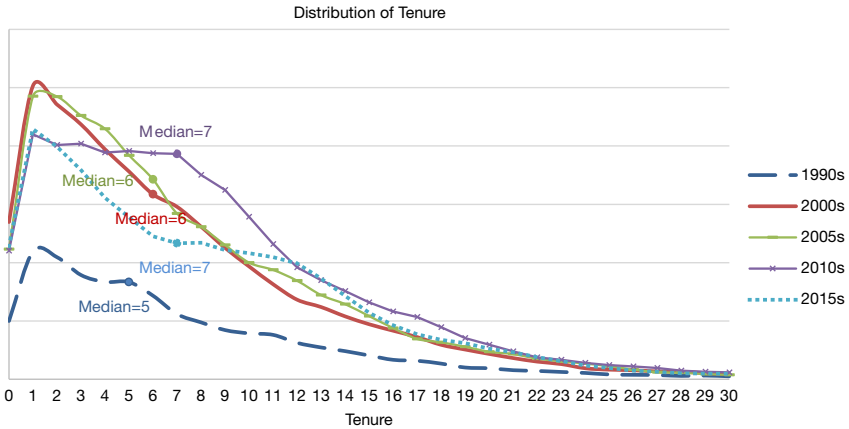
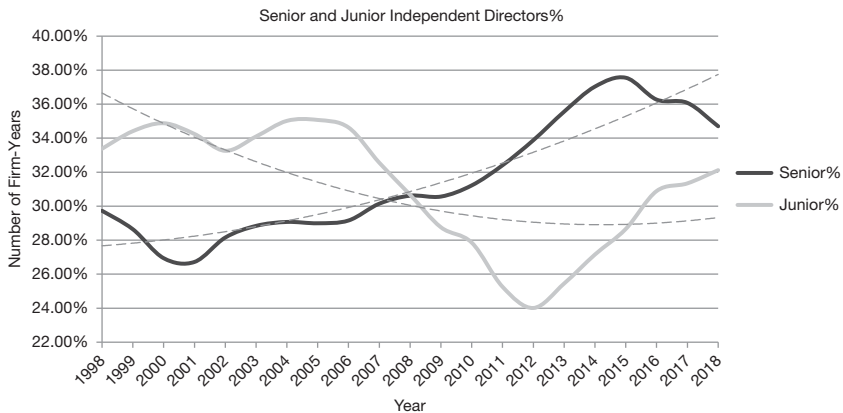


FIGURE 2  
Percentage of Senior and Junior Independent Directors over Time

Figure 2 shows how the composition of the board in terms of senior and junior independent directors (IDs) changes over time. Senior IDs are defined as those whose tenure is no less than 10 years, or the top 30th percentile of the tenures of all sampled IDs. Junior IDs are defined as those whose tenure is no longer than 3 years, or the bottom 30th percentile of the tenures of all sampled IDs.



over the course of ID tenure. How may corporate governance be affected by long-tenured IDs?

In this article, we shed light on this issue by examining the relation between ID tenure and insider trading among executives. We find considerable evidence that is consistent with the internal governance of insider trading being compromised in the

presence of long-tenured IDs, and to the best of our knowledge, this is the first study to provide evidence of the channel likely at work.

Theoretically speaking, how may ID tenure be related to insider trading? ID monitoring is expected to become more effective, as ID access to and the processing of firm-specific information are expected to improve over the course of their tenure. Moreover, IDs can accumulate experience and competence and increase their organizational commitment to the firm. Longer-serving IDs are thus likely to be stronger monitors, which, in turn, can deter executives from trading opportunistically. We hypothesize that when ID tenure increases, executives are less likely to engage in opportunistic trading, thus decreasing their trading profitability (the [monitoring hypothesis](#)).

Alternatively, IDs may become less effective monitors over the course of their tenure for two possible, mutually nonexclusive reasons. First, IDs are likely to become more personally connected with management and thus their allegiance to management increases (“connection”). Second, IDs who are willing to be friendly in their monitoring, as shown by their observed behavior over the course of their tenure, are more likely to be reappointed (“retention”). In both cases, the independence of IDs is likely to be compromised, thus decreasing the effectiveness of board oversight. The deterrence effect of board governance would then become weaker. As a result, executives may be emboldened to behave more opportunistically in their trading, leading to the alternative hypothesis that when ID tenure increases, opportunistic trading occurs more frequently, and hence executives exhibit higher trading profitability (the [compromised hypothesis](#)).

We conduct our empirical investigations with a sample of S&P 1500 firms for the period of 1998 to 2018. We measure ID tenure for a firm-year as the average tenure of all IDs in the firm as of that year. We find that private trades by executives become significantly more profitable over the course of IDs’ tenure, whereas neither their trading volume nor the direction (of their net trades) changes. Economically, an additional year of ID tenure is associated with an increase in executives’ trading profitability (ETP) of 0.72%–0.99% in annualized buy-and-hold abnormal returns (BHARs) depending on the holding period. Hence, the evidence is more consistent with the [compromised hypothesis](#) than with the [monitoring hypothesis](#).

Additional tests yield results that provide further support for the [compromised hypothesis](#). First, under this hypothesis, it is the quality of the oversight by IDs who are expected ex ante to be more effective monitors when they join the board but not those who are unlikely to be strong monitors at the beginning of their tenure that declines with their tenure ex post. As a result, the effect of ID tenure should be driven by the former type of IDs. Using various measures adopted in the prior literature to capture ID types, we find that this is indeed the case.

Next, corroborating our finding related to ETP, we show that when ID tenure increases, executives are more likely to engage in exploitative trades that are informationally more sensitive and to make proportionally more of such trades. Specifically, these trades are more likely to be opportunistic (Cohen, Malloy, and Pomorski (2012b)), to occur outside the generally accepted transparency window,

or to occur during the 21 trading days before the quarterly earnings announcements (Ali and Hirshleifer (2017)).

Third, we document several disciplinary factors that help mitigate opportunism among executives in the presence of long-tenured IDs. Specifically, the relation between ID tenure and ETP is significantly weaker in firms that have i) insider trading policies (ITPs) in place, ii) blockholders in their shareholder base, iii) IDs with legal expertise, or iv) a higher risk of shareholder-initiated derivative lawsuits. The results suggest that when insider trading is not bound by specific rules (ITPs) or disciplined through shareholder lawsuits or effective monitoring from blockholders, executive opportunism is more likely to be emboldened when board monitoring weakens due to long-tenured IDs. Conversely, the presence of IDs with legal expertise can be a deterring factor for such opportunism.

The question remains of how the independence of IDs may become compromised in such a way that executive trading is affected. We find very weak evidence in support of the retention channel. ID turnover is not robustly related to past ETP. Instead, we find strong evidence in support of the connection channel. Specifically, there is a higher likelihood of IDs and CEOs becoming socially connected over ID tenure that overlaps with CEO tenure.

Finally, we complement our main analyses of executives' trades by examining the relation between ID tenure and IDs' own trading and find that the profitability of the latter, whether through purchases or sales, does not vary over the course of their tenure. It is likely that long-tenured IDs are under greater regulatory scrutiny and/or have more reputational concerns, which dampen their incentives to exploit their informational advantages in terms of their own trading.

One concern is whether the endogeneity of ID tenure can potentially bias our estimates. It is likely that the relation between ID tenure and ETP may be driven by unobservables that are associated with both ID tenure and ETP. To address this issue, we conduct three tests, which include i) an exogenous shock that reduces the risk of shareholder-initiated derivative lawsuits against directors and hence weakens the monitoring incentives of long-tenured IDs; ii) the sudden death of an ID, which results in an unexpected change to ID tenure; and iii) a falsification test with the tenure of outside affiliated directors. Through these tests, we show that omitted variable bias is less of a serious concern.

Our study contributes to the literature in several ways. First, it enhances our understanding of corporate governance over the course of IDs' tenure. It is noteworthy that our study does not speak to the question of whether ID tenure should be capped or whether a board with longer-serving IDs is overall detrimental to shareholder value. The literature has reported mixed findings on the relation between ID tenure and other aspects of corporate governance.<sup>2</sup> Additionally, ID tenure depends

<sup>2</sup>Similar to the debates on the effectiveness of busy boards in terms of monitoring and advising (e.g., Field, Lowry, and Mkrtychyan (2013)), prior studies examining the relation between the tenure of outside directors and corporate governance have found mixed results. For example, regarding the role of IDs as monitors, some studies have shown that ID tenure is positively associated with CEO pay level (e.g., Vafeas (2003)) and the occurrence of governance issues such as litigation, scandals, and accounting restatements (e.g., Berberich and Niu (2011)), but other studies have found the opposite (e.g., Beasley (1996), Dou, Sahgal, and Zhang (2015)). Regarding the role of IDs as advisors, Jia (2017) shows that

on many factors that are related to the supply and demand of ID candidates on the market for director talent. In summary, Huang and Hilary (2018) document a nonlinear relation between the tenure of outside directors and firm value. We document a partial-equilibrium finding and add to the literature by focusing on an easily quantified monitoring task that is relevant for all firms.

Second, our study is related to a burgeoning literature that has raised various issues about the independence of a literally independent board based on current rules and regulations.<sup>3</sup> Interestingly, we find that it is ID tenure, but not board independence per se, that is more robustly related to ETP.<sup>4</sup> Furthermore, our finding that the positive relation between ID tenure and ETP is driven by IDs who are expected to be more effective monitors ex ante when they join the board highlights the intertemporal change in the monitoring effectiveness of these IDs over the course of their tenure. This finding points more directly to the issue of board independence over time and has rich implications for corporate governance. We also add to the literature by providing evidence on the channel through which ID independence can be compromised—IDs and executives are more likely to become socially connected over ID tenure.

Finally, our study calls for more attention to be paid to the internal governance of insider trading and, in particular, to the role of the board. Bettis, Coles, and Lemmon (2000) show that corporate self-regulation suppresses insider trading and improves stock liquidity. Later studies have documented the occurrence of opportunistic insider trading despite predetermined trading restrictions (e.g., Jagolinzer (2009), Lee, Lemmon, Li, and Sequeira (2014), and Ali and Hirshleifer (2017)). There has been increasing interest in how corporate governance may be related to insider trading and in finding various factors that affect this relation. See, for example, Jagolinzer, Larcker, and Taylor (2011) for the role of general counsel, Ravina and Sapienza (2010) for the effect of board size and firm antitakeover measures, and Skaife, Veenman, and Wangerin (2013) for the impact of internal controls, while Dai, Fu, Kang, and Lee (2016) relate insider trading to an index of internal and external firm governance. While these studies focus on the cross-sectional heterogeneity in corporate governance, we examine the intertemporal change in the quality of board oversight over the course of ID tenure.

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long board tenure is associated with poor corporate innovation. Kim, Mauldin, and Patro (2014) suggest that both the monitoring and advising of outside directors could improve over the course of their tenure, finding better monitoring of CEO compensation and better advising regarding firm acquisition/investment policies among longer-tenured outside directors.

<sup>3</sup>Studies have shown that ID independence can be undermined if IDs are handpicked by CEOs (Coles, Daniel, and Naveen (2014)), too busy to exercise effective monitoring (e.g., Ferris, Jagannathan, and Pritchard (2003), Perry and Peyer (2005), Fich and Shivdasani (2007), and Field et al. (2013)), socially connected with management (Hwang and Kim (2009), Fracassi and Tate (2012)), have conflicts of interest (Güner, Malmendier, and Tate (2008), Masulis and Reza (2015), and Cai, Xu, and Yang (2021)), or are hired as cheerleaders (Cohen, Frazzini, and Malloy (2012a)). Kim and Lu (2018) show that the effectiveness of board independence may be moderated if the CEO is more connected within executive suites.

<sup>4</sup>Our finding is consistent with Nguyen and Nielsen (2010), who show that while IDs are deemed valuable to shareholders from the negative stock price reaction to their sudden death, the market reacts less negatively when the deceased IDs have long tenure.

## II. Internal Governance of Insider Trading and Hypothesis Development

### A. Role of the Board and IDs in Insider Trading Governance

Despite its significance, there are no laws, rules, or regulations that require the disclosure of the internal governance of insider trading. To better understand the internal firm governance of insider trading and, in particular, the role of the board, we manually search firm policies on insider trading from company websites and the Internet in general for all sample firms.<sup>5</sup> We find that there is great heterogeneity in both disclosure practices and firm policies, if any exist and are disclosed, relating to how a firm governs insider trading. For many firms, our search does not yield any public firm policy or public statement on insider trading. Among the relevant company files concerning insider trading that we are able to find, many do not mention any specific policies and, instead, make rather general statements. Among those firms that mention the existence of an ITP, typically in the general code of business conduct and ethics (approximately 22.5% of the firms searched), many either do not make the specifics of their ITP available or refer readers to the corporate governance section of their companies' intranet or legal departments (to which there is no public access). Among the remaining firms (less than 10% of the firms searched), a detailed ITP is generally accessible to the public and provides guidance on the ways in which insiders may trade their own stocks. Typically, the ITP specifies periods when trading is prohibited (blackout periods), corporate events that trigger these blackout periods, whether a trade is required to be preapproved or precleared (and if so, to whom the intent of the trade should be reported when seeking preapproval or preclearance), rules pertaining to the creation of the 10b5-1 plan and its execution, and posttrading reporting.

As a result, the internal governance of insider trading is largely unknown to the outside world. Moreover, even with a voluntarily disclosed ITP, it is not clear whether trades are made pursuant to the relevant policy. Indeed, violations of predetermined trading restrictions appear to be common. For instance, Ali and Hirshleifer (2017) document substantial insider trading during "blackout periods" prior to quarterly earnings announcements, although these trades are typically prohibited (e.g., Bettis et al. (2000)). Lee et al. (2014) find that insiders within firms with certain restrictions continue to take advantage of positive private information while being more cautious when exploiting negative private information.<sup>6</sup>

Overall, existing evidence calls for the effectiveness of the internal governance of insider trading to receive more attention, and the efficacy of board oversight

<sup>5</sup>The searches were conducted in 2016 when our research first began, and thus all disclosure practices, if any, are current as of 2016. Firms may have since updated their policies and disclosure practices, but it is not clear how often such updates are made.

<sup>6</sup>Additionally, the 10b5-1 plan has even been found to enable strategic trades. Jagolinzer (2009) finds that the sales of plan participants, the bulk of Rule 10b5-1 trade, tend to follow price increases and precede price declines, generating significant abnormal returns. Hugon and Lee (2016) present similar evidence for Rule 10b5-1 trades around earnings announcements. Fich, Parrino, and Tran (2021) find that CEOs circumvent the 10b5-1 trading restrictions and conduct opportunistic trading, especially when the transaction value is large relative to the CEO's total compensation.

should be a key consideration. While the literature has largely focused on the impact of predetermined trading restrictions and the role of certain officers, such as the General Counsel, in the governance of insider trading, decisions on trading restrictions and officer appointments are mostly made or approved by the board. As revealed by our above search, it is clear from the available information that the board of directors is the governing body for insider trading with an officer (typically the General Counsel, Chief Compliance/Legal Officer, Clearance Officer, and sometimes even the CEO or the CFO) often being delegated as being responsible for routine check-ups. The board initiates firm-level rules and policies, reviews their adequacy regarding compliance with all applicable laws and regulations, and, more importantly, ensures their enforcement (with disciplinary actions when necessary). In particular, almost all disclosed codes of conduct state that violations or transactions that are potentially problematic should be made known to the board via full written disclosure, and exceptions or waivers can be made only by the board itself. That is, while the board may not directly monitor each individual trade, the key issue is how it responds to any signals or reports that indicate suspicious trades, which, in turn, may act as feedback affecting insider trading behavior. It is thus intriguing to see what may be underlying the relative deficiency in the responsiveness and governance of some boards, which is especially interesting given that board independence and, hence, presumably the effectiveness of board monitoring have been enhanced overall over the last two decades.

## B. ID Tenure and Hypothesis Development

Boards play two primary roles: advisory and monitoring roles (Adams and Ferreira (2007), Coles et al. (2008), and Adams, Hermalin, and Weisbach (2010)). Regarding the monitoring role, the prior literature has suggested that effective board monitoring hinges crucially on the firm information environment and on the board's access to information (Hermalin and Weisbach (1998), Hermalin and Weisbach (2003), Raheja (2005), Harris and Raviv (2008), and Duchin, Matsusaka, and Ozbas (2010)). IDs rely primarily on executives for inside information, which limits their ability to monitor effectively. This problem can be alleviated by having IDs serve for long periods, as they are expected to accumulate more firm-specific information and knowledge over time (Vance (1983)). Moreover, IDs accumulate experience and competence and increase their organizational commitment to the firm over the course of their tenure, which also improves their monitoring effectiveness (Buchanan (1974)). Compared with short-tenured IDs, long-tenured IDs are also less likely to have career concerns and are thus more likely to take a strict stance on issues involving executive misbehavior. As such, longer-serving IDs are likely to be stronger monitors, and the effectiveness of the board oversight of insider trading can thus be improved over the course of their tenure.

Conversely, if longer-serving IDs are stricter monitors of executive misbehavior, then they should first deter violations or suspicious trades by executives. After all, even though these trades may not be caught through the public enforcement of regulation, disciplinary actions can be taken by the board. As a result, while we cannot examine the intertemporal changes in firm policies to gauge the change in the

internal governance of insider trading over the course of ID tenure,<sup>7</sup> we predict that when ID tenure increases, opportunistic trading by executives is less likely to occur and their trading profitability decreases. We therefore obtain our first testable hypothesis as follows:

*Monitoring hypothesis.* When ID tenure increases, executives are less likely to engage in opportunistic trading, and their trading profitability should decrease *ceteris paribus*.

Alternatively, IDs may become less effective monitors over the course of their tenure, possibly through two channels, which we label “connection” and “retention.” The “connection” channel refers to the possibility that IDs are more likely to become personally connected and thus be cozy with executives over the course of their tenure (Vafeas (2003)). The “retention” channel arises because directors who, according to their observed behavior over the course of their tenure, have a confirmed willingness to be friendly in their monitoring are more likely to be reappointed. Conversely, directors who do not demonstrate such willingness may not be invited to serve again.

In both cases, ID independence, while seemingly satisfying regulatory requirements, is likely to be compromised, and the effectiveness of board oversight can decrease over the course of ID tenure. As a result, executives may be less deterred and, instead, be emboldened to engage in trading misbehavior, especially when there are no specific firm rules to guide their trading, leading to more opportunistic trading and hence increased ETP *ceteris paribus*.

According to this view of ID independence as being compromised, the impact of ID tenure depends on the extent to which the effectiveness of ID monitoring changes with such tenure. We thus predict that the positive relation between ID tenure and ETP should be driven by IDs who are expected *ex ante* to be more effective monitors (i.e., those whose oversight quality may decline with their tenure *ex post*). In other words, we should not expect to find such an association among IDs who have been shown to be less effective monitors from the start; that is, their monitoring effectiveness should not vary much with their tenure. We thus propose the following alternative hypothesis:

*Compromised hypothesis.* When ID tenure increases, executives are more likely to engage in opportunistic trading, and their trading profitability should increase *ceteris paribus*. This effect of ID tenure is driven by IDs who are expected to be more effective monitors *ex ante*.

### III. Data, Variables, and Summary Statistics

#### A. Data and Sample

We obtain our insider trading data from the Thomson Reuters insider filings database. We focus on open-market purchases and sales by executives and directors

<sup>7</sup>As discussed, this is because most firms do not disclose any firm policies, and even when they do, it is unknown when such policies were adopted. See also Bettis et al. (2000).



and exclude all transactions with cleansing records S and A.<sup>8</sup> We acquire data on board and director characteristics from ISS (formerly RiskMetrics) and BoardEx. Data on institutional ownership are from the Thomson Reuters Institutional Holdings (13f) database. We complement the insider trading and board data with stock return data from CRSP and firm financial statement data from Compustat. We require data on a firm's main variables in a year to be available for that firm-year to be included in the sample. These variables include measures of insider trading, board and director characteristics, institutional ownership, and key firm characteristics, which are used in the baseline regression analysis. The final sample consists of 264,552 trade transactions made by 35,063 executives and 72,920 trade transactions made by 12,773 IDs in 2,606 firms from 1998 to 2018.<sup>9</sup>

## B. Construction of Key Variables

### 1. Independent Directors

Directors can have one of the following board affiliations according to ISS and BoardEx: i) insider/employee, ii) independent outsider, or iii) affiliated outsider (i.e., a former executive; a family member of a current or former executive; or an individual with a transactional, professional, financial, or charitable relationship with the company).<sup>10</sup> While some prior studies have examined outside directors from groups ii) and iii) combined, we focus on independent outsiders (i.e., IDs) because the literature has shown them to be more effective monitors compared with affiliated directors. Nevertheless, we also examine how the tenure of affiliated outside directors affects ETP in terms of comparison.

### 2. ID Tenure

The tenure of each director is calculated from the "director service since" item in ISS.<sup>11</sup> To obtain a firm-level measure of ID tenure for a given firm-year, we follow the literature (e.g., Huang and Hilary (2018)) and take the mean ID tenure for each firm-year (labeled ID\_TENURE). For robustness checks, we use the median and longest ID tenure and find that the main results are qualitatively similar. Tenure is defined similarly for inside directors and affiliated directors in a firm-year.

### 3. Insider Trading Characteristics

To measure the profitability of insider trading, we follow the literature and calculate the return obtained from mimicking what an individual does, that is, either by purchasing one dollar's worth of the company stock when buying or by selling

<sup>8</sup>Transactions with a cleansing record S refer to trades with the underlying securities not being identified in the data vendor's security universe, whereas a cleansing record A flags cases where some of the data elements are invalid or missing.

<sup>9</sup>Our period of observation starts in 1998 because the key data on director tenure became available only in that year.

<sup>10</sup>See ISS for detailed definitions of each board affiliation classification. The literature has also classified directors slightly differently as inside, gray, and outside directors (e.g., Brickley, Coles, and Terry (1994)).

<sup>11</sup>We drop a small number of extreme cases that we believe suffer from data errors (e.g., cases in which the calculated tenure is more than 90 years). Our results are not affected if we instead winsorize the ID tenure variable.

one dollar's worth of the company stock when selling. We calculate the market-adjusted BHARs by subtracting the value-weighted market return from the firm return,  $(R_{it} - R_{mt})$ , and compounding it over time for four different holding horizons (30, 60, 90, and 180 trading days), which we label  $R(t + 30)$ ,  $R(t + 60)$ ,  $R(t + 90)$ , and  $R(t + 180)$ , respectively. The returns are multiplied by 100 and thus are expressed as percentages. We also follow Ali and Hirshleifer (2017) to calculate the factor-adjusted profits from trading; our main results, not tabulated for brevity, continue to hold.

In addition to profitability, we follow the literature and examine the volume and strength of insider trading. Trading volume (VOLUME) is defined as the natural logarithm of 1 plus the total number of shares traded by an insider during a year. Trading strength (STRENGTH) is defined as the number of shares purchased net the number of shares sold by an insider, scaled by the total share volume traded for that stock during the year. Furthermore, as discussed, we calculate total trading profits by considering the dollar value of the transactions, as detailed in Section IV.A.

We also use a set of control variables representing firm, executive, director, board, and transaction characteristics that have been shown in the literature to affect insider trading and profitability. The definitions of these variables are provided in the Appendix. To reduce the impact of outliers, we winsorize all continuous variables at the 1st and 99th percentiles.

### C. Summary Statistics

Table 1 reports the summary statistics for our sampled firms, directors, boards, and trading transactions. Panel A describes the profitability of the trades (returns at the individual transaction level, in percentages) made by executives and IDs. Consistent with the literature, we find that purchases are more profitable than are sales on average. Additionally, while IDs trade profitably, there appears to be a profitability gap between IDs and executives. Panel B presents the board and director characteristics (aggregated at the firm level). ID tenure in the average firm is 7.8 years, whereas insider director tenure is, on average, 10.7 years. The average total share of ID ownership is 1.24%, whereas the median is lower, at 0.33%, suggesting that in the aggregate, IDs have a nontrivial stake in the firm, which is made possible by grants of restricted equity and options to IDs as part of their compensation, in addition to their own open-market purchases. IDs in the average firm are approximately 62 years old and hold approximately one extra directorship in another firm. Panel C reports the characteristics of the sample firms that are comparable to the S&P 1500 firms used in the literature. Panel D presents the statistics on the timing and size of insider trading that are consistent with those in the prior literature.

## IV. Main Empirical Analyses and Results

In this section, we present the main results of our empirical tests. We test our predictions regarding the effect of ID tenure on the profitability of trades made by executives. We also examine the change in the nature of executives' trades over the

TABLE 1  
Summary Statistics for the Sample

In Table 1, the sample consists of all open-market trades from 1998 to 2018 conducted by the executives and independent directors (IDs) of the 2,606 firms in the ISS and Thomson Reuters databases with available stock returns from CRSP and firm accounting data from Compustat. Panel A first reports the summary statistics for the profitability of all transactions and then that of purchases and sales separately for executives and then IDs. The profitability of insider trading is expressed as a percentage and reported at the individual transaction level. Panels B–D present the summary statistics for director and board characteristics, firm characteristics, and the transaction-level controls, respectively. All variables are defined in the Appendix.

Variables	No. of Obs.	Mean	Median	Std. Dev.
<i>Panel A. Trading Profitability</i>				
<i>Executives</i>				
<i>All transactions</i>				
$R(t + 30)$	264,552	0.025	-0.090	12.227
$R(t + 60)$	264,552	0.128	0.102	15.741
$R(t + 90)$	264,552	-0.112	0.327	22.343
$R(t + 180)$	264,552	-0.759	0.705	34.984
<i>Purchases</i>				
$R(t + 30)$	22,122	3.990	1.611	20.827
$R(t + 60)$	22,122	4.461	2.128	21.149
$R(t + 90)$	22,122	6.735	1.913	35.620
$R(t + 180)$	22,122	9.836	1.216	56.867
<i>Sales</i>				
$R(t + 30)$	242,430	-0.337	-0.188	11.045
$R(t + 60)$	242,430	-0.268	-0.030	15.090
$R(t + 90)$	242,430	-0.736	0.221	20.599
$R(t + 180)$	242,430	-1.726	0.665	32.082
<i>IDs</i>				
<i>All transactions</i>				
$R(t + 30)$	72,920	0.499	0.060	13.951
$R(t + 60)$	72,920	0.858	0.390	20.366
$R(t + 90)$	72,920	0.763	0.396	24.564
$R(t + 180)$	72,920	0.847	0.331	37.454
<i>Purchases</i>				
$R(t + 30)$	23,600	2.115	0.717	18.166
$R(t + 60)$	23,600	3.325	1.285	25.666
$R(t + 90)$	23,600	3.393	0.976	31.106
$R(t + 180)$	23,600	5.111	0.269	48.149
<i>Sales</i>				
$R(t + 30)$	49,320	-0.275	-0.180	11.314
$R(t + 60)$	49,320	-0.322	0.007	17.140
$R(t + 90)$	49,320	-0.496	0.134	20.597
$R(t + 180)$	49,320	-1.193	0.347	30.853
<i>Panel B. Director and Board Characteristics</i>				
ID_TENURE	264,552	7.789	7.429	3.289
INSIDE_DIRECTOR_TENURE	264,552	10.690	9.000	7.543
ID_AGE	264,552	61.780	62.000	4.445
ID_OWNERSHIP	264,552	1.236	0.333	4.016
ID_MULTIDIRECTORSHIP	264,552	0.932	0.875	0.611
BOARD_SIZE	264,552	9.438	9.000	2.556
BOARD_INDEPENDENCE	264,552	0.739	0.778	0.152
CEO_CHAIRMAN	264,552	0.450	0.000	0.498
CLASSIFIED_BOARD	264,552	0.502	1.000	0.500
CO_OPTED_ID_TENURE	256,409	3.714	3.167	3.238
NON_CO_OPTED_ID_TENURE	264,552	8.879	9.200	7.295
<i>Panel C. Firm Characteristics</i>				
SIZE	264,552	8.202	8.068	1.469
MB_RATIO	264,552	2.529	1.922	1.955
R&D_DUMMY	264,552	0.417	0.000	0.493
INSTITUTIONAL_OWNERSHIP	264,552	0.778	0.804	0.190
RETURN_VOLATILITY	264,552	1.986	1.694	1.174
<i>Panel D. Transaction-Level Controls</i>				
LOSS_DUMMY	264,552	0.099	0.000	0.298
PRIOR_RETURN	264,552	0.107	0.071	0.295
RECENT_TRADE	264,552	0.081	0.007	0.566
TRANSACTION_SIZE	264,552	0.027	0.008	0.197

course of IDs' tenure and the factors that may discipline executive opportunism in these trades. We then investigate the channels through which the effectiveness of ID monitoring may be attenuated over ID tenure. Furthermore, we complement our main analyses of executives' trades by investigating the profitability of trades by the IDs themselves over the course of their tenure. Finally, we address the endogeneity of ID tenure.

## A. Profitability and Nature of Trades by Executives over the Course of IDs' Tenure

### 1. Baseline Analysis and Robustness Checks

We estimate the following OLS regression of an insider's trades on ID tenure in a firm-year as follows:

$$(1) \quad Y_{ijt} = \alpha_0 + \alpha_1 \text{ID\_TENURE}_{jt-1} + \alpha_2 \text{CONTROLS}_{ijt-1} + \theta_j + \mu_t + \varepsilon_{ijt}.$$

Here,  $Y_{ijt}$  is a variable that captures the characteristics of the trades (including profitability, volume, strength, profit, and nature) made by insider  $i$  at firm  $j$  in year  $t$ . Trades made by  $i$  with different transaction dates during the year are counted separately.  $\text{ID\_TENURE}_{jt-1}$  measures the average ID tenure in firm  $j$  as of the end of year  $t-1$ , and  $\text{CONTROLS}_{ijt-1}$  includes a set of variables that measure the characteristics of firm  $j$ , its board, and its directors as of year  $t-1$ , as well as some features of the focal transaction. Detailed definitions of these variables are provided in the [Appendix](#). Specifically, the control variables for firm characteristics include  $\text{SIZE}$ ,  $\text{MB\_RATIO}$ ,  $\text{R\&D\_DUMMY}$ ,  $\text{INSTITUTIONAL\_OWNERSHIP}$ , and  $\text{RETURN\_VOLATILITY}$ , which are all related to firms' information environment. Institutional ownership can also be a governance factor that deters opportunistic insider trading. Measures of corporate governance related to the board, such as  $\text{BOARD\_SIZE}$ ,  $\text{BOARD\_INDEPENDENCE}$ ,  $\text{CEO\_CHAIRMAN}$  duality, and  $\text{CLASSIFIED\_BOARD}$ , are included as controls.

In examining the effect of  $\text{ID\_TENURE}$ , we control for other ID characteristics ( $\text{ID\_AGE}$ ,  $\text{ID\_OWNERSHIP}$ , and  $\text{ID\_MULTIDIRECTORSHIP}$ ). We control for ID age to ensure that the effect of ID tenure is separate from that of ID age. Share ownership by IDs should induce stronger monitoring incentives for IDs, whereas their activity level, reflected by their membership in multiple boards, is expected to be negatively related to their monitoring effectiveness.

We also control for certain transaction-level characteristics.  $\text{LOSS\_DUMMY}$  and  $\text{PRIOR\_RETURN}$  are included to capture the timing of insider trading; insiders may exhibit contrarian behavior and make trades subsequent to poor accounting and stock performance.  $\text{RECENT\_TRADE}$  is included to see how trades may be affected if they follow a period of intensive insider trading within the firm.  $\text{TRANSACTION\_SIZE}$  measures the size of each trade and is expected to be related to its information content.

Similar to Ravina and Sapienza (2010), we include firm fixed effects to remove the impact of any (time-invariant) firm-specific factors. Therefore, our results are unlikely to be explained by any omitted firm-specific characteristics that drive both ID tenure and insider trading. In results not tabulated for brevity, we

find that our main results hold if we include executive (ID) fixed effects instead when examining trading by executives (IDs). We also include year fixed effects to account for the potential time trend in insider trading. The estimated standard errors are robust to heteroskedasticity and clustered at the individual level. The results are not affected if clustered at the firm level.

Table 2 presents the baseline results for the profitability of the trades made by executives. In Panel A, the significantly positive coefficients on ID\_TENURE across all four holding horizons show that trades made by executives become more profitable as ID tenure increases. Moreover, the magnitudes of the coefficients increase with the holding horizon, suggesting that the impact of ID tenure is stronger for longer holding horizons. Quantitatively, an additional year of ID tenure is associated with an increase in ETP ranging from 0.081% for  $R(t + 30)$  to 0.354% for  $R(t + 180)$ , which is equivalent to 0.72%–0.99% in annualized abnormal returns depending on the holding period. Note that the mean and median for  $R(t + 180)$ , the longest measurement window for ETP, are  $-0.759\%$  and  $0.705\%$ , respectively, and thus the economic magnitude of these impacts is substantial.<sup>12</sup> Overall, the results suggest that the [monitoring hypothesis](#) is unlikely to hold.

Panels B and C of Table 2 report the results for purchases and sales by executives, respectively. In the interest of space, we present the estimated coefficients on ID\_TENURE only. Clearly, the coefficients are significantly positive only in the case of sales; they are negative but insignificant in the case of purchases. On the one hand, Lee et al. (2014) find that in the presence of trading restrictions, executives continue to take advantage of positive private information, whereas they are more cautious in exploiting negative private information. Hence, executives may make more highly profitable purchases, regardless of ID tenure, while they may be more emboldened to sell on the basis of negative private information when the internal governance of insider trading is less effective because of long-tenured IDs, as suggested by the [compromised hypothesis](#). Unlike purchases, opportunistic sales occur before negative corporate events that negatively affect firms and cause losses to investors. As such, a shorter-tenured (and, hence, less likely to be compromised) independent board may be more attentive to such sales, which, in turn, can deter their occurrence.

On the other hand, sales can occur for diversification or liquidity reasons, thus disguising opportunistic sales and resulting in an even lower likelihood of being detected by a compromised board. Both cases lead to the positive association between ID tenure and the profitability of executive sales. This finding is consistent with the literature showing that the impact of corporate governance on the profitability of insider trading is more pronounced for sales than for purchases (e.g., Dai et al. (2016), Adhikari, Agrawal, and Sharma (2019)). Overall, the evidence thus far is consistent with the weakened effectiveness of ID monitoring over the course of IDs' tenure, as proposed by the [compromised hypothesis](#).

<sup>12</sup>In results not tabulated for brevity, we find that the positive relation between ID tenure and ETP holds for both CEOs and non-CEO executives. The coefficients are larger in magnitude for CEOs, consistent with their informational advantage relative to non-CEO executives. The only caveat is that the coefficient on ID\_TENURE is marginally insignificant in the case of  $R(t + 180)$  for CEOs.

TABLE 2  
The Profitability of Executives' Trading over the Course of Independent Director Tenure

Table 2 presents the OLS regression results for the effect of independent director tenure on the profitability of trades made by executives. Panel A reports the results for all transactions, whereas Panels B and C report the results for purchases and sales, respectively. The other control variables included in Panels B and C (not tabulated) are the same as those in Panel A. The definitions of all the variables are given in the Appendix. Constants are included in all regressions but are not displayed. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	$R(t+30)$	$R(t+60)$	$R(t+90)$	$R(t+180)$
<i>Panel A. All Transactions</i>				
ID_TENURE	0.081*** (0.027)	0.148*** (0.034)	0.166*** (0.049)	0.354*** (0.091)
INSIDE_DIRECTOR_TENURE	0.007 (0.010)	-0.022 (0.014)	-0.034* (0.020)	-0.076** (0.034)
ID_AGE	-0.097*** (0.028)	-0.112*** (0.033)	-0.114** (0.052)	-0.111 (0.095)
ID_OWNERSHIP	-0.034** (0.016)	-0.063*** (0.022)	-0.096*** (0.033)	-0.125** (0.052)
ID_MULTIDIRECTORSHIP	0.232* (0.121)	0.052 (0.164)	-0.175 (0.244)	-0.106 (0.430)
BOARD_SIZE	0.124*** (0.037)	0.177*** (0.048)	0.174** (0.071)	0.256** (0.120)
BOARD_INDEPENDENCE	-1.518*** (0.583)	-0.642 (0.801)	-0.658 (1.228)	0.105 (2.044)
CEO_CHAIRMAN	0.412*** (0.130)	0.693*** (0.178)	0.583** (0.267)	0.708 (0.448)
CLASSIFIED_BOARD	0.449*** (0.139)	0.378* (0.209)	0.146 (0.319)	-0.394 (0.581)
SIZE	-0.665*** (0.196)	0.862*** (0.210)	3.142*** (0.313)	9.053*** (0.521)
MB_RATIO	-1.411*** (0.082)	-1.192*** (0.069)	-1.573*** (0.147)	-0.742*** (0.215)
R&D_DUMMY	0.308 (0.188)	-0.433* (0.242)	-0.654* (0.375)	-0.252 (0.592)
INSTITUTIONAL_OWNERSHIP	-3.630*** (0.591)	-6.768*** (0.777)	-11.973*** (1.367)	-18.401*** (2.119)
RETURN_VOLATILITY	1.071*** (0.113)	1.139*** (0.115)	1.914*** (0.198)	3.072*** (0.420)
LOSS_DUMMY	0.514** (0.219)	2.056*** (0.265)	2.706*** (0.421)	4.056*** (0.791)
PRIOR_RETURN	-0.212 (0.261)	-0.150 (0.294)	-2.722*** (0.537)	-6.452*** (0.814)
RECENT_TRADE	-0.031 (0.077)	0.094 (0.087)	0.093 (0.164)	0.069 (0.473)
TRANSACTION_SIZE	-0.027 (0.261)	0.115 (0.314)	-0.077 (0.657)	0.187 (1.801)
No. of obs.	264,488	264,488	264,488	264,488
$R^2$	0.109	0.107	0.133	0.181
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel B. Purchases</i>				
ID_TENURE	-0.162 (0.114)	-0.146 (0.123)	-0.302 (0.207)	-0.463 (0.320)
No. of obs.	21,821	21,821	21,821	21,821
$R^2$	0.303	0.346	0.395	0.468
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel C. Sales</i>				
ID_TENURE	0.105*** (0.031)	0.141*** (0.037)	0.169*** (0.053)	0.333*** (0.095)
No. of obs.	242,339	242,339	242,339	242,339
$R^2$	0.108	0.114	0.146	0.250
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

We also conduct a few additional robustness checks, the results of which are tabulated in Table O.1 in the Supplementary Material. Overall, we find that our main findings hold when alternative measures of ID\_TENURE are used and after controlling for CEO tenure, the diversity in ID tenure, and firm age. We also show that our findings are robust to the variation in ID tenure due both to the passing of time (i.e., the same IDs over time) and to the change in ID composition (e.g., ID retirement). Moreover, we find that the relation between ID tenure and ETP does not vary significantly after the introduction of the Sarbanes–Oxley (SOX) Act, over time more generally, or across incorporation locations. For the sake of brevity, we report the details of the robustness checks in Section A of the Supplementary Material.<sup>13</sup>

Finally, we also investigate how the volume and the strength, as well as the dollar profit, of executive trading may be affected by ID tenure using specification (1) at the executive–firm–year level. The results are presented in Table O.2 in the Supplementary Material. We find that neither the volume nor the strength of trading by executives changes significantly with ID tenure (see the first two columns). In the tests in Section IV.A.3 on the nature of executive trading, we find that the share of opportunistic trading increases over the course of IDs' tenure. Hence, it appears that executives do not trade more to avoid attracting attention from regulators or the media but do trade more opportunistically. Nevertheless, taken together with the increase in ETP, this result suggests that executives gain more in terms of total trading profits over the course of ID tenure. We confirm that this is the case in the last column. Specifically, for each trade made by an executive in a firm–year, the corresponding profit is calculated as the product of the trade's annualized abnormal return and the dollar value of the transaction.<sup>14</sup> The profits for each trade are then aggregated to obtain the annual total trading profits for each executive–firm–year if that executive conducts multiple trades in the given firm–year. In the regression of the total profits on ID\_TENURE and the set of control variables, we find that the estimated coefficient on ID\_TENURE is significantly positive. Economically, the estimated coefficient indicates that executives' trading profits increase by \$0.138 million annually for each additional year of ID tenure, which is not trivial relative to their annual salary and bonus. The average annual salary and bonus for the sampled executives are \$0.474 and \$0.162 million, respectively, whereas the median values are even lower.

To summarize, we show that the effect of ID tenure is more robust than that of board independence per se. The positive relation between ID tenure and ETP is contrary to the prediction of the [monitoring hypothesis](#) and is instead consistent with that of the [compromised hypothesis](#), for which more evidence is presented below.

## 2. Extent to Which the Effectiveness of ID Monitoring Changes with Tenure

According to the [compromised hypothesis](#), the positive relation between ID tenure and ETP is driven by IDs who are expected to be more effective monitors when they join the board (but their effectiveness is attenuated over the course of

<sup>13</sup>In results not tabulated for brevity, we also examine whether the relation between ID tenure and ETP is nonlinear by additionally including the square of ID\_TENURE in the baseline regression and find that it is not the case.

<sup>14</sup>For brevity, we use only the 30-day trading window to calculate the annualized abnormal return for a trade.

their tenure). In this section, we examine certain characteristics of IDs that are related to their monitoring effectiveness *ex ante*. First, some IDs have been shown to be less effective monitors from the beginning, for example, those who are busy, co-opted, or initially connected with the CEO prior to their appointment; that is, the effectiveness of the monitoring service provided by these IDs should not vary much with their tenure (e.g., Ferris et al. (2003), Perry and Peyer (2005), Fich and Shivdasani (2007), Hwang and Kim (2009), Fracassi and Tate (2012), Field et al. (2013), and Coles et al. (2014)). We therefore separate IDs into two types based on whether they are co-opted (an ID is considered co-opted if she is elected to the board after the incumbent CEO takes office), initially connected with the CEO prior to joining the board,<sup>15</sup> or busy (an ID is classified as being busy if she holds at least three board directorships simultaneously). For both types, we calculate their respective tenure and replace ID\_TENURE in the baseline regression with the two new tenure variables. The results in Panels A–C of Table 3 show that the positive relation between ID tenure and ETP holds only for the tenure of IDs who are not co-opted or busy. The tenure of noninitially connected IDs has a positive impact on ETP that is more robust and greater in economic magnitude than that of connected IDs. Our finding of declining monitoring effectiveness over the course of the tenure of non-co-opted IDs is consistent with prior results based on the tenure-weighted co-option measure in Coles et al. (2014).

Second, in a similar spirit, we also consider the committee membership of IDs and separate IDs into two types based on whether they sit on a board governance committee. We focus on governance committees because they are more often responsible for issues related to insider trading.<sup>16</sup> IDs with a governance committee membership are thus expected to play a major monitoring role in board governance in regard to insider trading. The *compromised hypothesis* predicts that the positive relation between ID tenure and ETP should be more pronounced for these IDs. As reported in Panel D of Table 3, we find this to be the case. Specifically, the coefficients on the tenure of IDs on the governance committee are all significantly positive, whereas those on the tenure of other IDs are mostly positive but marginally significant in the only case of  $R(t + 60)$ .

Overall, consistent with the *compromised hypothesis*, the quality of oversight by IDs who are expected to be more effective monitors *ex ante* declines with their tenure *ex post*.

### 3. Nature of Trades by Executives over the Course of IDs' Tenure

We have thus far shown that the profitability of executives' trades increases, while their overall trading volume does not change significantly over the course of IDs' tenure, as discussed in Section IV.A.1. Hence, executives must trade more

<sup>15</sup>Following Fracassi and Tate (2012), we use information from BoardEx and consider three types of connections between IDs and the CEO: employment history, education, and social connections such as golf club or charity memberships. An ID is considered connected with the CEO if she has at least one type of connection with the CEO prior to joining the board.

<sup>16</sup>For example, as indicated in the code of business conduct and ethics for Denbury Resources Inc., "Any 10b5-1 trading plan of the CEO or the CFO must be approved by the Nominating/Corporate Governance Committee of Denbury's Board of Directors."



TABLE 3  
The Profitability of Executives' Trading over Independent Director Tenure:  
The Effect of ID Characteristics

Table 3 presents the OLS regression results for the profitability of trades by executives over the course of tenure for two different types of independent directors (IDs). For both types, their tenure is calculated separately and included as the key independent variable. In Panel A, IDs are separated into two categories: co-opted or non-co-opted. An ID is co-opted if she is elected to the board after the incumbent CEO takes office. In Panel B, IDs are separated into two different categories: connected with the CEO or not connected. An ID is defined as "connected" if she had at least one type of connection (through prior employment, education, or social activities) with the CEO prior to joining the board. In Panel C, IDs are separated into two additional categories: busy or not busy. An ID is classified as busy if she holds at least three board directorships simultaneously. In Panel D, IDs are separated into two final groups based on whether they sit on the governance committee of the board. The other control variables included are the same as those in Table 2 but are not tabulated. The definitions of all the variables are given in the Appendix. Constants are included in all regressions but not displayed. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	$R(t+30)$	$R(t+60)$	$R(t+90)$	$R(t+180)$
<i>Panel A. Are the Independent Directors (IDs) Co-Opted?</i>				
CO_OPTED_ID_TENURE	-0.017 (0.022)	-0.030 (0.030)	-0.062 (0.041)	-0.091 (0.071)
NON_CO_OPTED_ID_TENURE	0.012 (0.008)	0.042*** (0.011)	0.059*** (0.016)	0.101*** (0.027)
<i>Panel B. Are the IDs Initially Connected with the CEO?</i>				
CONNECTED_ID_TENURE	0.012 (0.011)	0.035** (0.015)	0.044* (0.024)	0.070* (0.042)
NON_CONNECTED_ID_TENURE	0.059*** (0.020)	0.060** (0.028)	0.096*** (0.037)	0.296*** (0.064)
<i>Panel C. Are the IDs Busy?</i>				
BUSY_ID_TENURE	0.012 (0.011)	0.011 (0.016)	0.004 (0.025)	-0.002 (0.042)
NOT_BUSY_ID_TENURE	0.058*** (0.019)	0.121*** (0.024)	0.143*** (0.036)	0.365*** (0.067)
<i>Panel D. Do the IDs Sit on the Governance Committee?</i>				
GOVERNANCE_COMMITTEE_ID_TENURE	0.065*** (0.014)	0.051** (0.022)	0.080** (0.031)	0.146*** (0.055)
NON_GOVERNANCE_COMMITTEE_ID_TENURE	-0.002 (0.015)	0.036* (0.021)	0.026 (0.032)	0.089 (0.057)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

profitably per average trade. The question of how to do so must be answered. As discussed in Section II, there has been abundant evidence in the literature showing that executives may trade opportunistically during informationally sensitive times, even in violation of predetermined trading restrictions, and that such trading yields greater gains for them. It then follows that over the course of IDs' tenure, executives may be more likely to trade opportunistically and to engage in proportionally more opportunistic trading. Such a change in the nature of the trades made by executives over the course of IDs' tenure is consistent with the *compromised hypothesis*. We thus use specification (1) to examine whether executives are more likely to engage in opportunistic trading as ID tenure increases. We use two separate dependent variables to capture opportunistic trading behavior by executives. The first is an indicator for whether a trade is opportunistic, the definition of which is elaborated below, so that it captures the decision of an executive to engage in opportunistic trading. Hence, the regression is estimated at the level of individual

trades. The second dependent variable, which measures the intensity of such trading, is the proportion of trades that are classified as opportunistic made by an executive in a given year. The regression for the second dependent variable is thus estimated at the executive-year level.

We classify executives' trading opportunism into three common forms identified in the literature. The first form is "opportunistic" trading, classified according to the definition given by Cohen et al. (2012b). Specifically, conditional on an executive making at least one trade in each of the three preceding years, that executive is defined as making a routine trade if she makes the trade in the same calendar month for at least 3 consecutive years. All other trades are defined as opportunistic. The second form of trading opportunism is trading that occurs outside the transparency window, which is defined as the month following an earnings announcement. Trades during that month are believed to contain less information than are trades in other months. Roulstone (2003) defines those firms in which 75% or more of their insider trading was initiated during the transparency window as those that adopted restrictive policies on insider trading. The third form of trading opportunism is defined by Ali and Hirshleifer (2017), who examine trades that occurred during the 21 trading days before a quarterly earnings announcement (excluding the 2 days immediately before). Such pre-QEA trades are deemed to be informationally very sensitive and are thus restricted or even prohibited in most firms. The pre-QEA period is, hence, commonly classified as a "blackout" period. We note that firms vary in their classifications of trading windows and blackout periods, as shown in Bettis et al. (2000). Without knowledge of any given firm's specific policy, the above definitions provide approximations of opportunistic trading and thus may suffer from measurement error. Hence, our results in this section should be interpreted with caution.

The results reported in Table 4 confirm that executives are more likely to trade opportunistically and to make proportionally more opportunistic trades over the course of IDs' tenure. The coefficients on ID\_TENURE are positive and significant for both the likelihood of making opportunistic trades (odd columns) and the share of (even columns) opportunistic trades in all three forms. While executives' overall trading volume does not change significantly over the course of IDs' tenure, as discussed in Section IV.A.1, the results here suggest that the share of opportunistic trades increases. Note that the second form of opportunism (trading outside the transparency window) encompasses the third form (pre-QEA trading) and covers a potentially sensitive time defined more broadly, as reflected in the relative coefficients on ID\_TENURE between these two cases. The coefficients are more significant both economically and statistically among trades of the second form, consistent with the lower occurrence of pre-QEA trading in general. Nevertheless, the coefficients on ID\_TENURE in the case of pre-QEA trading are also significant, indicating that as ID tenure increases, executives are more likely to trade and that they trade proportionally more during the very sensitive pre-QEA period. Quantitatively, each additional year of ID\_TENURE is associated with an increase in the likelihood of pre-QEA trading by 0.16% and an even greater increase in the share of opportunistic

TABLE 4  
The Nature of Executives' Trading over the Course of Independent Director Tenure

Table 4 reports the OLS regression results for the change in the nature of executives' trading over the course of independent director tenure. Three forms of executive trading opportunism are examined in the three columns of the table: "opportunistic" trading, trading conducted outside the transparency window, which is defined as the month following an earnings announcement, and trading during the 21 trading days before a Quarterly Earnings Announcement (excluding the 2 days immediately before), following Ali and Hirshleifer (2017). We follow Cohen et al. (2012b) in our identification of "opportunistic" trading. Specifically, conditional on an executive making at least one trade in each of the three preceding years, the executive is defined as making a routine trade if she makes her trade in the same calendar month for at least 3 consecutive years. All other trades are defined as opportunistic. In each of the columns, there are two dependent variables: INDICATOR is a dummy variable that equals 1 if a trade by an executive is classified as opportunistic, and 0 otherwise, and PROPORTION is the proportion of trades made by the executive in a year that are classified as opportunistic. Both dependent variables are multiplied by 100, and thus they are expressed as percentages. In the case of INDICATOR, the regressions are run at the individual trade level, whereas in the case of PROPORTION, the regressions are run at the executive-year level. The definitions of all the variables are given in the Appendix. Constants are included in all regressions but not displayed. Standard errors are given in parentheses and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	Opportunistic Trading		Trading Outside the Transparency Window		Pre-QEA Trading	
	Indicator	Proportion	Indicator	Proportion	Indicator	Proportion
	1		2		3	
ID_TENURE	0.369** (0.149)	0.405*** (0.092)	0.293*** (0.090)	0.362*** (0.086)	0.156*** (0.052)	0.145*** (0.046)
INSIDE_DIRECTOR_TENURE	0.341*** (0.065)	0.408*** (0.037)	0.100*** (0.035)	0.112*** (0.032)	0.002 (0.021)	0.011 (0.017)
ID_AGE	-0.009 (0.147)	0.069 (0.083)	-0.203*** (0.079)	-0.215*** (0.076)	-0.087* (0.050)	-0.040 (0.041)
ID_OWNERSHIP	-0.025 (0.096)	0.017 (0.057)	0.010 (0.054)	0.029 (0.052)	0.074** (0.031)	0.076*** (0.027)
ID_MULTIDIRECTORSHIP	-0.644 (0.742)	-1.799*** (0.429)	0.317 (0.399)	0.273 (0.394)	-0.456* (0.237)	-0.449** (0.216)
BOARD_SIZE	0.393* (0.216)	0.067 (0.125)	0.171 (0.120)	0.169 (0.117)	0.408*** (0.072)	0.327*** (0.065)
BOARD_INDEPENDENCE	-7.297** (3.541)	-6.921*** (1.929)	0.655 (1.851)	-1.508 (1.779)	0.241 (1.115)	-0.475 (0.985)
CEO_CHAIRMAN	2.595*** (0.735)	1.963*** (0.455)	-0.265 (0.412)	0.342 (0.404)	0.265 (0.247)	0.426* (0.219)
CLASSIFIED_BOARD	0.132 (1.383)	1.071 (0.720)	-0.910 (0.697)	-1.062* (0.645)	-0.435 (0.417)	-0.274 (0.327)
SIZE	2.738*** (0.765)	3.839*** (0.417)	-0.395 (0.393)	0.376 (0.377)	-0.996*** (0.226)	-0.289 (0.209)
MB_RATIO	0.218 (0.241)	0.371** (0.176)	-0.531*** (0.134)	-0.718*** (0.140)	-0.246*** (0.071)	-0.359*** (0.070)
R&D_DUMMY	-1.248 (0.800)	-0.984 (1.580)	3.870*** (0.687)	-2.990* (1.528)	-1.553*** (0.397)	-1.161 (0.830)
INSTITUTIONAL_OWNERSHIP	-3.707 (2.285)	-1.315 (1.665)	0.472 (1.527)	-1.531 (1.500)	-1.935** (0.930)	-0.946 (0.774)
RETURN_VOLATILITY	0.209 (0.246)	14.209 (21.994)	-1.811*** (0.176)	-68.515*** (20.809)	-1.402*** (0.115)	-73.711*** (10.775)
LOSS_DUMMY	0.460 (0.984)	-0.414 (0.632)	-0.601 (0.500)	-0.706 (0.598)	-0.351 (0.315)	-0.232 (0.332)
PRIOR_RETURN	-0.360 (0.621)	-3.165*** (0.577)	-3.192*** (0.504)	-1.715*** (0.552)	-1.134*** (0.301)	-0.395 (0.284)
RECENT_TRADE	0.339* (0.200)	0.404 (0.363)	-1.903*** (0.240)	1.250*** (0.312)	-1.003*** (0.168)	0.415 (0.303)
TRANSACTION_SIZE	3.869** (1.730)		-0.614 (0.658)		0.694 (0.481)	
No. of obs.	264,592	100,753	260,132	100,351	264,592	100,351
R <sup>2</sup>	0.147	0.111	0.115	0.146	0.099	0.131
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

trades.<sup>17</sup> The unconditional probability and share of pre-QEA trading are 7.61% and 7.40%, respectively.<sup>18</sup>

#### 4. Disciplinary Factors That Mitigate Executive Opportunism

Are there any disciplinary factors that help mitigate executives' opportunism when the effectiveness of board monitoring declines with ID tenure? We examine whether the presence of a firm ITP, blockholders in the shareholder base, and an ID with legal expertise, as well as the risk of shareholder-initiated derivative lawsuits, can play such a role. The results for the key variables of interest are presented in Table 5. Other control variables are also included, as in Table 2, but their estimated coefficients are not tabulated for purposes of brevity.

First, we examine the impact of the presence of a firm ITP. As discussed in Section II, we find that 594 sample firms specifically stated that they had adopted an ITP. Even though the details of the policies are not always publicly available, the presence of an ITP should leave executives with less discretion in terms of their trading decisions. As a result, we expect the positive relation between ID tenure and ETP to be mitigated in firms with ITPs.<sup>19</sup> We create an indicator, ITP, that identifies firms that have adopted ITP. We then interact ID\_TENURE with ITP in the baseline regression to capture the impact of ITPs on the relation between ID tenure and ETP relation.

In Panel A of Table 5, we find that while the coefficients on ID\_TENURE remain significantly positive, those on its interaction with ITP are significantly negative, except in the cases of  $R(t + 90)$  and  $R(t + 180)$ . Thus, the effect of ID tenure on ETP in the shorter horizons is attenuated in firms that adopt ITPs. In terms of economic magnitude, the presence of ITP reduces the impact of ID tenure by at least 40%. There has been controversy regarding whether ITPs are a public relations contrivance or an effective institutional arrangement through which to reduce informed trading (see Bettis et al. (2000)). Our findings are consistent with the disciplinary role of ITPs and suggest that the internal governance of insider trading can be enhanced by ITP adoption.

Second, we study the impact of shareholder governance. The literature has long argued that blockholders who account for more than 5% of share ownership in a firm are effective monitors through their "voice" and/or "exit." Additionally, given their large stakes, they have sufficient incentives to discipline executive opportunism and foster a fair informational environment in the firm. We expect executive opportunism to be less bold under the strong monitoring of large blockholders. For this reason, we augment the baseline regression by interacting ID\_TENURE with #BLOCKHOLDERS, the number of blockholders who own

<sup>17</sup>For ease of coefficient interpretation, both dependent variables for all three forms of opportunistic trading are multiplied by 100 and are thus given as percentages.

<sup>18</sup>In comparison, the unconditional probability of trading outside the transparency window and the share of such trades are 34.23% and 33.79%, respectively.

<sup>19</sup>Note that as discussed earlier, it is not possible to identify the exact date of ITP adoption for a given firm. This fact also makes it impossible for us to relate ITP adoption to ID tenure. Therefore, if a sample firm is identified as having adopted ITP, then we assume that the ITP is in place within the firm (and that its terms are stable) throughout the sample period. Thus, the results of the analysis involving ITP should be interpreted with caution.

TABLE 5  
Disciplinary Factors That Mitigate Executives' Opportunism in  
Trading over the Course of ID Tenure

Table 5 presents the OLS results from regressing the profitability of executives' trading on independent director (ID) tenure and its respective interactions with potential disciplinary factors. ITPS is an indicator for firms that have adopted insider trading policies. #BLOCKHOLDERS is the number of blockholders owning more than 5% of the firm. LEGAL\_ID is a dummy variable that equals 1 if there is at least one ID with legal expertise on the board in a given firm-year, and 0 otherwise. An ID is considered to have legal expertise if she has been a lawyer or an attorney or has held a position in a law enforcement department or supervisory institution. UD is a dummy that equals 1 if the state in which the firm is incorporated has Universal Demand law in force during a given year, and 0 otherwise. Other control variables are also included as in Table 2 but are not tabulated. The definitions of all the variables are given in the Appendix. Constants are included in all regressions but not displayed. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	$R(t+30)$	$R(t+60)$	$R(t+90)$	$R(t+180)$
<i>Panel A. Insider Trading Policies</i>				
ID_TENURE	0.125*** (0.034)	0.212*** (0.042)	0.234*** (0.059)	0.394*** (0.103)
ID_TENURE × ITPS	-0.075** (0.036)	-0.086* (0.051)	-0.082 (0.072)	0.048 (0.134)
<i>Panel B. Number of Blockholders Owning More Than 5% of the Firm</i>				
ID_TENURE	0.184*** (0.032)	0.285*** (0.043)	0.400*** (0.068)	0.684*** (0.125)
ID_TENURE × #BLOCKHOLDERS	-0.037*** (0.009)	-0.041*** (0.013)	-0.082*** (0.020)	-0.112*** (0.035)
#BLOCKHOLDERS	0.297*** (0.089)	0.272** (0.128)	0.750*** (0.197)	1.107*** (0.335)
<i>Panel C. ID with Legal Background</i>				
ID_TENURE	0.090*** (0.027)	0.165*** (0.035)	0.191*** (0.051)	0.434*** (0.094)
ID_TENURE × LEGAL_ID	-0.047 (0.050)	-0.092 (0.062)	-0.138* (0.079)	-0.426*** (0.145)
LEGAL_ID	0.353 (0.451)	0.631 (0.578)	1.312* (0.775)	2.945** (1.464)
<i>Panel D. Universal Demand Laws</i>				
ID_TENURE	0.070** (0.029)	0.133*** (0.037)	0.136*** (0.052)	0.374*** (0.096)
ID_TENURE × UD	0.093** (0.046)	0.133** (0.061)	0.243*** (0.083)	-0.085 (0.147)
UD	0.613 (0.805)	2.530* (1.346)	2.765 (1.781)	9.109*** (3.184)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

more than 5% of the firm. As reported in Panel B of Table 5, the positive relation between ID tenure and ETP is significantly weakened in firms with blockholders. The coefficients on the interaction term are significantly negative across the four horizons. Economically, the presence of each additional blockholder reduces the impact of ID tenure on EPT by 14%–20% depending on the holding horizon. Moreover, compared with the baseline results in Table 2, the significantly positive coefficients on ID\_TENURE with their greater economic magnitude suggest that the effect of ID tenure is substantially greater in firms without any blockholders.

Third, we also investigate whether certain boards may be more vigilant (or less tolerant) of the potential legal risk associated with suspicious trading by insiders.

We expect this situation to be more likely if there are IDs with legal expertise on the board. On the other hand, the presence of IDs with legal expertise is also a deterring factor for executive opportunism. As a result, the effect of ID tenure on ETP may be moderated by the presence of an ID with legal expertise. Based on the primary employment information provided by ISS, an ID is considered to have legal expertise if she has been a lawyer or an attorney or has held a position in a law enforcement department or a supervisory institution. A dummy, `LEGAL_ID`, is created that equals 1 if there is at least one ID with legal expertise on the board in the firm-year, and 0 otherwise. We then augment the baseline regression by interacting `ID_TENURE` with `LEGAL_ID`. Panel C of [Table 5](#) reports that the coefficients on `ID_TENURE` continue to be significantly positive; more importantly, those on the interaction term are negative across the holding horizons and significant in the cases of  $R(t + 90)$  and  $R(t + 180)$ . Moreover, the coefficients on the interaction term for the two longer holding horizons have slightly smaller absolute magnitudes than do those on `ID_TENURE`. This finding suggests that the effect of ID tenure on ETP becomes significantly weaker and almost vanishes if IDs with legal expertise are present on the board, consistent with the disciplinary role of these IDs in deterring executive opportunism. In results not tabulated, we find that the attenuating effect of `LEGAL_ID` is stronger both economically and statistically for sales by executives, for which the associated legal risk is more prominent.

Finally, a large body of literature shows how directors and executives are held accountable following litigation that accuses them of a breach of their fiduciary duties. Such litigation has both economic and reputational costs. Economically, firms may incur expenses in derivative lawsuits that are not reimbursable by firms according to state laws or are not covered by directors' and officers' liability (D&O) insurance.<sup>20</sup> Moreover, these lawsuits can lead to the loss of one's position in the company and can have further reputational consequences in the labor market (e.g., Agrawal, Jaffe, and Karpoff (1999), Ferris, Jandik, Lawless, and Makhija (2007), Karpoff, Lee, and Martin (2008), and Brochet and Srinivasan (2014)). However, the literature has shown that universal demand (UD) laws make it significantly more difficult for shareholders to bring derivative lawsuits against directors and executives (e.g., Davis Jr (2008), Appel (2019)). Hence, while the impact of UD laws on the incentives for ID monitoring is independent of ID tenure, the monitoring incentives of long-tenured IDs are likely to be further weakened when such IDs face a lower threat of lawsuits for breach of their fiduciary duty in the governance of insider trading under our [compromised hypothesis](#). We thus expect trading opportunism among executives to become more severe in the presence of long-tenured IDs. Thus, the positive relation between ID tenure and ETP should be more prominent for firms incorporated in states that have adopted UD laws.

To test this assertion, for each sample firm-year, we create an indicator variable, `UD`, for firms incorporated in one of the 23 states that adopted UD laws

<sup>20</sup>D&O insurance is a way to insulate IDs from legal risk. See Bhagat, Brickley, and Coles (1987) and Holderness (1990) for the related argument that suggests that D&O insurance can be beneficial to shareholder value. We do not examine D&O insurance here because unlike the UD laws discussed below, the adoption of D&O insurance is endogenous to firm decision-making.

during the year.<sup>21</sup> We then interact ID\_TENURE with UD in the baseline regression and expect a positive coefficient on the interaction term. The results, reported in Panel D of Table 5, confirm our argument. The coefficients on ID\_TENURE remain positive and significant, consistent with a robust impact of ID tenure on ETP, even in states without UD laws. Importantly, the coefficients on the interaction term, ID\_TENURE  $\times$  UD, are positive and significant for all holding horizons, except  $R(t + 180)$ , with magnitudes even larger than those of the coefficients on ID\_TENURE. This finding suggests that the effect of ID tenure on ETP is at least twice as large in states with UD laws compared with states without such laws. We also note that the coefficients on UD are positive and significant for two of the holding horizons, which is consistent with the finding of Adhikari et al. (2019) that the adoption of UD laws increases ETP.<sup>22</sup> All the other control variables included in the baseline regressions reported in Table 2 are also included but are not tabulated for brevity. Our findings highlight the importance of the internal governance of insider trading, especially when governance via shareholder litigation is weak.

Overall, consistent with the **compromised hypothesis**, the results indicate the importance of other governance mechanisms for containing opportunism in executive trading when the effectiveness of board monitoring is compromised by the long tenure of IDs.

## B. Channels Through Which the Effectiveness of ID Monitoring Is Moderated over the Course of IDs' Tenure

We have thus far established that the evidence supports the **compromised hypothesis**. The remaining question is how the independence of IDs becomes compromised, which, in turn, affects executive trading. As discussed above, there are two potential channels: connection and retention. In this section, we provide direct evidence of increased connections between CEOs and IDs over the course of IDs' tenure, thereby supporting the connection channel. We find less robust evidence for the retention channel.

### 1. Direct Evidence of Increased Connections Between CEOs and IDs over the Course of IDs' Tenure

Intuitively, the higher likelihood of IDs and the CEO forming connections during the overlap in their tenures is indicative of the influence of the connection channel. Here, we check whether this is the case. IDs who were previously connected with the CEO through education or prior employment, as suggested in the social connections literature, are excluded from this analysis because connections

<sup>21</sup>We obtain the state of incorporation for each firm using the data shared by Bill McDonald (<https://sraf.nd.edu/data/augmented-10-x-header-data/>). For firms that are missing from McDonald's data set, we resort to Compustat for the relevant information.

<sup>22</sup>This is likely to be the case if UD laws make it more difficult for shareholder derivative lawsuits to directly target opportunistic trading by executives (see also Jung, Nam, and Shu (2018)). However, note that with the inclusion of firm fixed effects in the regression, the coefficients on UD capture the effect of UD laws only for those firms in the several states that adopted UD laws after 1998, when our sample period starts. Most of the 23 states adopted UD laws before 1998, and thus the effect of UD is absorbed by firm fixed effects. Specifically, the 23 states that adopted UD laws did so in 1989–1993, 1995–1998, 2001, and 2003–2005.

of these kinds do not change over time (e.g., an ID connected with the CEO by graduating from the same school remains connected with the CEO throughout her tenure on the board). That is, we focus on connections between IDs and the CEO that can be newly built during the overlap in their tenures. Following the literature, social connections established through activities such as leisure clubs or charity memberships qualify for our analysis. We collect information on these activities for both the CEO and IDs from BoardEx.<sup>23</sup>

Using a logit model, we examine the association between the likelihood of a connection between the CEO and IDs and overlap in their tenures. The dependent variable is an indicator of connections between the CEO and IDs for the scenario in which either the CEO or an ID of the firm joins a leisure club or charity institution of which the other is also a member during a given year. To address the issue that the occurrence of such social connections is relatively rare, we employ penalized maximum likelihood estimation.<sup>24</sup> The results are reported in Table 6, with the odd columns presenting the estimated coefficients and the even columns presenting the corresponding odds ratios. In columns 1 and 2, we include a dummy variable, AFTER, which equals 1 for the period during which the tenure of an ID overlaps with that of the CEO and 0 for all other periods. The estimated coefficient on this dummy is significantly positive, which suggests that the likelihood of a connection between the CEO and IDs increases significantly once their tenures overlap. To further see how such a connection develops over time during their overlapping tenures, we break the overlap into four periods and create the following indicator variables (labels in parentheses): the first year (OVERLAPPING\_TENURE\_(0,1)), second and third years (OVERLAPPING\_TENURE\_[2,3]), fourth and fifth years (OVERLAPPING\_TENURE\_[4,5]), and sixth year onward (OVERLAPPING\_TENURE\_[6,AFTER]). The benchmark is thus the years before their tenures overlap. The results in columns 3 and 4 show that the likelihood of a connection forming between the CEO and IDs starts to increase in the first year of their overlapping tenures and further increases throughout such overlap. The estimated coefficients on all four period indicators are positive and significant, with both their economic magnitude and statistical significance increasing over time. The above results hold after accounting for various ID, firm, and board characteristics. In sum, we confirm that IDs are more likely to become socially connected with the CEO during the period of overlap in their tenures, which provides strong support for the connection channel.

## 2. Tests of the Retention Channel

We test the retention channel by linking ID turnover with past ETP. Specifically, given that ID turnover is relatively rare, we use two measures: the percentage

<sup>23</sup>Note that for many observations, information on these activities is missing in BoardEx. To obtain a valid time-varying measure of social connections, we use only information on the activities that is available in the data.

<sup>24</sup>Penalized likelihood (Firth (1993)) is a general approach that reduces the small-sample bias in maximum likelihood estimation. In the case of a logistic regression, penalized likelihood also has the advantage of producing finite and consistent estimates of the regression parameters when the maximum likelihood estimates do not even exist because of complete or quasi-complete separation. Nevertheless, our results continue to hold if we use simple logit regressions.



TABLE 6  
The Likelihood of a CEO–ID Connection During the Overlap in Their Tenures

Table 6 investigates how the likelihood of an independent director (ID) getting socially connected with the CEO varies over her tenure that overlaps with the CEO's, using a Logit model. The dependent variable is a dummy that equals 1 if the ID and the CEO are connected through social activities such as leisure club or charity memberships. Penalized maximum likelihood estimation is used. AFTER is an indicator for the period after the tenure of the ID begins to overlap with that of the CEO. The period of overlap in the tenure of the ID and the CEO is also segmented into four periods, and for each period, an indicator variable is created (labels are given in parentheses): the first year (OVERLAPPING\_TENURE\_{0,1}), the second and third years (OVERLAPPING\_TENURE\_{2,3}), the fourth and fifth years (OVERLAPPING\_TENURE\_{4,5}), and the sixth year onward (OVERLAPPING\_TENURE\_{6,AFTER}). The estimated coefficients are presented in the odd columns with the corresponding odds ratios reported in the even columns. Three types of diversity are measured by the Blau index, which is calculated as  $1 - \sum_{i=1}^S p_i^2$ . For gender diversity,  $p_i$  represents the percentage of female and male directors. For age diversity,  $p_i$  is the percentage of directors belonging to a birth cohort in the 1920s, 1930s, 1940s, 1950s, and 1960s. For ethnic diversity,  $p_i$  indicates the percentage of directors who are Caucasian, Indian, Asian, Hispanic, Black/African-American, or another ethnicity. The definitions of the other variables are given in the Appendix. Constants are included in all regressions but not displayed. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	Coefficient	Odds Ratio	Coefficient	Odds Ratio
AFTER	0.319*** (0.064)	1.376*** (0.088)		
OVERLAPPING_TENURE_{0,1}			0.239** (0.120)	1.269** (0.153)
OVERLAPPING_TENURE_{2,3}			0.307*** (0.090)	1.359*** (0.123)
OVERLAPPING_TENURE_{4,5}			0.317*** (0.094)	1.373*** (0.129)
OVERLAPPING_TENURE_{6,AFTER}			0.355*** (0.074)	1.427*** (0.106)
ID_GENDER	-0.055 (0.070)	0.946 (0.066)	-0.054 (0.070)	0.947 (0.066)
ID_NATIONALITY	0.167*** (0.054)	1.182*** (0.063)	0.163*** (0.054)	1.177*** (0.063)
GENDER_DIVERSITY	-0.798*** (0.204)	0.450*** (0.092)	-0.795*** (0.204)	0.452*** (0.092)
AGE_DIVERSITY	0.285 (0.225)	1.330 (0.299)	0.287 (0.225)	1.332 (0.299)
ETHNIC_DIVERSITY	0.148 (0.147)	1.160 (0.170)	0.148 (0.147)	1.160 (0.170)
ID_AGE	-0.015*** (0.003)	0.985*** (0.003)	-0.016*** (0.003)	0.984*** (0.003)
ID_OWNERSHIP	-0.001 (0.006)	0.999 (0.006)	-0.001 (0.006)	0.999 (0.006)
ID_MULTIDIRECTORSHIP	-0.086* (0.047)	0.918* (0.043)	-0.084* (0.047)	0.919* (0.043)
BOARD_SIZE	-0.013 (0.011)	0.987 (0.010)	-0.013 (0.011)	0.987 (0.010)
BOARD_INDEPENDENCE	0.185 (0.206)	1.203 (0.248)	0.190 (0.207)	1.210 (0.250)
CEO_CHAIRMAN	0.194*** (0.055)	1.214*** (0.066)	0.191*** (0.055)	1.211*** (0.066)
CLASSIFIED_BOARD	0.280*** (0.053)	1.323*** (0.070)	0.280*** (0.053)	1.323*** (0.070)
SIZE	0.126*** (0.022)	1.135*** (0.025)	0.126*** (0.022)	1.135*** (0.025)
MB_RATIO	-0.238*** (0.031)	0.788*** (0.024)	-0.239*** (0.031)	0.787*** (0.024)
Year FE	Yes	Yes	Yes	Yes
No. of obs.	210,128	210,128	210,128	210,128

of IDs who depart in a year and a dummy that equals 1 if at least one ID departs in a year and 0 otherwise. We can then regress ID turnover on past ETP, but the underlying relation may not be linear in the sense that ETP has to be somewhat high for the retention effect to occur. Indeed, we do not find that the relation between

past ETP and ID turnover is linearly significant (results not tabulated for brevity). To better capture the retention incentive associated with sufficiently high ETP, we create a dummy for each firm-year that equals 1 if ETP in the firm-year is in the top quartile of the sample for that year, and 0 otherwise. Firm-level ETP in a given year is the weighted sum of the trading profitability for each individual trade by its executives, with the weights being the size of each individual transaction occurring in that year. Then, assuming that ID turnover occurs in year 0, for each ETP measurement window, we first define three dummies as above for each of the past 3 years; taking  $R(t + 180)$  as an example, L1HIGH180, L2HIGH180, and L3HIGH180 are the dummies for years  $-1$  to  $-3$ , respectively. We also construct a fourth dummy, L1\_3HIGH180, which equals 1 if any of the above three dummies equals 1, and is 0 otherwise.

We then regress ID turnover on each of the four dummies. The retention channel predicts that we should observe a significantly negative relation. However, we do not find this to be the case. As reported in Table O.3 in the Supplementary Material, we find a negative relation that is only marginally significant in very few sporadic cases; such a relationship is not persistent across ETP measurement windows and hence is not robust. To conclude, the evidence does not seem to provide strong support for the retention channel.

### C. Profitability of Trades by the IDs Themselves over the Course of Their Tenure

Finally, we complement our main analyses of the relation between ID tenure and ETP by examining the profitability of trades by the IDs themselves over the course of their tenure. Table 7 presents the results for the effect of ID tenure on IDs' trading profitability, obtained from regressions using specification (1). What is different here is that we regress the profitability of each ID's trading on her own tenure at the director-firm-year level (instead of taking the mean of all ID tenures to obtain an aggregate measure at the firm-year level when we examine the effect of ID tenure on executive trading). Here, we are also able to control for more of IDs' individual characteristics, such as ID\_GENDER, ID\_MEETING\_ATTENDANCE, and ID\_COMMITTEE\_MEMBERSHIP. The last two are included to capture the involvement of each individual ID in firm decision-making by tracking their attendance at board meetings and their participation in board committees. Note that other ID characteristics, such as ID\_AGE, ID\_OWNERSHIP, and ID\_MULTIDIRECTORSHIP, are also measured at the individual level here.

In Panel A of Table 7, in contrast to the case for executives' trading, we find that the profitability of overall ID trading declines with IDs' tenure, as shown by the significantly negative coefficients on ID\_TENURE. However, as reported in Panels B and C, the results appear different when ID trading is examined separately for purchases and sales, respectively. The profitability of neither ID purchases nor ID sales is robustly related to the IDs' own tenure. For sales, the coefficients on ID\_TENURE are consistently negative across all holding horizons, and none is significant. For purchases, the coefficients on ID\_TENURE exhibit different signs

TABLE 7  
The Profitability of ID Trading over the Course of Their Own Tenure

Table 7 presents the OLS regression results for the profitability of independent director trading over the course of their own tenure. The profitability of each independent director's (ID) trading is regressed on her own tenure. Variables for ID characteristics are all measured at the individual-firm-year level. Panel A reports the results for all transactions combined. Panels B and C present the separate results for purchases and sales by IDs, respectively. The control variables included in Panels B and C are the same as in Panel A but are not tabulated. The definitions of all the variables are given in the Appendix. Constants are included in all regressions but not displayed. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	$R(t+30)$	$R(t+60)$	$R(t+90)$	$R(t+180)$
<i>Panel A. All Transactions</i>				
ID_TENURE	-0.025** (0.010)	-0.040*** (0.014)	-0.047*** (0.018)	-0.061** (0.029)
ID_GENDER	-0.301* (0.162)	-0.470* (0.246)	-0.630** (0.307)	-0.876* (0.467)
ID_MEETING_ATTENDANCE	-1.359 (0.898)	-1.892 (1.157)	-1.734 (1.236)	-1.273 (2.047)
ID_COMMITTEE_MEMBERSHIP	-0.034 (0.060)	-0.103 (0.092)	-0.046 (0.118)	-0.050 (0.192)
ID_AGE	-0.020** (0.010)	-0.023 (0.014)	-0.021 (0.018)	-0.029 (0.027)
ID_OWNERSHIP	-0.010 (0.046)	-0.121 (0.081)	-0.197** (0.085)	-0.404*** (0.141)
ID_MULTIDIRECTORSHIP	-0.070 (0.075)	-0.188* (0.098)	-0.155 (0.116)	-0.382** (0.188)
BOARD_SIZE	0.023 (0.051)	0.133* (0.079)	0.239** (0.100)	0.256 (0.168)
BOARD_INDEPENDENCE	0.907 (1.014)	1.849 (1.511)	2.538 (2.053)	1.984 (3.192)
CEO_CHAIRMAN	0.125 (0.220)	0.229 (0.313)	0.577 (0.404)	0.981 (0.643)
CLASSIFIED_BOARD	-0.214 (0.261)	-0.384 (0.368)	-0.570 (0.467)	-1.386* (0.794)
SIZE	-0.125 (0.246)	0.394 (0.366)	0.225 (0.498)	2.051** (0.938)
MB_RATIO	-0.921*** (0.100)	-0.927*** (0.136)	-0.723*** (0.209)	0.216 (0.343)
R&D_DUMMY	0.492 (0.380)	-0.774 (0.537)	-0.344 (0.683)	0.335 (1.054)
INSTITUTIONAL_OWNERSHIP	-4.753*** (1.135)	-7.081*** (1.550)	-9.264*** (2.222)	-15.730*** (3.309)
RETURN_VOLATILITY	1.691*** (0.198)	2.225*** (0.259)	2.624*** (0.302)	3.900*** (0.434)
LOSS_DUMMY	-0.693** (0.351)	-1.193** (0.508)	-1.127* (0.678)	0.726 (1.063)
PRIOR_RETURN	-1.634*** (0.447)	-3.865*** (0.643)	-4.998*** (0.778)	-11.143*** (1.556)
RECENT_TRADE	0.042 (0.140)	-0.049 (0.224)	-0.099 (0.314)	-0.194 (0.461)
TRANSACTION_SIZE	-0.042 (0.138)	0.254 (0.255)	0.295 (0.360)	0.360 (0.384)
No. of obs.	66,007	66,007	66,007	66,007
$R^2$	0.138	0.159	0.173	0.217
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel B. Purchases</i>				
ID_TENURE	0.048** (0.024)	-0.009 (0.034)	0.012 (0.043)	0.053 (0.062)
No. of obs.	21,202	21,202	21,202	21,202
$R^2$	0.261	0.301	0.353	0.454
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel C. Sales</i>				
ID_TENURE	-0.014 (0.011)	-0.004 (0.016)	-0.032 (0.021)	-0.019 (0.035)
No. of obs.	44,406	44,406	44,406	44,406
$R^2$	0.153	0.174	0.189	0.237
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

across holding horizons and are insignificant, except in the case of  $R(t + 30)$ , for which the coefficient is positive and significant.<sup>25</sup>

Why does overall ID trading appear to become less profitable over the course of IDs' tenure, but the profitability of their respective purchases and sales does not significantly change in either case? To reconcile these seemingly conflicting results, we conduct a few more checks to examine how IDs trade over the course of their tenure. The results are presented in Table O.4 in the Supplementary Material. First, in Panel A, we find that the number and total size of purchases (columns 1 and 3, respectively) made by IDs both decrease, whereas the number and total size of sales (columns 2 and 4, respectively) increase with their tenure. Therefore, they tend to become net sellers, which seems reasonable given their accumulation of share ownership over the course of their tenure. Despite their net selling, their share of ownership in the firm increases with their tenure, as reported in the last column. That is, their net sales are smaller in magnitude than their share ownership accumulated through compensation packages. Second, in Panel B of Table O.4 in the Supplementary Material, we repeat the regressions reported in Panel A of Table 7 with the addition of an indicator variable, PURCHASE, for purchase transactions. Consistent with the literature, ID purchases are found to be generally more profitable than ID sales, as indicated by the significantly positive coefficients on PURCHASE. Notably, the effect of ID\_TENURE becomes insignificant after including PURCHASE, as suggested by the positive but insignificant coefficients on ID\_TENURE for all four holding horizons.

Hence, taken together, the results in each panel help reconcile the findings in Panels B and C of Table 7 with those in Panel A. While neither the profitability of purchases nor that of sales made by IDs changes, the less profitable sales become more dominant over the course of their tenure, resulting in a decline in the profitability of their overall trading. That is, it is the direction of IDs' trading, not profitability, that changes over the course of IDs' tenure. While IDs may become more informed over the course of their tenure, reputational concerns and/or regulatory pressure as regulators may pay special attention to long-tenured IDs may make them more conservative in their own trading, which results in the lack of change in the profitability of their trades.

#### D. Endogeneity of ID Tenure

Currently, there are no regulations on term limits for IDs in U.S. firms. The endogeneity of ID tenure can potentially bias our estimates in three ways. First, one may be concerned that IDs, whose independence may be compromised after forming connections with the CEO during the overlap in their tenures, are more likely to be renominated and, as a result, have longer tenure. We conduct a robustness check on a subsample of short-tenured executives (including CEOs), whose tenure falls in the bottom quartile of those of all executives in the sample (i.e., 3 years or shorter). In results that are not tabulated for brevity, we find that the positive relation between ID tenure and ETP continues to hold for this subsample, which demonstrates the

<sup>25</sup>We also examine whether the effect of ID\_TENURE on the profitability of IDs' own trades is nonlinear by including the square of ID\_TENURE in the regressions. The results, not tabulated for brevity, show no robust evidence of such a nonlinear relation.

robustness of the impact of ID tenure, even among those IDs whose tenure has less of an overlap with short-tenured executives, alleviating the concern of reverse causality.

Second, it is possible that firms perform better due to more valuable advising from longer-serving IDs so that executives gain from this advising in their trading. However, if we partition the sample into two groups, well-performing and poorly performing firms, and then repeat the analysis for each group, our findings continue to hold in each group (the results are not tabulated for brevity). Moreover, this argument is inconsistent with that of Huang and Hilary (2018), who show that the relation between outside director tenure and firm performance is nonlinear. Furthermore, this argument cannot be reconciled with our findings on the cross-sectional variation in the relation between ID tenure and ETP, which depends on whether the IDs are effective monitors *ex ante* (Section IV.A.2) or whether other disciplinary mechanisms are in place (Section IV.A.4). That is, the performance-induced trading gains should not, as we find, be affected by those factors underlying the cross-sectional variation in the relation between ID tenure and ETP.

Third, another potential issue is that both ID tenure and ETP may be driven by some time-varying unobservable factor. Note that our estimation with firm fixed effects should have purged the potential impact of any time-invariant factors, such as firm culture, which determines ID monitoring (or the lack thereof). As discussed in the Introduction, one candidate for such a time-varying factor may be the firm's information environment. However, as shown in the results tabulated in Panels A and B of Table O.5 in the Supplementary Material, our findings hold in subsamples of both complex and simple firms as well as in those of both firms with high analyst coverage and those with low coverage, respectively. Moreover, as discussed in Section IV.A.4, we exploit the staggered adoption of UD laws among U.S. states as an exogenous shock to the risk of shareholder-initiated derivative lawsuits against directors and executives, which we show as affecting the monitoring incentives of IDs. Nevertheless, to demonstrate the robustness of our main finding, we exploit an additional quasi-natural experiment for identification, on which we next focus. We also supplement these analyses with a falsification test that focuses on affiliated outside directors, which is relegated to Section B of the Supplementary Material for brevity.

We examine how the sudden death of an ID, which results in an unexpected change in ID\_TENURE, may affect the relation between ID tenure and ETP. We follow the procedure in Nguyen and Nielsen (2010) to manually search for events of ID death. We find 370 cases of ID death within our sample, of which 105 are excluded, as they are less likely to be unexpected because the reported causes of death are cancer, complications from specified diseases or surgery, or other long-term illnesses. To be able to compare ETP around an ID's death, we require that the executives of a firm trade within a time window both before and after her death (−2 years, +2 years) for the firm to be included in the test, which leaves us with 150 firms that have experienced the sudden death of an ID; these firms are labeled treatment firms.<sup>26</sup> In 115 of these treatment firms, the deceased ID's tenure is longer

<sup>26</sup>We impose the restriction of the 4-year window around the date of the ID's death, but not longer, to reduce confounding by factors other than the ID's death. Our findings are robust to the use of a shorter window (e.g., a 2-year window (−1 year, +1 year)).

than the pre-event average ID tenure for the firm, resulting in a decrease in the average tenure of the remaining IDs, that is, a decrease in ID\_TENURE, ex post. In the remaining 35 firms, the deceased ID's tenure is shorter than the pre-event ID\_TENURE, resulting in an increase in ID\_TENURE ex post.

As such, depending on whether the deceased ID's tenure is longer (labeled "LT-ID") or shorter ("ST-ID") than the pre-event ID\_TENURE, her sudden death results in either a decrease or an increase in ID\_TENURE for the firm. Additionally, as shown in the data, the occurrence of sudden death appears to be much more frequent for LT-IDs than for ST-IDs. Given the longer tenure of the former IDs, their death leads to a significant decrease in ID\_TENURE. In contrast, the resulting increase in ID\_TENURE from the death of ST-IDs is relatively small due to their shorter tenure.<sup>27</sup> Intuitively, the two scenarios have very different governance implications, with the death of LT-IDs resulting in a more significant change in the board's governance landscape; hence, executives are likely to become more cautious and to refrain from trading opportunistically in the face of such a departure from the original status quo.<sup>28</sup> We thus expect the impact from the sudden death of LT-IDs and ST-IDs to be asymmetric; that is, ETP is expected to be substantially lower following the significant decrease in ID\_TENURE due to the sudden death of an LT-ID, while it is expected to be mildly or insignificantly higher following the modest increase in ID\_TENURE from the sudden death of an ST-ID.

To account for the impact of potentially confounding factors, we use a difference-in-differences (DID) approach to determine the effect of an exogenous change in ID\_TENURE around the sudden death of an ID on ETP.<sup>29</sup> This approach compares the ETP of the treatment firms around the sudden death of their IDs with that of closely matched control firms that are otherwise similar but have not experienced the death of any of their IDs during our sample period. Specifically, we match each treatment firm with control firms in the same industry (defined based on the Fama–French 48-industry classification) that has propensity scores within a predefined radius of the treatment firm (a 0.01 radius is chosen here).<sup>30</sup> Propensity scores are estimated using SIZE, MB\_RATIO, PRIOR\_RETURN, and ID\_TENURE, all as of 2 years prior to the sudden death of the ID in the treatment firm.<sup>31</sup> In addition to the three common factors, we include ID\_TENURE as one of the matching variables to ensure that the ID\_TENURE of the matched control firms is comparable to that of the treatment firm to start with. We verify that the propensity score matching procedure creates two groups of firms with similar observable pre-event characteristics. Please refer to the details in Section C of the Supplementary Material (not reported here for brevity).

<sup>27</sup>This result can be seen from a simple comparison as follows: The average (median) decrease in ID\_TENURE from the death of LT-IDs is 1.26 (0.95) years, whereas the average (median) increase in ID\_TENURE from the death of ST-IDs is 0.68 (0.55) years.

<sup>28</sup>The new postdeath board does not need to enact new policies for this to occur; executives may become more cautious when they are forced to leave their "comfort zone" under the old board with long-serving IDs.

<sup>29</sup>Fahlenbrach, Low, and Stulz (2017) use director death as an instrument in 2-stage least-squares regressions predicting future bad events and performance.

<sup>30</sup>The results are robust to a broad range of radius values.

<sup>31</sup>This approach ensures that the matching variables are measured prior to the insider trading window that we examine later.

TABLE 8  
The Profitability of Executives' Trading over the Course of ID Tenure:  
The Impact of an ID's Sudden Death

Table 8 presents the results of the second-stage estimations from a 2-stage difference-in-differences framework based on Gardner (2021). TREATMENT is an indicator for the treatment firms, that is, those that have experienced the sudden death of independent directors (IDs). For each treatment firm, its matched control firms are selected from the same industry (defined based on the Fama–French 48-industry classification) and have propensity scores within a 0.01 radius of the treatment firm. Propensity scores are estimated using firm size, market-to-book ratio, prior 180-day return, and ID tenure, all as of 2 years prior to the sudden death of the ID in the treatment firm. Firms with executives who trade within the time window both before and after the ID's sudden death (−2 years, +2 years) are included. POST is an indicator for the 2-year period after the sudden death of IDs. Panel A presents the results for cases where there is a significant decrease in ID tenure due to the sudden death of an ID whose tenure was longer than the firm average prior to his/her death. Panel B presents the results for cases where there is a modest increase in ID tenure resulting from the sudden death of an ID whose tenure was shorter than the firm average prior to his/her death. Other control variables included are the same as in Table 2 but are not tabulated. The definitions of all the variables are given in the Appendix. Standard errors are given in parentheses below and are clustered at the individual level. \*\*\*, \*\*, and \* denote coefficient significance at the 1%, 5%, and 10% levels, respectively.

Variables	$\bar{R}(t+30)$	$\bar{R}(t+60)$	$\bar{R}(t+90)$	$\bar{R}(t+180)$
<i>Panel A. Sudden ID Death That Substantially Decreases Average ID Tenure</i>				
TREATMENT × POST	−1.085*** (0.318)	−1.739*** (0.456)	−2.305*** (0.573)	−4.273*** (0.998)
No. of obs.	29,485	29,485	29,485	29,485
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel B. Sudden ID Death That Modestly Increases Average ID Tenure</i>				
TREATMENT × POST	−1.028 (0.698)	−1.197 (0.791)	−1.348 (1.073)	−1.242 (2.250)
No. of obs.	7,969	7,969	7,969	7,969
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Recent literature has suggested that in the presence of heterogeneity in a treatment effect that varies over time or by treatment group, which may very well be the case in our setting, the conventional DID approach may not identify a readily interpretable measure of the treatment effect (Gardner (2021), Wooldridge (2021)). To address this issue, we adopt the 2-stage estimation framework proposed by Gardner (2021). Specifically, in the first stage, firm and time effects are identified from the sample of untreated observations, and in the second stage, after removing firm and time effects, the average treatment effects are identified by comparing the treated and untreated outcomes.

Table 8 presents the results of the second-stage estimations; Panel A presents the results for cases where the death of LT-IDs results in a significant decrease in ID\_TENURE, and Panel B presents the results for cases where the death of ST-IDs results in a modest increase in ID\_TENURE. In both panels, TREATMENT indicates treatment firms, and POST indicates the 2-year period after the sudden death of IDs in the treatment firms. Note that the specification does not include TREATMENT and POST alone because they are subsumed into the firm and year fixed effects, respectively.<sup>32</sup> The key variable of interest is their interaction,

<sup>32</sup>Guo and Masulis (2015) use a similar specification in exploring the effect of the SOX Act on board independence and its implications for corporate governance.

TREATMENT  $\times$  POST. All the other control variables from the baseline regressions in Table 2 are also included but not tabulated for the purpose of brevity. As expected, in Panel A, we find that the coefficients on TREATMENT  $\times$  POST are negative and significant, which suggests that ETP declines significantly in the 2 years following the significant decrease in ID tenure arising from the sudden death of an LT-ID. In comparison, the corresponding coefficients in Panel B are not significant, either economically or statistically, suggesting that ETP is not affected following the sudden death of ST-IDs. The more significant change in the governance landscape that results from the unexpected passing of an LT-ID likely sends an alert to executives regarding their trading behavior, which explains the decline in ETP. The unexpected passing of ST-IDs, however, does not affect the board as substantially as does that of LT-IDs, so their impact on ETP is insignificant.

To summarize, we believe that the endogeneity of ID tenure is unlikely to introduce substantial bias into our estimates to the extent that the interpretation of our findings is greatly affected.

## V. Conclusions

We find that executives profit more from their private trades as ID tenure increases, especially profit from sales. In addition, the likelihood that trades made by executives are opportunistic increases. Our findings suggest that the effectiveness of the board monitoring of insider trading weakens over the course of IDs' tenure. This change is driven by IDs who are supposed to be more effective monitors *ex ante* when they join the board. We further show that the connections between IDs and the CEO are the underlying channel that likely leads to the comprising of ID independence. Our study highlights the necessity of taking a dynamic view of corporate governance as in Field et al. (2013) and of the internal governance of insider trading.

There has also been intense interest in the literature on board structure and behavior and their relevance for shareholder value. The explicit rules and regulations for a majority independent board aside, public and institutional pressures are also placed on more devoted boards. The National Association of Corporate Directors, the Council of Institutional Investors, and Institutional Shareholder Services (2012) have all recommended various limitations on the number of boards on which directors serve. When the supply of ID candidates dwindles, firms may find it more difficult to introduce new IDs, which results in incumbent IDs serving longer than is optimal. Our findings imply that one must take ID tenure into account when assessing the effectiveness of board independence. Additionally, our study calls for more research to obtain a better understanding of how IDs and executives interact and, hence, how corporate governance is affected over the course of IDs' tenure.



## Appendix. Variable Definitions

This Appendix documents the definitions of additional variables used in the analysis. The summary statistics are provided in [Table 1](#).

### *Director and Board Characteristics*

**BOARD\_INDEPENDENCE:** The percentage of IDs on the board.

**BOARD\_SIZE:** The number of directors on the board.

**CEO\_CHAIRMAN:** A dummy variable that equals 1 if the CEO is also the chairman of the board, and 0 otherwise.

**CLASSIFIED\_BOARD:** A dummy variable that equals 1 if the board is staggered, and 0 otherwise.

**ID\_AGE:** The average age of all IDs of a given firm in a given year. For tests at the individual-director level, it is the age of the director.

**ID\_COMMITTEE\_MEMBERSHIP:** The total number of committees the director sits on. We consider audit, compensation, governance, and nomination committees using the information provided by ISS.

**INSIDE\_DIRECTOR\_TENURE:** The firm average tenure of all inside directors in a given year.

**ID\_GENDER:** A dummy variable that equals 1 if the director is female, and 0 otherwise.

**ID\_MULTIDIRECTORSHIP:** The average number of outside directorships held by all IDs of the firm in each year. For tests at the individual-director level, it is the number of outside directorships held by the director.

**ID\_MEETING\_ATTENDANCE:** A dummy variable that equals 1 if the director attends fewer than 75% of the board meetings in a year, and 0 otherwise.

**ID\_NATIONALITY:** A dummy variable that equals 1 if the director is a U.S. citizen, and 0 otherwise.

**ID\_OWNERSHIP:** The percentage of firm equity shares held by all IDs in the aggregate. For tests at the individual-director level, it is the percentage of firm equity shares held by the director.

### *Firm Characteristics*

**INSTITUTIONAL\_OWNERSHIP:** The percentage of shares held by institutional investors.

**MB\_RATIO:** The market-to-book ratio. It is the market value of equity plus the book value of assets minus the book value of common equity, all divided by the book value of assets.

**R&D\_DUMMY:** A dummy variable that equals 1 if the firm reports nonzero R&D expenses in a given year, and 0 otherwise.

**RETURN\_VOLATILITY:** The standard deviation of the daily market adjusted returns of the firm's stock over the 90 days prior to insider trading.

**SIZE:** The natural logarithm of market capitalization.

### Transaction-Level Controls

**LOSS\_DUMMY:** A dummy that equals 1 if the firm's net income before extraordinary items during the most recent fiscal year is strictly negative, and 0 otherwise.

**PRIOR\_RETURN:** The market-adjusted buy-and-hold returns for the 180 days prior to insider trading.

**RECENT\_TRADE:** The total absolute number of shares traded by all firm insiders during the 10 days prior to insider trading as a percentage of the total shares outstanding of the firm.

**TRANSACTION\_SIZE:** The number of shares traded in an insider trading as a percentage of the total shares outstanding of the firm.

## Supplementary Material

To view supplementary material for this article, please visit <http://doi.org/10.1017/S0022109023000492>.

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