Does board independence constrain insider opportunism?

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Abstract

We examine whether insider opportunism is reduced by board independence. Using a sample of 18,194 firm-year observations over the period 1996-2016, we show that increases in board independence constrain opportunistic insider trading. Our identification strategy uses a quasi-natural experiment where the SOX Act of 2002 and associated changes to the listing rules of NYSE/NASDAQ are used as a source of exogenous shocks in board independence. Our results are economically meaningful as insider opportunism declines by about 10.5%. We find that self-imposed insider trading restrictions is the channel through which board independence reduces insider opportunism. Our additional analyses show that in competitive industries and R&D intensive firms, the impact of board independence on opportunism is less pronounced. We also find that constraining opportunism for board independence exists for firms with less complexity. However, in co-opted boards, independent directors are less effective. Overall, this study supports the monitoring channel of board independence for reducing rent-seeking activities of insiders.

Keywords: *Insider opportunism, insider trading, board independence, SOX*

JEL classification: *G14; G34; G40*

1. Introduction

Insiders possess superior non-public information about the firm (Seyhun, 1986), which allows self-interested insiders to exploit informational advantages over outside shareholders. The empirical literature shows that insider trading is informative in terms of future returns (e.g., Lakonishok and Lee, 2001; Kraft et al., 2014) and managers secure abnormal profits based on this private information. It is now well-documented that managers are aware of the mispricing of their own firms (Rozeff and Zaman, 1998) and exploit this mispricing around different corporate events and announcements. There exist two different views for the role of insider trading. One strand of literature (e.g., Aboody and Lev 2000; Lakonishok and Lee 2001; Roulstone, 2003; Chang et al., 2017) highlights improved market efficiency as a positive role of insider trading. However, a counter view has received more attention from the regulators as some prior literature also suggests that opportunistic insiders extract benefits from their trading and this limit gains available to other investors (e.g., Seyhun, 1986; Manove, 1989; Fishman and Hagerty, 1992; Bettis et al., 2000; Jagolinzer et al., 2011; Rahman et al., 2020).

Over the years, legislation has been enacted to discipline opportunistic insider trading.[1] In addition, firms also adopt corporate governance policies like blackout periods.[2] However, there is an ambiguity with regard to the type of trading where corporate governance can play its role. Not all trading is illegal and not all trading is informative. If insiders trade within the framework of existing corporate policies and regulations, trading is legal. But still, this trading can be informative since insiders have informational advantages. Therefore, identifying and monitoring opportunistic insider trading remains an ongoing research area of great interest to both regulators and academics. For instance, Ali and Hirshleifer (2017) show that opportunistic insiders are involved in a nontrivial degree of rent-seeking activities, including earnings

[1] E.g., Insider Trading and Securities Fraud Act (1988) and Stock Enforcement Remedies and Penny Stock Reform Act (1990).
[2] A blackout period is a time when insiders are prohibited from trading in their firms' stocks.

restatements and earnings management, shareholder litigation, SEC enforcement actions and excess compensation. Motivated by these supporting arguments for rent-seeking activities and insider trading, we identify opportunistic insider trading following Ali and Hirshleifer (2017)[3] and examine whether improved governance through board independence can reduce this firm-level opportunism.

The corporate governance literature assumes that rent extraction activities are attenuated by effective monitoring and good governance (Shleifer and Vishny, 1997; Bettis et al., 2000). Very few studies empirically address this issue from an insider trading perspective, since there is an ambiguity with regard to the type of trading considered as opportunistic and how corporate governance can play its role. This ambiguity is amplified when investigating board independence as a corporate governance tool. There exists considerable debate on what type of board structure is optimal for firms in ensuring effective monitoring and governance (Adams and Ferreira, 2007). But the general notion is that corporate boards are accountable for protecting the interest of shareholders, and the well-functioning of boards depends on their structure. The role of board independence for effective monitoring is well-documented in the literature (e.g., Denis and McConnell, 2003; Bhagat and Bolton, 2008; Faleye et al., 2011). For example, Faleye et al. (2011) find that board monitoring by independent directors reduces earnings management and excessive compensation packages of executives and increases CEO turnover for poor firm performance. However, firms also face the dilemma of whether independent boards should undertake more of an advising or more of a monitoring role, since the benefits of effective monitoring come at the cost of advising (Adams and Ferreira, 2007).

In relation to opportunistic insider trading the effect of board governance is also unclear. This is possibly due to lack of credible identification of opportunistic insider trading

[3] Throughout this paper, we use terms "firm level opportunism", "insider opportunism" and "opportunistic insider trading" interchangeably.

and its linkage with corporate governance. For example, Dai et al. (2016) find that corporate governance does not reduce profitability from insider purchases but it reduces profitability from insider sales. However, prior literature (e.g., Lakonishok and Lee, 2001; Jeng et al., 2003; Lee et al., 2014) shows that insider sales, in general, do not generate any significant abnormal returns and for that reason the corporate governance mechanism is irrelevant. In this regard, Edmans et al. (2018) and Dai et al. (2016) offer an alternative view and argue that insider sales can be informative and could be part of an optimal compensation contract and, hence, governance is important. Given the conflicting predictions and evidence, the issue of what opportunistic insider trading is and whether corporate governance reduces such opportunism is an open question.

To provide empirical evidence on that question, we use an insider opportunism measure following Ali and Hirshleifer (2017) and examine whether board independence reduces such opportunistic insider trading and the conditions that affect the strength of this relationship.[4] We use a sample of U.S. firms over the period of 1996-2016 and provide direct evidence that increases in board independence reduces firm-level insider opportunism. The result is economically significant: a one standard deviation increase in board independence, decreases opportunistic insider trading by about 10.5%.

A caveat in linking a causal relationship between the strength of board independence and firm level opportunism is that either board composition is endogenous or some other omitted variables drive our results. For example, firm performance can bring in more outside directors (Hermalin and Weisbach, 1998) and unobservable factors also can influence both firm level opportunism and board composition simultaneously (Harris and Raviv, 2006). To address this endogeneity concern, following Coates (2007) and Banerjee et al. (2015), we use a quasi-

[4] The measure proposed by Ali and Hirshleifer (2017) identifies opportunism based on both insider purchases and sales just before earnings announcements. They also validate this measure by showing that these opportunistic insiders are involved in significant amounts of rent-seeking activities.

natural experiment. The Sarbanes-Oxley Act of 2002 (SOX Act) and associated changes to the listing rules of the NYSE/NASDAQ is considered as a source of a natural exogenous shock for improved governance through increased board independence. These new regulations adopted in the US required the majority of the directors to be independent and a 100% independent audit committee in public firms. One of the unique characteristics of this exogenous shock was that some firms were already compliant with the requirement of board independence before the passage of the SOX Act while others were not compliant and were forced to increase their board independence after the SOX Act came into effect. Using a difference-in-difference specification, we find that the SOX Act increases board independence for the pre-SOX non-compliant firms and for such an increase in board independence, insider opportunism decreases. Overall, considering exogenous change in board independence, we show a causal inverse relationship between the strength of board independence and insider opportunism.

We perform two additional analyses to understand the channel and the setting in which the impact of board independence on firm level opportunism is more or less pronounced. First, Roulstone (2003) identifies insider trading as 'SAFE' trading if a higher percentage of shares are traded within one-month following earnings announcements i.e., the higher is the percentage, the higher is the 'SAFE' trading due to self-imposed insider trading restrictions in firms. These restrictions do not allow the insiders to trade before the earnings announcements. Following Roulstone (2003), we identify trading restrictions and find that independent boards impose firm-level insider trading restrictions to mitigate the insider opportunism in firms. Second, Adams and Ferreira (2007) highlight two different roles of independent directors: advising and monitoring. They argue that the benefits of effective monitoring and governance come at the cost of advising. Firms who face more intensive competition need a stronger advising role from directors. Consistent with this argument, we find that as competition increases, the impact of board independence on opportunism becomes less pronounced. In

other words, in competitive firms, directors are potentially more involved in advising than monitoring. We also examine how independent directors play their role in R&D intensive firms. Coles et al. (2008) argue that in R&D intensive firms, boards are dominated by insiders as firms benefit mostly from firm-specific proprietary knowledge. As expected, we find that the impact of board independence on opportunistic insider trading is less pronounced for increases in R&D intensity.

In the final analysis, we perform two cross-sectional tests to further substantiate our baseline results. First, Coles et al. (2008) argue that less complex firms require more monitoring than advising. In cross-sectional analysis, we show that the monitoring role of board independence is more important in less complex firms. Accordingly, we find that our baseline results only hold in less complex firms, suggesting a decrease in insider opportunism when there is an increase in board independence. Second, Hwang and Kim (2009) argue that independent directors are ineffective in co-opted boards. Coles et al. (2014) define a board as co-opted if directors are appointed after the CEO assumes office. We find that insider opportunism is reduced by independent directors when co-option is low in boards.

Our study builds on the growing literature on board independence, corporate governance, and insider trading. We contribute to this literature by showing how an effective independent board structure can influence firm level opportunism. Given the debate on optimality of independent board structure in terms of monitoring and advising roles and the complex psychological setting of boards (Adams and Ferreira, 2007; Coles et al., 2008), our study gives impetus with regard to the form of board structure being effective for reducing rent-seeking activities of insiders. We contribute and extend such literature by documenting less opportunistic insider trading for higher levels of independent directors. We also show that this mitigating mechanism is less pronounced in competitive and R&D intensive firms because of

the advising role being more demanding compared to monitoring. We further show that board governance mechanisms do not work so well when directors are mostly co-opted.

We also contribute to the growing literature on insider trading and governance (e.g., Bettis et al., 2000; Jagolinzer et al., 2011; Lee et al., 2014). While our study is closest to Dai et al. (2016), we have a meaningful different setting and outcome. Dai et al. (2016) find that corporate governance does not reduce profitability from insider purchases, but that it reduces profitability from insider sales. In contrast, we consider insider purchases and sales around earnings announcements and identify opportunistic insider trading following Ali and Hirshleifer (2017). We find that board independence reduces such insider opportunism. We also show that self-imposed insider trading restrictions is the channel through which independent boards reduce such opportunistic trading.

The remaining parts of this study are as follows: Section 2 outlines the hypothesis development. Section 3 describes the empirical design. Section 4 presents and discusses the results, while Section 5 concludes the research.

2. Hypothesis development

Board independence is assumed to be a critical part of effective corporate governance, regardless of the setting or jurisdiction (e.g., Denis and McConnell, 2003; Bhagat and Bolton, 2008). The SOX Act gives direction that corporate audit committees should be comprised of independent directors. This essentially promotes the monitoring role of directors in reducing agency problems and corporate misbehaviour/fraud in firms. Moreover, as firms grow in size and become more complex in terms of their scope of operations and business, the advising role of boards becomes more important. A number of studies gives emphasis to this argument. For instance, Fich (2005) and Coles et al. (2008) argue that complex firms need more independent directors to bring more expertise into corporate decision-making. Given the significance of both the advising and monitoring roles of directors, the role of independent board members in

terms of reducing agency problems, improving financial performance, and increasing firm value has received major research attention.

There exists both supporting and contradictory evidence for the role of independent boards. In support of independent boards, it is argued that the greater the representation of independent directors on corporate boards, the more the effective corporate governance in terms of reducing agency problems and improving firm value and performance. For instance, Weisbach (1988) argues that poor performing CEOs are more likely to be terminated by boards with more outside directors than otherwise. A similar finding for outside directors is also reported for reducing corporate fraud and manipulation of earnings. For example, Klein (2002) shows that earnings management is less likely in firms with independent boards. Banerjee et al. (2015) show that independent directors restrain overconfident CEOs from value destruction in firms. Recently, Bird et al. (2018) report that independent boards reduce corporate risk taking and variability of firm performance. Based on this strand of literature, we propose the following hypothesis:

H1a: Insider opportunism is inversely related to the level of board independence.

A number of studies also question the role of independent directors since they report either a negative or no relationship between firm performance and board independence (e.g., Hermalin and Weisbach, 1991; Mehran, 1995; Agrawal and Knoeber, 1996; Klein, 1998; Harris and Raviv, 2006; Drymiotes, 2007; Pathan and Faff, 2013). For example, Drymiotes (2007) argues against fully independent boards and that including corporate insiders in the corporate board can help reduce the information asymmetry problem and allow boards to put more effort into monitoring and governance. In addition, Adams and Ferreira (2007) study the dual role of boards: advising versus monitoring and conclude that if independent directors are tougher monitors, CEOs tend to be reluctant to disclose information to independent boards. However, information flow is critical for effective monitoring and governance of firms. In

addition, Coles et al. (2008) find that complex firms require more of the advising role from boards compared to monitoring by them and, therefore, independent directors might not monitor rent-seeking activities of insiders. Hence, we propose the following alternative hypothesis:

H1b: Insider opportunism is positively related to the level of board independence.

3. Research design

3.1 Data and sample

To examine the impact of board independence on insider opportunism, we construct our sample using data from a number of different sources. Initially, we obtain open market insider transactions from Thomson Reuters Insiders Filings Database for the period 1996-2016. Although this data goes back to 1986 we are restricted until 1996 due to other data constraints listed below. Most relevant to our study, this database includes trading related information including insiders' designation, trading date, price, and volume. According to the Securities and Exchange Act 1934, all the corporate insiders are required to report this trading information. Following Lakonishok and Lee (2001), we require at least 100 shares traded at any particular time. To identify firm-level insider opportunism, we focus on trading around quarterly earnings announcements (QEA), especially trading within 21 days before the announcements. The QEA data are obtained from COMPUSTAT. We also obtain all data on accounting and financial variables from this database. For security level price and return, we only consider common stocks with share codes 10 and 11 listed on NYSE, AMEX, and NASDAQ. These data are sourced from CRSP. We eliminate regulated firms in the utilities and financial industries. For board structure variables, we obtain data from ISS (formerly RiskMetrics) for the period 1996-2016 since data are available from 1996 onwards. These data include relevant information about the number of directors, number of independent directors, and directors' representation in different committees and other boards. We also collect

analysts' following data from the Institutional Broker Estimates Services (I/B/E/S) database. Finally, after cleaning missing observations for all the variables, our final regression sample comprises 18,194 firm-year observations over the period 1996-2016.

3.2 Measures of variables

3.2.1 Firm-level insider opportunism

Following in the spirit of Ali and Hirshleifer (2017), our insider opportunism measure follows five steps. First, we identify insider trading which takes place during the 21 days before the QEA and we exclude the last 2 days before the QEA. Second, for each of the 2 days surrounding the QEA, we calculate abnormal profits by using a market adjusted return model. The abnormal profit (ABNORMAL PROFIT) for insider *i* at time, *t* is measured in a 5-day window around the QEA date as follows:

$$ABNORMAL\_PROFIT_{i,t} = \frac{\sum_{j=-2}^{j=2}(R_{i,t+j} - R_{m,t+j})}{5} \quad (1)$$

where, $R_{i,t}$ is the stock return of firm *i* on day *t* and $R_{m,t}$ is the CRSP value weighted index return on that day. Here, QEA dates and event windows are denoted by *t* and *j,* respectively. Third, after calculating abnormal profits of each pre-QEA trade we aggregate the abnormal profits and calculate the average abnormal profit (AVERAGE_PROFIT) for each insider for each year as follows:

$$AVERAGE\_PROFIT_{i,y} = \frac{\sum(ABNORMAL\_PROFIT_{i,y})}{TRADE_{i,y}} \quad (2)$$

where, $ABNORMAL\_PROFIT_{i,y}$ is the net abnormal profit of buy and sell and $TRADE_{i,y}$ is the total number of pre-QEA trades by an insider *i* in year *y*. Fourth, with average abnormal profits of each insider, we rank insiders into quintiles. Finally, to identify insider opportunism (OPPORTUNISTIC_FIRM) for firm i in year y, we calculate the ratio of the number of highest ranked quintile 5 insiders to the total number of insiders:

$$OPPORTUNISTIC\_FIRM_{i,y} = \frac{NO.OF\ Q5\ INSIDERS_{i,y}}{NO.OF\ TOTAL\ INSIDERS_{i,y}} \quad (3)$$

where, Q5 insiders are the highest ranked insiders identified based on quintile ranking of average yearly abnormal profits from their pre-QEA trades.

In robustness checks, we also use an alternative measure of opportunistic insider trading. Following Cohen et al. (2012), routine traders are identified as those who place their trade in the same calendar month for three consecutive years, whereas all other traders are identified as opportunistic traders. NON_ROUTINE is an indicator variable that takes value of 1 if the insider is identified as opportunistic and 0 otherwise.

3.2.2 Board characteristics

Our key variable is board independence (IND_DIR). We calculate IND_DIR as the ratio of the number of independent directors to total number of directors sitting on a given board. In sensitivity analysis, we also take the natural logarithm of 1 plus total number of independent directors on a board (IND_ALT) as an alternative measure.

3.2.3 Control variables

We use a series of firm characteristics which have predictive power on opportunistic insider trading (e.g., Skaife et al., 2013; Gao et al., 2014 and Wu, 2018). All the variables are measured at time *t-1*, unless otherwise stated. The control variables comprise: FIRM_SIZE, the natural logarithm of market value of equity; MTB, estimated as the ratio of market to book value of equity; R&D_DUMMY, an indicator variable that takes a value of 1 if a firm has positive R&D expenditures and 0 otherwise; LOSS_DUMMY, an indicator variable that takes a value of 1 if a firm reports a loss in a financial year and 0 otherwise; PROFIT, the ratio of income before extraordinary items to total assets; FIRM_AGE, the natural logarithm of years since a firm first appeared in the CRSP database; VOL, the standard deviation of daily stock returns over each one year period; TURNOVER, the average of the ratio of trading volume to shares outstanding

over a one year period; ANALYST_FOLLOWING, the natural logarithm of 1 plus number of analysts coverage in a year. We also include board size (BOARD_SIZE) in our regression models which is calculated as the natural logarithm of number of directors sitting on a board.

Descriptive statistics

Table 1 shows the descriptive statistics for key variables used in our study. Panel A displays the board structure variables. The average (median) number of directors per board is 9.012 (9.000) with a standard deviation of 2.304, which is similar to recent studies. For instance, Coles et al. (2008) report a mean (median) board size of 10.4 (10). For board independence, our summary statistics are consistent with prior studies. The mean (median) for the fraction of independent directors (IND_DIR) is reported as 0.714 (0.750), which is similar to 0.753 (0.778) in Ferreira et al. (2011). Panel B shows means, standard deviations, and medians of our key variables: firm level insider opportunism (OPPORTUNISTIC_FIRM) and other firm characteristics. The OPPORTUNISTIC_FIRM has a mean value of 0.027 with a standard deviation of 0.105. The average FIRM_SIZE in the sample is 7.597, the average MTB ratio is 3.515, and VOL of returns is 0.026.[5] Overall, we find that all the firm characteristics variables are similar to previous studies and within reasonable range.

[Table 1 here]

Table 2 shows the Pearson correlation matrix for the key variables used in the study. The OPPORTUNISTIC_FIRM variable is negatively correlated with IND_DIR. The sign of this correlation is consistent with our prediction related to the monitoring hypothesis of board independence. In terms of correlations among other variables, most of them are statistically significant due to the large sample. However, the magnitude of these correlations are modest implying little concern about multicollinearity.

[Table 2 here]

[5] Descriptions of all the variables are provided in Table A1.

3.3 Empirical approach

To test the influence of board independence on firm level opportunism, we specify the following regression model:

$$OPPORTUNISTIC\_FIRM_{i,t}$$

$$= \alpha_0 + \alpha_1 IND\_DIR_{i,t} + \alpha_2 BOARD\_SIZE_{i,t} \sum_{k=3}^{11} \alpha_k \, CONTROLS_{i,t-1}$$

$$+ \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t} \quad (4)$$

where all the variables are defined previously. In estimating model (4), we include industry- and year- fixed effects to control for time invariant omitted industry characteristics.

4. Empirical results

4.1 Baseline results

Table 3 shows the baseline results for the ordinary least-squares (OLS) regression models specified in Model (4). The results support the monitoring hypothesis of board independence – namely, that increases in independent directors reduces firm-level opportunistic insider trading. Column (1) reports the OLS regression, with year fixed effects and all control variables and column (2) shows a model which further controls for industry fixed effects. The coefficient estimates on IND_DIR are negative and statistically significant in both the columns. In column (2) we report that the estimated coefficient on IND_DIR is -0.017, with $p<0.01$. In terms of economic significance, this coefficient implies that for a one standard deviation increase in IND_DIR, opportunistic insider trading decreases by about 10.5%.[6] Overall, we find evidence consistent with our main hypothesis that board independence reduces insider opportunism.[7]

[6] The mean of OPPORTUNISTIC_FIRM is 0.027 (from Table 1) and the standard deviation of IND_DIR is 0.165 (from Table1). With the coefficient of -0.017 in column (2) of Table 3, this implies a 10.5% (0.165*0.017/0.027=10.5%) reduction of firm level opportunism for one standard deviation increase in board independence.

[7] We also find that our results are robust to a Tobit regression model. The results are untabulated and available from the authors upon request.

[Table 3 here]

4.2 Addressing endogeneity and identification strategy

A caveat on our baseline results is that either board independence is endogenous or some other omitted variables are driving our results. In other words, firm-level opportunism can bring in more outside directors and unobservable factors can also influence both insider opportunism and board composition simultaneously (Harris and Raviv, 2006). To address this endogeneity concern, we develop an identification strategy which is based on exogenous shocks to board independence in a quasi-natural experiment. We also include firm fixed effects for any omitted time-invariant firm characteristics.

Prior literature (e.g., Coates, 2007; Banerjee et al., 2015) uses the SOX Act and other associated changes in listing rules of the NYSE/NASDAQ as a source of exogenous shocks in board independence. This regulatory change requires a majority of independent directors and 100% independent audit committees in public firms. One of the primary objectives of this regulatory change is that board independence can attenuate unethical and opportunistic behaviour in firms. Overall, this rule change is a good candidate for an exogenous shock in board independence for at least two reasons. First, the change in regulation is exogenous to any firm specific characteristics. Second, the change is adopted with the expectation of improvements in governance and monitoring through more representation by independent directors.

One of the unique characteristics of this exogenous shock is that some firms are already compliant with the requirements of board independence before the passage of the SOX Act, while others are not compliant and are forced to increase their board independence after the SOX Act came into effect. This unique nature of the shock is ideally suited to a quasi-natural

experiment design. [8] To identify the regression sample for this quasi-natural experiment, treated (TREATED) firms are defined as the non-compliant firms who do not have a majority of independent directors on the board and a 100% independent audit committee during the period 2000-2001 (before the SOX Act in 2002). The control firms (CONTROL) are the already compliant firms. To reduce the likelihood that firm characteristics are systematically driving our results, TREATED firms are matched with CONTROL firms in terms of all control variables used in model (4). The matching is performed using nearest-neighbour propensity score matching with a 0.005 caliper during the period 2000-2001. Panel A of Table 4 shows the ex-ante summary statistics of how well the TREATED firms are matched with the CONTROL firms. None of the matching variables show significant differences between TREATED and CONTROL firms. Hence, this setting is very useful to examine whether board independence, driven by the SOX Act as a source of exogenous shock, has any causal influence on insider opportunism.

In the quasi-natural experiment, we use difference-in-difference specification where the key variable of interest is the interaction of TREATED and POST. As defined previously, we identify TREATED firms by an indicator variable that takes a value of 1 if firms are non-compliant, pre-SOX Act and 0 otherwise. POST is a dummy variable that takes a value of 1 if the observations are from the year 2002 or later and 0 otherwise. We expect that if board independence has a causal influence on insider opportunism, the interaction term (TREATED×POST) will be negative and significant. Panel B of Table 4 displays the results. Column (1) shows the results with industry fixed effects, whereas column (2) shows results with firm fixed effects. In both columns, we find that the interaction term is negative and significant (-0.029) at the 5% level. We also run sub-sample regressions for TREATED and CONTROL groups and find that the variable POST is negative and significant only for the

[8] We thank an anonymous reviewer for pushing us hard on this point.

non-compliant firms.[9] These results suggest that the SOX Act increases board independence for the pre-SOX non-compliant firms and for such an increase in board independence, insider opportunism decreases. Overall, we find that board independence has a causal influence on insider opportunism.

[Table 4 here]

4.3 Robustness checks

4.3.1 Alternative measures

Table 5 shows the regression results for alternative measures of board independence and opportunistic insider trading. We take the natural logarithm of 1 plus total number of independent directors on a board (IND_ALT) as an alternative measure of board independence. Column (1) of Table 5 reports our results. The estimated coefficient on IND_ALT remains negative and significant which is consistent with our baseline prediction. Following Cohen et al. (2012), we also use an alternative measure for opportunistic insider trading. We classify trading as either routine or opportunistic. Routine traders are deemed those who place their trade in the same calendar month for three consecutive years, whereas all other traders are identified as opportunistic traders. We define opportunistic traders (NON_ROUTINE) by an indicator variable that takes a value of 1 if the insider is identified as opportunistic and 0 otherwise. In columns (2) and (3) of Table 5, we run probit regressions for our baseline model (4) with the exception that our dependent variable is an indicator variable (NON_ROUTINE). Column (2) shows results with year fixed effects and column (3) shows results with both industry and year fixed effects. In both the columns, we report marginal effects with z-values in parentheses. We find that it is 7% less likely (as reported in column 3) for the insiders to be opportunistic if representation of independent directors on boards increases by one unit.

[9] The sub-sample analysis is untabulated and available upon request.

[Table 5 here]

4.3.2 Reduced sample analysis

There might be a concern that the significance of our results is biased due to a large number of 0 values in the OPPORTUNISTIC_FIRM measure. To address this concern, we discard all 0 values and re-run our baseline model (4) for the reduced sample size of 1,945 firm-year observations. This sample represents only firms that have a certain degree of opportunistic insider trading. In untabulated results, we find that the estimated coefficient on IND_DIR maintains its negative sign and is significant at the 1% level. This analysis further supports our prediction that board independence reduces opportunistic insider trading.

4.3.3 Additional controls

In this section, we include additional control variables to further address any potential omitted-variables concern. First, there is a possibility that governance mechanisms including CEO power, institutional monitoring, and a governance index of firms could subsume the role of board independence. Accordingly, we additionally include these variables in our model (4) as a part of our regime of robustness checks. CEO power (CEO_POWER) is defined by an indicator variable that takes a value of 1 if CEO is also the chairperson of the board and 0 otherwise. Institutional monitoring (INS_INVESTORS) is measured by taking the natural logarithm of total number of institutional investors in a firm. For corporate governance, we use two alternative index measures: G_INDEX and G_INDEX_ALT which we construct following Bebchuk et al. (2009) and Gompers et al. (2003), respectively. Second, to control for any momentum effects and contrarian trading behavior of insiders, we include PAST_RETURN which is the market-adjusted return at time t-1. Table 6 shows the results including all these additional control variables. Column (1) reports results with G_INDEX as the proxy for corporate governance, whereas column (2) reports results with G_INDEX_ALT as an alternate

proxy. Irrespective of these variations, we find that the estimated coefficient on IND_DIR is negative and significant (at the 5% level). Overall, our baseline results are robust to the inclusion of additional control variables.

[Table 6 here]

4.4 Additional analyses

Our main finding suggests that greater representation of independent directors on boards reduces firm level opportunism. In this section, we perform two additional analyses to substantiate this conjecture. First, we examine the potential channel through which board independence reduces insider opportunism. Second, we show how independent directors play their role in competitive markets and R&D intensive firms.

4.4.1 Potential channel

We argue that independent boards could impose firm-level insider trading restrictions to mitigate the insider opportunism in firms. Roulstone (2003) develop a measure to identify these self-imposed insider trading restrictions. The restrictions are in the form of trading windows around quarterly earnings announcements. Roulstone (2003) define insider trading as 'SAFE' trading if a higher percentage of shares are traded by insiders within one-month following earnings announcements i.e., the higher is the percentage, the higher is the deemed restrictions in firms. Following Roulstone (2003), we also identify insider trading restrictions by a dummy variable (RESTRICT) that takes a value of 1 if 75% or greater of insider trading takes place within a one-month window following quarterly earnings announcements and 0 otherwise. We interact both these measures: SAFE and RESTRICT, with our board independence variable (IND_DIR) and predict that if insider trading restrictions occur via this channel, then both interaction terms will be negative and significant. Table 7 shows the results. As predicted, we find that the estimated coefficients on the interaction terms: IND_DIR×SAFE and

IND_DIR×RESTRICT are negative and significant at the 5% level. Overall, this supports the view that insider trading restrictions is the channel through which board independence influences insider opportunism.

[Table 7 here]

4.4.2 Independent directors' role in a competitive market and R&D intensive firms

Competition in an industry works as an external disciplinary mechanism for firms. Hart (1983) theoretically shows that a higher level of competition reduces managerial slack, while improving governance quality and shaping manager interests to be more aligned with shareholders. Schmidt (1997) further supports this argument by showing that competition increases efficiency in allocating resources. Randøy and Jenssen (2004) argue that the link between board independence and firm performance varies with levels of competition. They find that independent directors are less relevant for highly competitive industries as competition plays the governance role.

On the other hand, Adams and Ferreira (2007) highlight two different roles of independent directors: advising and monitoring. They argue that the benefits of effective monitoring and governance come at the cost of advising. Firms that face higher levels of competition need more of an advising role from independent directors relative to a governance role. Consistent with both arguments, we further hypothesize that the impact of board independence on insider opportunism is less pronounced for increases in competition. Following Hoberg and Phillips (2016), we utilize text-based network industry classifications and total similarity index as our measure of competition (COMPETITION).[10] A higher value of this index suggests a higher level of competition. Our key variable of interest is the interaction of IND_DIR and COMPETITION. Column (1) of Table 8 reports these results. We

[10] The index is available at http://hobergphillips.tuck.dartmouth.edu/industryconcen.htm

find that the estimated coefficient on the interaction term is positive and significant, which suggests that in competitive markets board independence is not a significant governance mechanism for reducing opportunistic insider trading.

[Table 8 here]

We also examine the role of independent directors in research and development (R&D) intensive firms. R&D intensive firms have higher costs for proprietary information (Jones, 2007) and disclosing such proprietary information is a concern in a competitive environment (e.g., Verrecchia, 1983; Gertner et al., 1988; Harris 1998). In support of this proprietary cost argument, Coles et al. (2008) argue that in an R&D intensive firm, corporate boards are dominated by insiders as firms benefit mostly from firm-specific knowledge. Since independent directors are less relevant in R&D intensive firms, we expect that the impact of board independence on opportunistic insider trading is less pronounced for increases in R&D intensity. We create a R&D intensity variable (R&D_INTENSITY) which is the ratio of research and development expenditures to total assets. Our key interest is on the interaction term (IND_DIR×R&D_INTENSITY). Column (2) of Table 8 shows the results. We find that the estimated coefficient on the interaction term is positive and significant which implies that independent directors' role on insider opportunism is less pronounced for increases in R&D intensity.

4.5 Cross-sectional tests

In this section, we examine how the relationship between board independence and firm-level opportunism varies cross-sectionally among firms. We show that the monitoring role of independent boards is conditional on how demanding the advising role of boards is compared to their monitoring role and whether directors are co-opted by CEOs as a box-ticking exercise.

Coles et al. (2008) argue that complex firms require more on advising than they do on monitoring. Consistent with this argument, we expect that the relationship between board

independence and firm-level opportunism only (or more strongly) holds for less complex firms. Coles et al. (2008) defines complex firms as those that are generally diversified and large. Following this definition, we develop two alternative measures of complexity: the number of business segments (COMPLEXITY_BUS_SEG) and the number of geographic segments (COMPLEXITY_BUS_SEG). These measures are categorized as high (low) if the number of business segments or geographic segments for a firm are higher (lower) than the sample median. Table 9 shows the results for high versus low categories of complexity for both measures. We see that our baseline finding only holds for firms with low levels of complexity and that the null hypothesis of equality between the low and high coefficients is rejected (at the 5% level). As such, this analysis suggests that only in less complex firms, do independent directors play their monitoring role resulting in decreases in opportunistic insider trading.

[Table 9 here]

Hwang and Kim (2009) argue that independent directors are not effective monitors if firms consider director appointments as a box-ticking exercise and if these directors are handpicked by CEOs. Motivated by this argument, Coles et al. (2014) define co-opted boards as the fractions of directors appointed after the CEO assumes office. They find that co-option is inversely related to board monitoring. We hypothesize that constraining insider opportunism by independent boards is conditional on the degree of co-option in boards. We classify co-opted boards as high (low) if the fraction of directors appointed after the CEO assumes the role (DIRECTORS_CO-OPTED) is higher (lower) than the sample median. We also use a tenure-weighted version as an alternative measure of board co-option. It is measured as the tenure of co-opted directors divided by the total tenure of all directors. We define DIRECTORS_CO-OPTED_TENURE as high (low) if the tenure-weighted measure of co-opted boards is higher (lower) than the sample median. Table 10 shows the results for high versus low categories of co-opted boards for both the measures. We find that independent directors play an effective

monitoring role and reduce insider opportunism only when co-option is low in boards. Moreover, the null hypothesis of equality between the low and high coefficients is rejected in both cases (at the 5% level). Overall, this result suggests that if directors are co-opted, even if they are independent, then such directors demonstrate aligned interests with CEOs and corporate insiders rather than performing their role as effective monitors.

[Table 10 here]

5. Conclusion

Although insider trading regulations, restrictions, and broader legislation have been enacted over time, insiders still trade opportunistically in firms. There is an ambiguity with regard to the type of trading where corporate governance can play its role. Not all insider trading is illegal and not all insider trading is informative. Identifying, monitoring, and disciplining firm level opportunism still remains of keen interest to policy makers and academics. In this paper, we utilize the firm-level opportunistic insider trading measure developed by Ali and Hirshleifer (2017) and examine whether improved governance through board independence can discipline this. Overall, our study has significant implications for policy on insider trading and governance.

We find that higher representation of independent directors on boards reduces insider opportunism. Through a battery of tests including a quasi-natural experiment of the enactment of the SOX Act of 2002 and the associated changes in the listing rules of the NYSE/NASDAQ, as board independence increases, insider opportunism decreases. We further show that self-imposed insider trading restrictions is the channel through which board independence reduces insider opportunism. We also find that independent directors are less important in highly competitive markets and for R&D intensive firms. Moreover, for less complex firms, as the monitoring and governance role is more demanding, insider opportunism reduces for increases

in board independence. However, such increases in board independence is less effective in co-opted boards.

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Table A1: Description of variables

Name of variables	Symbol	Description	Source
Panel A: Dependent variables			
Firm level insider opportunism	OPPORTUNISTIC_FIRM	Following Ali and Hirshleifer (2017), opportunistic insider trading at firm level is identified by measuring the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the Quarterly Earnings Announcements (QEA) in a particular year. Here, profitability for each insider trade is estimated as the average market adjusted return in five-day event window centred at the QEA date.	Multiple
Non-routine opportunistic traders	NON_ROUTINE	Following Cohen et al. (2012), routine traders are identified as those who place their trade in the same calendar month for three consecutive years, whereas all other traders are identified as opportunistic traders (NON_ROUTINE). NON_ROUTINE is an indicator variable that takes a value of 1 if an insider is identified as opportunistic and 0 otherwise.	Thomson Reuters Insiders Filings Database
Panel B: Key explanatory variables			
Independent board	IND_DIR	The ratio of number of independent directors to total number of directors on a board.	ISS (formerly RiskMetrics)
Alternative measure of independent board	IND_ALT	The natural logarithm of 1 plus total number of independent directors on a board.	ISS (formerly RiskMetrics)
The requirement for a majority of independent directors and a fully independent audit committee according to the SOX Act	TREATED	A dummy variable that takes a value of 1 if a firm does not comply with the majority independent board and a 100% independent audit committee before the SOX Act and 0 if they are control firms.	ISS (formerly RiskMetrics)
The impact of the SOX Act	POST	A dummy variable which takes a value of 1 if the observation occurs in 2002 or later and 0 otherwise.	ISS (formerly RiskMetrics)
Name of variables	Symbol	Description	Source
Panel C: Control variables			

Number of directors on the board	# of DIRECTORS	The total number of directors on the board.	ISS (formerly RiskMetrics)
Board size	BOARD_SIZE	The natural logarithm of the total number of directors on the board.	ISS (formerly RiskMetrics)
Size of firm	FIRM_SIZE	The natural logarithm of the market value of equity of the firm at time t-1.	COMPUSTAT's Fundamentals Annual database
Market to book ratio	MTB	The ratio of market to book value of equity of the firm at time t-1.	COMPUSTAT's Fundamentals Annual database
R&D intensive firm	R&D_DUMMY	An indicator variable taking a value of 1 if the firm has positive R&D expenditure at time t-1 and 0 otherwise.	COMPUSTAT's Fundamentals Annual database
Loss firm	LOSS_DUMMY	An indicator variable taking a value of 1 if the firm reports a loss at time t-1 and 0 otherwise.	COMPUSTAT's Fundamentals Annual database
Profitability of firm	PROFIT	The ratio of income before extraordinary items to total assets of the firm at time t-1.	COMPUSTAT's Fundamentals Annual database
Age of firm	FIRM_AGE	The natural logarithm of the age of the firm at time t-1 since its first appearance in CRSP.	Center for Research in Security Prices (CRSP) database
Volatility of returns	VOL	The standard deviation of the firms daily stock returns over one year period at time t-1.	Center for Research in Security Prices (CRSP) database
Trading volume	TURNOVER	The average of the ratio of trading volume per year to stock outstanding of the firm at time t-1.	Center for Research in Security Prices (CRSP) database
Analyst coverage	ANALYST_COVERAGE	The natural logarithm of 1 plus number of analysts following the firm in year t-1.	I/B/E/S
<u>Panel D: Other variables</u>			
CEO chairman	CEO_POWER	An indicator variable that takes a value of 1 if the CEO of the firm is also the chairperson of the board and 0 otherwise.	Thomson Reuters Insiders Filings Database

Name of variables	Symbol	Description	Source
Institutional ownership	INS_INVESTORS	The natural logarithm of total number of institutional investors in the firm.	Thomson Reuters Institutional (13f) Holdings

Recent stock return	PAST_RETURN	The value-weighted market adjusted return at time t-1.	Center for Research in Security Prices (CRSP) database
Governance index	G_INDEX	A governance index for each firm constructed following Bebchuk et al. (2009).	ISS (formerly RiskMetrics)
Alternate Governance index	G_INDEX_ALT	An alternate governance index for the firm constructed following Gompers et al. (2003).	ISS (formerly RiskMetrics)
Product market competition	COMPETITION	A text-based network industry classifications and total similarity index for the firm following Hoberg and Phillips (2016).	http://hobergphillips.tuck.dartmouth.edu/industryconcen.htm
Research and development intensity	R&D_INTENSITY	The ratio of R&D expenditures to total assets of the firm.	COMPUSTAT's Fundamentals Annual database
Simple or complex firms	COMPLEXITY_BUS_SEG or COMPLEXITY_GEO_SEG	Complexity is high (low) if the firms' number of business segments and geographic segments are higher (lower) than sample median.	COMPUSTAT's Segments database
Co-opted boards	DIRECTORS_CO-OPTED or DIRECTORS_CO-OPTED_TENURE	The fraction of directors or tenure-weighted directors appointed in the firm after the CEO assumes the role following Coles et al. (2014).	Personal Website of Lalitha Naveen

Table 1 Descriptive Statistics

This table provides descriptive statistics for the key variables used in the study. The key variable of interest is the firm-level insider opportunism (OPPORTUNISTIC_FIRM): the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Here, profitability for each insider trade is estimated as the average market-adjusted return in five-day event window centred at the QEA date. We use board independence (IND_DIR) as our main explanatory variable. IND_DIR is estimated by taking the ratio of number of independent directors to total directors sitting on a board. We have a large set of control variables: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE. Descriptions of all these variables are provided in Table A1.

Name of Variables	Observations	Mean	Median	SD
Panel A : Board characteristics				
# of DIRECTORS	18,194	9.012	9.000	2.304
IND_DIR	18,194	0.714	0.750	0.165
BOARD_SIZE	18,194	2.166	2.197	0.257
Panel B : Firm characteristics				
OPPORTUNISTIC_FIRM	18,194	0.027	0.000	0.105
FIRM_SIZE	18,194	7.597	7.402	1.574
MTB	18,194	3.515	2.516	3.401
R&D_DUMMY	18,194	0.874	1.000	0.331
LOSS_DUMMY	18,194	0.070	0.000	0.256
PROFIT	18,194	0.051	0.058	0.112
FIRM_AGE	18,194	2.903	2.957	0.832
VOL	18,194	0.026	0.023	0.013
TURNOVER	18,194	1.993	2.010	0.757
ANALYST_COVERAGE	18,194	2.090	2.215	0.884

Table 2 Correlation matrix

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	OPPORTUNISTIC FIRM	1											
(2)	IND DIR	-0.028***	1										
(3)	BOARD SIZE	-0.046***	0.133***	1									
(4)	FIRM SIZE	-0.074***	0.245***	0.568***	1								
(5)	MTB	-0.005	-0.005	0.002	0.328***	1							
(6)	R&D DUMMY	0.002	0.068***	0.001	0.022**	0.043***	1						
(7)	LOSS DUMMY	0.031***	-0.032***	-0.137***	-0.158***	-0.020**	0.063***	1					
(8)	PROFIT	-0.030***	0.015*	0.050***	0.048***	0.160***	-0.045***	-0.493***	1				
(9)	FIRM AGE	-0.082***	0.237***	0.379***	0.384***	-0.076***	0.094***	-0.092***	0.068***	1			
(10)	VOL	0.059***	-0.194***	-0.333***	-0.370***	0.019**	-0.002	0.352***	-0.292***	-0.358***	1		
(11)	TURNOVER	0.037***	0.197***	-0.196***	0.016*	0.076***	-0.092***	0.131***	-0.056***	-0.204***	0.396***	1	
(12)	ANALYST COVERAGE	-0.020**	0.168***	0.213***	0.469***	0.151***	-0.090***	-0.099***	0.140***	0.109***	-0.188***	0.270***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Baseline results: Board independence and insider opportunism

This table shows the results from OLS regressions that link board independence with insider opportunism. Following Ali and Hirshleifer (2017), firm-level insider opportunism (OPPORTUNISTIC_FIRM) is identified by measuring the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market adjusted return in five-day event window centred at the QEA date. The key explanatory variable is board independence (IND_DIR) which is measured by taking the ratio of number of independent directors to total directors on a board. We have a set of control variables: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variable: OPPORTUNISTIC_FIRM	
	(1)	(2)
IND_DIR	-0.012**	-0.017***
	(2.01)	(2.68)
BOARD_SIZE	0.008*	0.009**
	(1.90)	(2.02)
FIRM_SIZE	-0.004***	-0.005***
	(5.99)	(6.01)
MTB	-0.000	0.000
	(1.02)	(0.38)
R&D_DUMMY	0.004*	0.003
	(1.73)	(0.71)
LOSS_DUMMY	0.001	-0.001
	(0.26)	(0.26)
PROFIT	-0.007	-0.006
	(0.70)	(0.65)
FIRM_AGE	-0.007***	-0.007***
	(5.04)	(4.38)
VOL	0.297**	0.138
	(2.39)	(1.12)
TURNOVER	0.001	0.001
	(0.80)	(0.79)
ANALYST_COVERAGE	0.002**	0.001
	(2.01)	(1.15)
Industry Fixed Effects	No	Yes
Year Fixed Effects	Yes	Yes
SE Clustering	Firm	Firm
Observations	18,194	18,194
Adjusted R^2	0.012	0.021

Table 4 Difference-in-difference analysis: Pre-SOX voluntary compliant versus non-compliant firms

This table shows the causal link between board independence and insider opportunism. The key variable is the interaction of TREATED and POST. TREATED is a dummy variable that takes a value of 1 if firms do not comply with the majority independent board and 100% independent audit committee before the SOX Act and 0 if they are control firms. The control firms are those who are already compliant with a majority independent board and 100% audit committee requirement before the SOX Act. POST is a dummy variable that takes a value of 1 if the observations are from the year 2002 or later and 0 otherwise. Control firms are identified by matching on all the following variables: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE. The matching is performed using nearest-neighbour propensity score with a 0.005 caliper during the period 2000-2001. Following Ali and Hirshleifer (2017), firm-level insider opportunism (OPPORTUNISTIC_FIRM) is identified by measuring the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market-adjusted return in five-day event window centred at the QEA date. The definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Panel A: Ex-ante summary statistics

	Non-Compliant Firms (TREATED)		Compliant Firms (CONTROL)		TREATED minus CONTROL
VARIABLES	(1) Mean	(2) Standard Deviation	(3) Mean	(4) Standard Deviation	(5) Difference in Means
IND_DIR	0.429	0.136	0.652	0.152	-0.223***
BOARD_SIZE	2.129	0.281	2.140	0.304	-0.011
FIRM_SIZE	7.691	1.771	7.702	1.739	-0.011
MTB	4.570	4.909	4.345	4.507	0.225
R&D_DUMMY	0.896	0.306	0.862	0.346	0.034
LOSS_DUMMY	0.052	0.222	0.060	0.239	-0.008
PROFIT	0.069	0.074	0.070	0.067	-0.001
FIRM_AGE	2.682	0.784	2.674	0.941	0.008
VOL	0.036	0.013	0.034	0.013	0.002
TURNOVER	1.636	0.857	1.541	0.809	0.095
ANALYST_COVERAGE	2.086	0.945	1.996	1.062	0.089

Panel B: Regression results – Difference-in-difference

	Dependent variable: OPPORTUNISTIC_FIRM	
	(1)	(2)
TREATED×POST	-0.029**	-0.029**
	(2.01)	(2.14)
TREATED	0.005	0.065
	(0.49)	(1.02)
POST	0.015	0.011
	(1.34)	(0.89)
ALL OTHER CONTROLS	Yes	Yes
Industry Fixed Effects	Yes	No
Firm Fixed Effects	No	Yes
SE Clustering	Firm	Firm
Observations	1,332	1,332
Adjusted R^2	0.010	0.010

Table 5 Robustness checks: Alternative measures of board independence and opportunistic trading

This table shows the outcome of using alternative measures of board independence and opportunistic insider trading in firms. For alternative measure of board independence (IND_ALT), we take the natural logarithm of 1 plus total number of independent directors on a board. For opportunistic insider trading, following Cohen et al. (2012), routine traders are identified as those who place their trade in the same calendar month for three consecutive years, whereas all other traders are identified as opportunistic traders. NON_ROUTINE is an indicator variable that takes a value of 1 if the insider is identified as opportunistic and 0 otherwise. Our set of control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variables: OPPORTUNISTIC_FIRM and NON_ROUTINE		
	OPPORTUNISTIC_FIRM	NON_ROUTINE	NON_ROUTINE
	(1)	(2)	(3)
IND_ALT	-0.010**		
	(2.23)		
IND_DIR		-0.038**	-0.069***
		(2.25)	(2.66)
ALL OTHER CONTROLS	Yes	Yes	Yes
Industry Fixed Effects	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes
SE Clustering	Firm	Firm	Firm
Observations	18,194	18,194	10,770
Adjusted/Pseudo R^2	0.021	0.026	0.141

Table 6 Robustness checks: Additional controls

This table shows the relationship between independent boards and insider opportunism. The additional control variables included are as follows: CEO_POWER, a dummy variable that takes a value of 1 if the CEO is also the chairperson of the board and 0 otherwise; INS_INVESTORS, the natural logarithm of total number of institutional investors in a firm; PAST_RETURN, the market adjusted return at time t-1; G_INDEX and G_INDEX_ALT, the standard governance indexes, constructed following Bebchuk et al. (2009) and Gompers et al. (2003), respectively. We follow Ali and Hirshleifer (2017) to identify OPPORTUNISTIC_FIRM, measured by the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the Quarterly Earnings Announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market adjusted return in five-day event window centred at the QEA date. Our set of baseline control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variables: OPPORTUNISTIC_FIRM	
	(1)	(2)
IND_DIR	-0.020**	-0.026**
	(2.30)	(2.30)
CEO_POWER	0.003	0.002
	(1.18)	(0.63)
INS_INVESTORS	-0.012**	-0.011
	(2.31)	(1.34)
PAST_RETURN	-0.190**	-0.064
	(5.00)	(1.45)
G_INDEX	-0.001	
	(0.57)	
G_INDEX_ALT		-0.001
		(0.94)
ALL OTHER CONTROLS	Yes	Yes
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
SE Clustering	Firm	Firm
Observations	12,668	4,020
Adjusted R^2	0.026	0.017

Table 7 Additional analysis: Potential channel

This table provides analysis exploring the potential channel of how independent boards affect insider opportunism. Following Roulstone (2003), we identify self-imposed insider trading restrictions of firms based on the percentage of shares traded by insiders within one-month following earnings announcements (denoted SAFE, as in Roulstone, 2003). The higher is the percentage, the higher is the deemed restrictions in firms i.e. a higher level of "SAFE" insider trading. Following Roulstone (2003), we also identify insider trading restrictions by a dummy variable (RESTRICT) that takes the value of 1 if 75% or greater of insider trading takes place within one-month window around earnings announcements and 0 otherwise. We follow Ali and Hirshleifer (2017) to identify OPPORTUNISTIC_FIRM, measured by the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the Quarterly Earnings Announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market adjusted return in five-day event window centred at the QEA date. The key explanatory variables are the interaction terms. Our set of control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variables: OPPORTUNISTIC_FIRM	
	(1)	(2)
IND_DIR	0.016	-0.003
	(1.13)	(0.32)
SAFE	0.008	
	(0.55)	
RESTRICT		0.010
		(1.18)
IND_DIR × SAFE	-0.046**	
	(2.35)	
IND_DIR × RESTRICT		-0.029**
		(2.56)
ALL OTHER CONTROLS	Yes	Yes
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
SE Clustering	Firm	Firm
Observations	15,277	15,277
Adjusted R^2	0.024	0.023

Table 8 Additional analysis: The role of competition and R&D intensity

This table shows how independent directors affect insider opportunism in competitive markets (COMPETITION) and R&D intensive firms (R&D_INTENSITY). Following Hoberg and Phillips (2016), we utilize text-based network industry classifications and total similarity index as a measure of COMPETITION. We measure R&D_INTENSITY by R&D expenditures to total assets ratio. We follow Ali and Hirshleifer (2017) to identify OPPORTUNISTIC_FIRM, measured by the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market-adjusted return in five-day event window centred at the QEA date. The key explanatory variables are the interaction terms. Our set of control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variable: OPPORTUNISTIC_FIRM	
	(1)	(2)
IND_DIR	-0.027***	-0.027***
	(3.38)	(3.80)
COMPETITION	-0.001	
	(1.61)	
R&D_INTENSITY		-0.144**
		(2.47)
IND_DIR × COMPETITION	0.003**	
	(2.51)	
IND_DIR × R&D_INTENSITY		0.306***
		(3.24)
ALL OTHER CONTROLS	Yes	Yes
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
SE Clustering	Firm	Firm
Observations	17,820	18,194
Adjusted R^2	0.022	0.022

Table 9 Cross-sectional tests: Board independence, firm complexity, and insider opportunism

This table shows the cross-sectional tests for the monitoring role of independent boards. It shows how the relationship between IND_DIR and OPPORTUNISTIC_FIRM varies cross-sectionally among firms with differing levels of complexity. The dependent variable is OPPORTUNISTIC_FIRM. Following Ali and Hirshleifer (2017), OPPORTUNISTIC_FIRM is identified by measuring the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market-adjusted return in five-day event window centred at the QEA date. IND_DIR is measured by taking the ratio of number of independent directors to total directors sitting on a board. Following in the spirit of Coles et al. (2008), we define complexity as high (low) if number of business segments (COMPLEXITY_BUS_SEG) or geographic segments (COMPLEXITY_GEO_SEG) are higher (lower) than sample median. Our set of control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variable: OPPORTUNISTIC_FIRM			
	COMPLEXITY_BUS_SEG		COMPLEXITY_GEO_SEG	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
IND_DIR	-0.010	-0.025***	-0.011	-0.024**
	(1.00)	(2.71)	(1.19)	(2.51)
ALL OTHER CONTROLS	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustering	Firm	Firm	Firm	Firm
Observations	7,808	7,291	9,433	5,666
Adjusted R^2	0.033	0.029	0.038	0.033
Difference in coefficients on IND_DIR between High vs Low sub-sample: $\chi 2$ (p-value)		8.80*** (0.01)		8.09** (0.02)

Table 10 Cross-sectional tests: Board independence, co-opted boards, and insider opportunism

This table shows the cross-sectional tests for the monitoring role of independent boards. It shows how the relationship between IND_DIR and OPPORTUNISTIC_FIRM varies cross-sectionally in co-opted boards. The dependent variable is OPPORTUNISTIC_FIRM. Following Ali and Hirshleifer (2017), OPPORTUNISTIC_FIRM is identified by measuring the ratio of the number of highest ranked quintile 5 insiders to total number of insiders based on profitability of trades and their rankings in 5 quantiles during the 21 days before the quarterly earnings announcements (QEA) in a particular year. Profitability for each insider trade is estimated as the average market-adjusted return in five-day event window centred at the QEA date. IND_DIR is measured by taking the ratio of number of independent directors to total directors sitting on a board. Following Coles et al. (2014), we define co-opted boards as high (low) if the firms' fraction of directors appointed after the CEO assumed the role is higher (lower) than sample median. We also use tenure-weighted measure of board co-option and classify as high (low) if the measure is higher (lower) than sample median. Our set of control variables comprise: BOARD_SIZE, FIRM_SIZE, MTB, R&D_DUMMY, LOSS_DUMMY, PROFIT, FIRM_AGE, VOL, TURNOVER, and ANALYST_COVERAGE and the definitions of all these variables are included in Table A1. The standard errors are clustered at firm level. The t-values are reported in parentheses and ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively.

Independent variables	Dependent variable: OPPORTUNISTIC_FIRM			
	DIRECTORS_CO-OPTED		DIRECTORS_CO-OPTED_TENURE	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
IND_DIR	-0.014	-0.026**	-0.014	-0.023**
	(1.47)	(2.54)	(1.47)	(2.30)
ALL OTHER CONTROLS	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustering	Firm	Firm	Firm	Firm
Observations	8,522	6,797	8,371	6,948
Adjusted R^2	0.025	0.026	0.027	0.035
Difference in coefficients on IND_DIR between High vs Low sub-sample: $\chi 2$ (p-value)		9.16*** (0.01)		8.19** (0.02)