

# Corporate governance and the profitability of insider trading

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**Abstract :** This paper examines the influence of corporate governance systems on insiders' ability to profit from their information advantage and the ways through which corporate governance systems influence such ability. We find that corporate governance significantly reduces the profitability of insider sales but not that of insider purchases. Given that sales involve greater legal risk than purchases, the results suggest that well-governed firms restrict informed insider trading mainly to reduce legal risk. We also find that better-governed firms reduce the profitability of insider sales by increasing the likelihood of adopting ex-ante preventive measures (e.g., voluntary insider trading restriction policies), implementing such measures more effectively, and taking ex-post disciplinary actions more actively. These results highlight how better-governed firms are able to restrict insiders from exploiting private information.

**Keywords:** Corporate governance; Insider purchases; Insider sales; Profitability of insider trading; Legal risk

**JEL Classification:** G34, K22

*Corporate governance restricts the profitability of insider sales but not that of insider purchases;  
Better-governed firms are more likely to adopt voluntary insider trading restriction policies;  
Better-governed firms enforce voluntary insider trading restriction policies more effectively;  
Better-governed firms are more likely to discipline CEOs who engage in informed insider sales transactions.*

## 1 Introduction

Although insider trading could play a positive role by making the market more efficient and by helping firms compensate managers for their successful entrepreneurship (e.g., Manne, 1966; Roulstone, 2003; Piotroski and Roulstone, 2005), a number of previous studies emphasize that informed insider trading allows insiders to exploit their information advantage over other market participants and thus enables them to extract private benefits (e.g., Seyhun 1986; Fishman and Hagerty, 1992; Bettis et al., 2000; Jagolinzer et al., 2011; Agrawal and Nasser, 2012; Kraft et al., 2014; Lee et al., 2014; Agrawal and Cooper, 2015; Aitken et al., 2015; Hillier et al., 2015). Consistent with this negative view of insider trading, policymakers have placed various restrictions on insider trading, such as Rule 10b-5 of the Securities Exchange Act of 1934, the Insider Trading and Securities Fraud Enforcement Act (ITSFEA), and the Stock

Remedies and Penny Stock Reform Act (SERPSRA).<sup>1</sup>

In this paper, we extend the literature on insider trading by examining the influence of corporate governance systems on insiders' ability to profit from their information advantage and the ways through which governance systems influence such ability. Focusing on legal risk as one of the key reasons why governance systems limit insiders' ability to profit from their information advantage, we investigate how legal risk incentivizes well-governed firms to pay closer attention to restricting informed insider sales than to restricting informed insider purchases. We also examine three mechanisms that corporate governance uses to restrict informed insider trading: 1) increasing the likelihood of adopting ex-ante preventive measures (e.g., voluntary insider trading policies (ITPs)), which has been already investigated in previous studies but with mixed results, <sup>2</sup>) implementing such measures more effectively, and 3) taking ex-post disciplinary actions more actively against informed transactions. To the best of our knowledge, the last two channels have not been examined in previous studies.

There are at least two reasons why well-governed firms are expected to discourage their insiders from exploiting private information. First, if managers engage in insider trading for their own benefit at the expense of shareholders and if corporate governance systems are designed to align the interests of shareholders with those of the managers, these systems should effectively limit managerial incentives and abilities to profit from such trading. Second, due to the ITSFEA, firms are responsible for employees' illegal transactions. Moreover, previous studies show that weak corporate governance is associated with more securities fraud class actions (Helland and Sykuta, 2005) and more accounting enforcement actions by the Securities and Exchange Commission (SEC) (Beasley, 1996; Dechow et al., 1996). These suggest that firms have strong incentives to adopt well-functioning corporate governance mechanisms that can minimize legal risk arising from informed insider transactions.<sup>2</sup>

In addressing the role of corporate governance in restricting informed insider trading, we focus on legal risk as an important factor that well-governed firms care about when restricting informed insider trading. Specifically, given that insider sales involve greater legal risk than insider purchases, our analysis focuses on examining whether the restrictive

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<sup>1</sup> See Bhattacharya (2014) for a summary of various views on insider trading. He uses the artifice of a hypothetical trial to present the cases for and against insider trading.

<sup>2</sup> In a related study, Ravina and Sapienza (2010) show that market-adjusted abnormal returns earned by executives and independent directors are closely related to the GIM index. Although their study provides evidence on how the quality of a firm's governance affects the profitability of insider trading, given the limitation of the GIM index as an overall corporate governance measure as pointed out in Bhagat and Bolton (2008), we still do not fully understand the role of corporate governance in limiting the profitability of insider trading. Moreover, their main research question is not to examine the relation between corporate governance and profits earned by insiders, but to compare the trading performance of independent directors with that of other executives. Recently, using Dutch data, Cziraki et al. (2014) show that insiders are more likely to exploit private information when they cannot reap large private benefits of control due to stronger corporate governance standards related to anti-shareholder mechanisms. This

effect of corporate governance on the informativeness of insider trading is higher for insider sales than for insider purchases.

Sales transactions tend to be less informative than purchase transactions because insiders have various reasons to sell their shares that are not related to private information (e.g., Lakonishok and Lee, 2001; Rogers, 2008). Moreover, some studies document that firms do not experience negative abnormal returns (i.e., insiders do not earn abnormal profits) following insiders' sales transactions in recent periods, although insiders continue to earn abnormal profits from their purchase transactions (e.g., Jeng et al., 2003; Jagolinzer et al., 2011; Lee et al., 2014). These findings indicate that shareholders' concerns are lower in insider sales than in insider purchases, limiting the role of governance mechanisms in restricting insider sales.

However, there are at least three reasons why good corporate governance discourages insiders from exploiting negative private information (i.e., selling). First, previous studies show that insiders exploit negative private information and earn abnormal profits by selling their shares prior to the disclosure of such information (e.g., Jagolinzer, 2009; Muller et al., 2012; Agrawal and Cooper, 2015).<sup>4</sup> Second, evidence suggests that legal risk associated with insider sales is greater than legal risk associated with insider purchases (e.g., Cheng and Lo, 2006; Johnson et al., 2007; Rogers, 2008) and that such risk is particularly high if they occur prior result suggests that insider trading profits and private benefits of control are substitutes, raising the question of whether corporate governance mechanisms are able to limit informed insider transactions.<sup>4</sup> Jagolinzer (2009) and Muller et al. (2012) point out that even when insiders use pre-planned selling within Rule 10b5-1, which was promulgated by the SEC in October 2000, they can still take advantage of their private information by timing their disclosures in facilitating the pre-planned sales. Agrawal and Cooper (2015) document that insiders sell more intensively before the announcements of earnings restatements.

the release of negative earnings news with no warning about earnings disappointments (Billings and Cedergren, 2015).<sup>3</sup> Finally, allowing insider sales cannot be viewed as an optimal way to compensate managers for their success because insider sales are more likely to reflect managerial failure rather than entrepreneurial success. Therefore, even well-governed firms with optimal compensation structures are likely to devote efforts to discouraging informed insider sales.

Overall, these arguments suggest that although insiders on average do not earn abnormal profits from their sales, firms have incentives to design corporate governance mechanisms that can discourage informed insider sales. Additionally, even though insiders earn significantly positive abnormal profits from their purchase transactions, shareholders may be less concerned about restricting these transactions because they involve lower legal risk, and abnormal profits can be considered as compensation for managerial success.

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<sup>3</sup> Cheng and Lo (2006) show that managers strategically choose disclosure policies and time their purchase transactions but not sales transactions, suggesting that they are aware of potential legal risk involved with exploiting negative private information. Moreover, Rogers (2008) points out that private litigants focus almost exclusively on insider selling cases and shows that managers optimally choose disclosure policies to reduce legal risk before insider sales, but not before insider purchases. In addition, Johnson et al. (2007) show that litigation significantly increases after abnormal insider selling, especially after the Private Securities Litigation Reform Act of 1995, and Billings and Cedergren (2015) find that the probability of being sued significantly increases when insiders engage in insider sales prior to the release of negative earnings news, especially when they do not provide prior warnings or when they engage in opportunistic trading. Jagolinzer (2009) and Henderson et al. (2012) further show that insiders exploit their negative private information in a way that minimizes legal risk. They show that to reduce the legal risk of insider sales, insiders strategically use voluntary disclosure of planned trades according to Rule 10b5-1 of the Securities and Exchange Act of 1934. They further show that insiders earn high abnormal returns from their sales after creating legal cover by articulating specific plan details based on Rule 10b5-1.

Next, to show how corporate governance works to restrict informed insider trading, we examine three specific mechanisms through which corporate governance affects the profitability of insider trading. One possible mechanism is through influencing firms to voluntarily adopt

ITPs to restrict insider trading ex ante. Bettis et al. (2000), Jagolinzer et al. (2011), and Lee et al. (2014) show that firms voluntarily adopt ITPs to restrict insider trading and that these policies significantly affect the profitability of insider trading. Given that ITPs reduce firms' legal risk, firms with better corporate governance are more likely to adopt such policies ex-ante. Although Jagolinzer et al. (2011) and Lee et al. (2014) have already examined the link between corporate governance and likelihood of adopting ITPs, given their mixed evidence, our analysis is likely to provide further evidence on the issue. Related, but another mechanism through which corporate governance restricts informed insider trading is to implement voluntary ITPs more effectively. If this mechanism indeed works, we will expect insiders of better-governed firms to make less informed transactions by trading mostly during the short window allowed to trade under ITPs or engage in mostly routine transactions.<sup>4</sup> The last mechanism is to limit managerial incentives to engage in insider trading through ex-post disciplinary actions against insiders who engage in informed transactions. This ex-post mechanism can restrict future informed insider trading by signaling a firm's commitment to discipline top executives when they engage in transactions that exploit private information.<sup>5</sup>

We test the importance of these three potential mechanisms by examining 1) whether the quality of a firm's corporate governance is positively associated with the likelihood of adopting

ITPs and policies that require GC's pre-approval, 2) whether conditional on firms' adoption of these policies, insider transactions in firms with better governance are more likely to occur during the allowed period (i.e., within one month after earnings announcement), or belong to routine trades that are less informative, and 3) whether the likelihood of forced CEO turnover is higher in better-governed firms whose CEOs engaged in informed insider transactions.

Using a large sample of insider transactions made by officers and directors of firms listed on the NYSE, AMEX, or NASDAQ from 1998 to 2011, we find that better corporate governance significantly reduces the six-month profitability of insider sales but not that of insider purchases.

This asymmetric effect of governance on the profitability of insider trading is consistent with both the legal risk-based explanation by Cheng and Lo (2006) and Rogers (2008) and the compensation-based explanation suggested by Roulstone (2003).<sup>6</sup> The results are robust to using a variety of corporate governance measures, insider trading profitability measures, regression model specifications, and controlling for endogeneity bias.

We also find that the impact of a firm's corporate governance on the profitability of insider sales is more pronounced for firms with greater ex-ante litigation risk and for opportunistic transactions that are more likely to attract the attention of the SEC (Cohen et al., 2012). These results indicate that good governance plays an important role in reducing the profitability of insider sales transactions that are likely to be motivated by negative private information and thus increase legal risk.

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<sup>4</sup> Cohen et al. (2012) show that routine insider transactions are not informative about firms' future while opportunistic transactions are.

<sup>5</sup> Examples of disciplinary actions include oral or written warning, suspension, removal of job duties and responsibilities, and reduction in compensation. Niehaus and Roth (1999) show that the likelihood of CEO turnover among the defendant firms under securities class actions is significantly positively associated with the extent of insider selling during the period when firms are accused of not releasing material information to the public.

<sup>6</sup> Since allowing profitable insider purchases and prohibiting opportunistic insider sales are potential ways to reward and discipline managers for their success and failure, respectively, an optimal compensation/governance structure may restrict only insider sales, suggesting that good corporate governance asymmetrically affects the profitability of insider trading depending on types of insider transactions.

In addition, we find that firms with better corporate governance are more likely to adopt voluntary restriction policies, such as ITPs and policies that require GC pre-approval. We further find that the negative relation between the quality of corporate governance and the profitability of insider sales holds even after controlling for these ex-ante voluntary restriction policies, suggesting that good governance systems affect the profitability of insider trading not only through their influence on the likelihood of adopting ex-ante measures but also through other channels. More specifically, we find that better-governed firms implement these ex-ante voluntary restriction policies more effectively: insiders of well-governed firms with ex-ante restriction policies are more likely to trade their shares during the period allowed to trade by the policies. In addition, their transactions are more likely to be routine trades that tend to be less informative. We also find that better-governed firms are more likely to take an active ex-post disciplinary action (i.e., forced CEO turnover) against CEOs who engage in informed insider sales transactions. Thus, corporate governance affects the profitability of insider trading by increasing the likelihood of adopting ex-ante preventive measures such as ITPs and policies that require GC pre-approval, implementing such measures more effectively, and taking ex-post disciplinary actions such as forced CEO turnover more actively. These results shed new light on understanding the mechanisms through which corporate governance affects the profitability of insider trading.

Our paper contributes to the literature in at least two important ways. First, it contributes to the literature on corporate governance and insider trading. Although some studies show that legal risk affects insider trading behavior (Cheng and Lo, 2006; Jagolinzer and Roulstone, 2009; Lee et al., 2014), we still do not know much about the role of legal risk in corporate governance and insider trading. Our study shows that reducing legal risk is one of important reasons why wellgoverned firms exert their efforts to restrict informed insider trading.

Second, our paper identifies the mechanisms through which well-governed firms restrict informed insider trading, which, to the best of our knowledge, has not attracted much attention in previous studies. Although prior literature examines whether corporate governance systems influence the likelihood of adopting ex-ante restrictive measures such as ITPs and GC's approval policies, the evidence is largely mixed. Our study shows that to restrict insiders from exploiting private information, better-governed firms not only increase the likelihood of adopting these exante preventive measures but also implement these ex-ante voluntary restriction policies more effectively and take ex-post disciplinary actions (i.e., forced CEO turnover) more actively.

The remainder of the paper is organized as follows. In Section 2, we discuss the construction of our key variables of interest (the measures of the quality of a firm's corporate governance and the profitability of insider trading) and describe the data and sample characteristics. Section 3 outlines our empirical methodology and presents the main empirical results. In Section 4 we examine the channels through which corporate governance discourages insiders from taking advantage of negative private information. We present the summary and concluding remarks in Section 5.

## **2 Variable construction and sample description**

### **2.1 Measures of corporate governance quality**

To measure the quality of a firm's corporate governance, we focus on board independence and institutional ownership. Previous studies emphasize the importance of board independence in corporate governance. For example, Weisbach (1988), Rosenstein and Wyatt (1990), Byrd and Hickman (1992), Hermalin and Weisbach (1998), and Bhagat and Bolton (2008) show that independent directors protect the interests of shareholders when managers' interests diverge from shareholders', suggesting that the board independence is an important corporate governance measure. Roulstone (2003) shows that the executives of firms with restriction policies on insider trading tend to receive a premium in their total compensation, suggesting that ITPs are closely related to executive compensation. Given the importance of the compensation committee in determining executive compensation structures, the independence of compensation

committee is likely to be crucial for corporate governance to be effective in controlling and monitoring insiders' incentives. Therefore, we use the percentage of independent directors on the board and the percentage of independent directors in the compensation committee as the measures of board independence.

The literature also shows that large shareholders perform an important monitoring function (Shleifer and Vishny, 1986). For example, Hartzell and Starks (2003) find that institutional investors have strong incentives to closely monitor managers when they have a large stake in the firms. We use two measures to capture the governance role of large shareholders: the percentage of ownership held by institutional investors and the percentage of shares held by the top five independent, long-term, and dedicated/quasi-indexer institutional investors as defined in Chen et al. (2007).

To measure the overall quality of a firm's corporate governance, we conduct principal component analysis and use the first principal component of the above four measures as a measure of the quality of corporate governance, CG.<sup>7</sup> To check the robustness of our results, we use an alternative measure based on a more comprehensive list of corporate governance variables including board size, the percentages of old directors, an indicator for busy directors, an indicator for at least one independent director who is a large shareholder, the fraction of directors whose tenure predates the CEO, an indicator for CEO/Chairman duality, and the ownership held by insiders as in Armstrong et al. (2012), Hazarika et al. (2012) and Hoechle et al. (2012). Similar to CG, we use the first principal component of these variables plus the four variables used to calculate CG to obtain a more comprehensive governance measure, CGBroad. Appendix 1 summarizes the detailed description on the construction of each governance variable used in the analysis.<sup>10</sup>

We obtain the above governance data from RiskMetrics, ExecComp, and Thomson Reuters' institutional holdings (13F) databases. RiskMetrics provides information on director ownership and compensation committee membership starting from 1998, while ExecComp provides information on CEO/Chairman duality and insider ownership for about 2,800 firms that are or were members of the Standard and Poor's (S&P) 500 index, the S&P MidCap 400 index, or the S&P SmallCap 600 index. Finally, we collect the institutional ownership data from the Thomson Reuters' institutional holdings (13F) database. The data availability allows us to measure the quality of corporate governance from 1998.

In addition, we experiment with another alternative measure of the quality of a firm's corporate governance, i.e., the self-constructed governance score based on the Corporate Governance Quotient (CGQ) attributes provided by Institutional Shareholder Services (ISS).

This measure has been used in several papers including Aggarwal et al. (2009), Bernile and Jarrell (2009), Chung et al. (2010) and Chung and Zhang (2011). ISS covers a large set of U.S. firms included in the S&P 500 index, the S&P Small-Cap 600 index, or the Russell 3000 index starting from 2001.<sup>11</sup> Following these previous studies, we define the ISS governance score, CGISS, as the number of minimally acceptable governance attributes met by a firm out of 64 governance attributes along eight major dimensions, with higher ISS scores indicating better governance.

## **2.2 Measure of insider trading profitability**

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<sup>7</sup> Our results are quantitatively similar when the individual measures are aggregated as one composite measure of corporate governance using an approach similar to the one used in Larcker et al. (2007) and Armstrong et al. (2012).

<sup>10</sup> Our corporate governance measures are more related to internal corporate governance than external corporate governance. Even though institutional ownership can be considered as one of important external governance forces, to the extent that institutional investors as shareholders (i.e., owners) play an important role in shaping internal governance at portfolio firms, institutional ownership can serve as an effective internal governance system. We focus more on internal governance measures rather than external governance measures because they are more likely to be directly responsible for preventing informed insider trading that makes firms susceptible to high litigation risk.

<sup>11</sup> ISS also covers the firms that are required to file various documents and forms with the SEC through the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). For a detailed description of CGQ for U.S. firms covered by ISS, see Aggarwal and Williamson (2006) and Aggarwal et al. (2009).

We measure the profitability of insider trading by estimating abnormal returns over the 180 calendar days following the transaction date.<sup>8</sup> We use two approaches to calculate abnormal returns. First, similar to Ravina and Sapienza (2010), we use the six-month market-adjusted abnormal return defined as the difference between a firm's buy-and-hold return over the 180 calendar days following the transaction date and the corresponding buy-and-hold return for the market (ProfitBHAR), where we use the CRSP value-weighted index as a proxy for the market portfolio.

Second, as an alternative measure of insider trading abnormal returns, we follow Jagolinzer et al. (2011) and use an intercept from the Carhart (1997) four-factor model estimated over the 180 calendar days subsequent to the transaction date (ProfitAlpha). To save space, we present most of our results based on the market-adjusted abnormal returns since the results based on the fourfactor model are qualitatively similar.<sup>9</sup> Throughout the paper, we multiply post-transaction abnormal returns of sales by -1 to indicate that the numbers reported in the paper are abnormal profits earned by insiders.

### 2.3 Sample selection and summary statistics

Our initial sample includes insider transactions of firms listed on the NYSE, AMEX, or NASDAQ covered in Thomson Financial Insiders Data Feed (IDF) from 1998 to 2011. The Thomson Financial IDF contains trade information on directors, officers, and large stockholders with holdings greater than 10% of a firm's stock, all subject to disclosure requirements as defined in Section 16 of the Securities Exchange Act of 1934. Since our main hypothesis about the role of governance in preventing insiders from exploiting private information is relevant only for officers and directors, we exclude transactions made by large shareholders from the sample and use only transactions made by officers and directors in most of our analyses. We also focus only on valid open market or private purchase and sales transactions of common shares.<sup>10</sup> To be included in our sample, we also require that firms be covered by RiskMetrics, ExecuComp, and Thomson Reuters' institutional holdings (13F) databases, and that their stock return and financial data be available in CRSP and Compustat, respectively.

Following previous studies, we further limit the sample by requiring that share codes in CRSP be 10 or 11, and we exclude the following transactions from the sample: (1) transactions with less than 100 shares or those with trading prices less than \$2; (2) transactions with traded prices outside the range between the daily low and high prices reported in CRSP; (3) transactions with the number of shares exceeding the total number of shares outstanding in CRSP; (4) transactions with the number of shares traded exceeding the total daily trading volume in CRSP; and (5) regulated firms in the financial or utilities industries (firms with SIC codes between 6000 and 6999 or between 4900 and 4999). These

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<sup>8</sup> We focus on the window of the 180 days because of the "short swing" rule (Section 16(b) of the Securities Exchange Act of 1934) that prohibits insiders from earning profits in a round-trip transaction within a six-month interval, which is likely to force insiders not to reverse their position for at least six months. We also examine how short-term (three days around the filing date of insider trading) abnormal returns are affected by the effectiveness of corporate governance, and find that the market interprets the announcements of insider sales in better-governed firms as less informative news than those in poorer-governed firms. Finally, we use the log of total dollar profits earned from insider trading as an alternative measure of the informativeness of insider trading and find similar results. Since total dollar profits are confounded by size and individual wealth effects, we focus on the measures based on abnormal returns as in previous studies (Ravina and Sapienza, 2010; Jagolinzer et al., 2011).

<sup>9</sup> In Table 2, we use the monthly time-series portfolio approach to estimate average abnormal returns (alphas) based on the four-factor model as in Loughran and Ritter (1995) and Cohen et al. (2012).

<sup>10</sup> A valid transaction is one without a cleanse code of "A" or "S" in Thomson Financial Insiders Data Feed database. Any shares acquired as a part of compensation are not included in the analyses, even though the sales of shares received as a part of compensation are included in the analyses, since we cannot separate open market or private sales of shares that are acquired as a part of compensation from other open market or private sales. The data do not allow us to separate open market transactions from private transactions.

restrictions result in a final sample of 11,310 firm-year observations and 463,527 insider transactions. We also obtain data on analyst forecasts from I/B/E/S and data on litigation from Stanford Securities Class Action Clearinghouse. Because the data requirements differ across tests, the sample size for each test varies depending on the availability of the data in the analysis.<sup>11</sup>

**Table 1** Summary statistics

| Variables                     | Purchases |         |        | Sales   |        |        | Difference |           |
|-------------------------------|-----------|---------|--------|---------|--------|--------|------------|-----------|
|                               | Mean      | Median  | STD    | Mean    | Median | STD    | Mean       | Median    |
|                               | (1)       | (2)     | (3)    | (4)     | (5)    | (6)    | (7)        | (8)       |
| <i>Profit<sub>BHAR</sub></i>  | 3.702     | 2.893   | 30.948 | -0.641  | 0.372  | 22.951 | 4.343***   | 2.521***  |
| <i>Profit<sub>Alpha</sub></i> | 6.511     | 6.081   | 24.121 | -1.557  | -1.635 | 18.415 | 8.068***   | 7.716***  |
| <i>CG</i>                     | -0.113    | 0.186   | 1.347  | 0.008   | 0.299  | 1.253  | -0.122***  | -0.114*** |
| <i>CG<sub>Broad</sub></i>     | -0.181    | 0.120   | 1.508  | 0.013   | 0.383  | 1.388  | -0.194***  | -0.262*** |
| <i>CG<sub>ISS</sub></i>       | 35.237    | 36.000  | 6.240  | 36.848  | 38.000 | 5.718  | -1.611***  | -2.000*** |
| <i>Size</i>                   | 8,312     | 1,608   | 28,470 | 19,306  | 3,396  | 49,966 | -10,994*** | -1,787*** |
| <i>MB</i>                     | 2.890     | 2.013   | 3.635  | 4.334   | 3.080  | 4.528  | -1.444***  | -1.067*** |
| <i>Return</i>                 | -11.058   | -11.605 | 26.211 | -14.807 | -9.904 | 30.339 | 3.749***   | -1.701    |
| <i>Trade<sub>Size</sub></i>   | 0.200     | 0.025   | 0.523  | 0.272   | 0.105  | 0.498  | -0.072***  | -0.079*** |
| <i>Trade<sub>Recent</sub></i> | 0.422     | 0.000   | 1.798  | 0.578   | 0.009  | 1.757  | -0.156***  | -0.009*** |
| <i>R&amp;D</i>                | 0.178     | 0.000   | 0.382  | 0.264   | 0.000  | 0.441  | -0.086***  | 0.000***  |
| <i>Loss</i>                   | 0.184     | 0.000   | 0.387  | 0.063   | 0.000  | 0.243  | 0.121***   | 0.000***  |
| <i>Dispersion</i>             | 0.223     | 0.051   | 0.558  | 0.090   | 0.033  | 0.324  | 0.133***   | 0.018***  |
| <i>IT-Policy</i>              | 0.401     | 0.000   | 0.490  | 0.487   | 0.000  | 0.500  | -0.086***  | 0.000***  |
| <i>G-Counsel</i>              | 0.074     | 0.000   | 0.261  | 0.089   | 0.000  | 0.285  | -0.015***  | 0.000***  |

<sup>11</sup> There are a total of 1,429,547 transactions made by insiders of NYSE, AMEX, and NASDAQ firms that are available in the IDF database of Thomson Financial during our sample period. Due to stock returns (CRSP) and financial data (Compustat) requirements, 40,659 and 45,589 observations are excluded, respectively. In addition, 212,710 observations are excluded due to the unavailability of analyst information or due to the requirement of a minimum of 3 analysts following the firm in I/B/E/S. Finally, 667,062 transactions are excluded from the sample due to the fact that the data is unavailable in RiskMetrics, ExecComp, or Thomson Reuters' insider holdings (13F) databases. Reflecting the fact that these various data requirements exclude many small firms that tend to have more insider purchases relative to insider sales, we find that the ratio of the number of sales transactions to the number of purchases transactions significantly increases as we impose such requirements: from 4.3 times before imposing any requirements to 13.9 times after requiring the availability of the minimum number of analyst following and corporate governance measures. Therefore, it is possible that a weak link between our corporate governance measures and abnormal returns from purchases documented in this paper is due to the exclusion of many small firms in the analyses.



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This table reports descriptive statistics (i.e., mean, median, and standard deviation) for a sample of 31,840 purchase transactions and 431,687 sales transactions made by officers and directors between 1998 and 2011. Variables are defined in Appendix 2. \*\*\*, \*\*, and \* in columns (7) and (8) stand for statistical significance based on two-sided tests at the 1%, 5%.

Table 1 reports summary statistics for a sample of 31,840 purchase transactions and 431,687 sales transactions. Columns (1)-(3) show summary statistics for the purchase subsample and columns (4)-(6) show those for the sales subsample. The last two columns report the results for the test of differences between these two subsamples. Detailed descriptions of each variable are available in Appendix 2. The average six-month buy-and-hold abnormal returns (ProfitBHAR) for purchase and sales transactions are 3.702% and -0.641%, respectively. The difference in ProfitBHAR between these two groups is significant, in line with prior findings that insider purchases generally are more profitable than insider sales (e.g., Lakonishok and Lee, 2001). Similarly, the mean daily abnormal return over the six-month period (ProfitAlpha) for purchase transactions is 6.511 basis points, which is significantly larger than that for sales transactions (1.557 basis points). The mean market-adjusted abnormal returns over the 180 calendar days prior to the insider trading date (Return) for purchase and sales transactions are -11.058% and 14.807%, respectively, suggesting that insiders tend to trade their shares following poor past stock performance.

We also find that the mean CG, CGBroad, and CGISS scores are -0.113 (0.008), -0.181 (0.013), and 35.237 (36.848) for purchase (sales) transactions, respectively. The mean market value of equity (Size) measured in 1998 purchasing power is \$8.3 billion for purchase transactions and \$19.3 billion for sales transactions, indicating that insider purchases (sales) are more likely to occur in smaller (larger) firms. The mean market-to-book equity ratios (MB), the mean ratio of the absolute value of the net number of shares purchased (i.e., number of shares purchased minus number of shares sold) by all insiders of a firm on the transaction date to the total number of shares outstanding (TradeSize), and the mean ratio of the sum of absolute values of the daily net numbers of shares purchased by all insiders of the same firm during the ten days prior to the transaction date to the total number of shares outstanding (TradeRecent) are 2.890 (4.334), 0.200% (0.272%), and 0.422% (0.578%) for purchase (sales) transactions, respectively.

We also find that 17.8% (26.4%) and 18.4% (6.3%) of our sample purchase (sales) transactions are made by insiders of firms reporting non-zero R&D expenditures (R&D) and by insiders of firms with negative net income before extraordinary items during the most recent fiscal year (Loss), respectively. The mean standard deviation of financial analysts' earnings per share (EPS) forecasts over the average forecasted EPS (Dispersion) is 22.3% (9.0%) for purchase (sales) transactions. Finally, the mean fractions of transactions made by insiders of firms with ITPs (a policy that requires GC pre-approval) for purchase and sales transactions are 40.1% (7.4%) and 48.7% (8.9%), respectively.<sup>12</sup> As shown in columns (7) and (8), the differences in these numbers between purchase and sales transactions are all significant except for the median Return. These results suggest that controlling for relevant firm and transaction characteristics are important when we analyze the purchase and sales transaction samples separately.

## 2.4 Abnormal returns

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<sup>12</sup> Similar to Jagolinzer et al. (2011), we collect data on ITPs and the policy that requires GC pre-approval by manually searching firms' websites in early 2012. We set the indicator variable to one only if we find evidence of such policies on websites. Otherwise, we set the variable to zero. One limitation of this approach is that we do not know when a firm has adopted the policy; therefore, we set the indicator to one for the whole sample period once we find evidence of such policies on its website. To check the robustness of our results, we experiment with an alternative approach similar to the one used in Roulstone (2003) by defining firms with 75% or more of insider trades within one month after earnings announcements as those with insider trading restriction policies and find similar results.

**Table 2** Abnormal returns earned by insiders according to the quality of firms' corporate governance and type of insider trading

|                    | <i>Profit<sub>BHAR</sub></i> |                   |                   | <i>Profit<sub>Alpha</sub></i> |                   |                   | <i>Profit<sub>portfolio</sub></i> |                   |                   |
|--------------------|------------------------------|-------------------|-------------------|-------------------------------|-------------------|-------------------|-----------------------------------|-------------------|-------------------|
|                    | Purchases<br>(1)             | Sales<br>(2)      | Aggregate<br>(3)  | Purchases<br>(4)              | Sales<br>(5)      | Aggregate<br>(6)  | Purchases<br>(7)                  | Sales<br>(8)      | Aggregate<br>(9)  |
| <i>Full sample</i> | 3.702<br>(0.000)             | -0.641<br>(0.000) | -0.314<br>(0.000) | 6.511<br>(0.000)              | -1.557<br>(0.000) | -1.152<br>(0.000) | 2.025<br>(0.001)                  | -2.407<br>(0.000) | -2.203<br>(0.000) |
| <i>High CG</i>     | 1.818<br>(0.000)             | -1.088<br>(0.000) | -0.881<br>(0.000) | 1.416<br>(0.000)              | -1.426<br>(0.000) | -1.223<br>(0.000) | 3.001<br>(0.000)                  | -2.906<br>(0.000) | -2.416<br>(0.000) |
| <i>Medium CG</i>   | 5.942<br>(0.000)             | -0.892<br>(0.000) | -0.462<br>(0.006) | 6.325<br>(0.000)              | -2.048<br>(0.000) | -1.521<br>(0.000) | 0.766<br>(0.148)                  | -2.485<br>(0.000) | -2.308<br>(0.000) |
| <i>Low CG</i>      | 4.023<br>(0.000)             | 0.148<br>(0.003)  | 0.433<br>(0.001)  | 4.913<br>(0.000)              | -1.026<br>(0.000) | -0.589<br>(0.000) | 0.855<br>(0.116)                  | -1.770<br>(0.000) | -1.589<br>(0.000) |
| <i>High-Low</i>    | -2.205<br>(0.174)            | -1.236<br>(0.000) | -1.314<br>(0.000) | -3.497<br>(0.217)             | -0.400<br>(0.000) | -0.634<br>(0.000) | 2.186<br>(0.208)                  | -1.136<br>(0.004) | -0.826<br>(0.028) |
| Sample size        | 31,840                       | 431,687           | 463,527           | 31,840                        | 431,687           | 463,527           | 168                               | 168               | 168               |

This table reports average abnormal returns earned by insiders according to corporate governance and insider trading types for a sample of 463,527 insider transactions made by officers and directors between 1998 and 2011. We divide firms into three subgroups according to the overall quality of their corporate governance, *CG*. A higher *CG* indicates better corporate governance. In each year, firms with top 30% and bottom 30% of *CG* are classified as *High* and *Low CG* firms, respectively. For sales portfolios, we multiply the abnormal returns earned by insiders by -1 to indicate that the numbers reported are abnormal profits earned by insiders. *High – Low* is a zero-investment portfolio that is long in *High CG* firms and short in *Low CG* firms. Abnormal returns are measured by six-month market-adjusted abnormal returns (*Profit<sub>BHAR</sub>*), daily abnormal returns (*Profit<sub>Alpha</sub>*), and average monthly abnormal returns (*Profit<sub>portfolio</sub>*). Daily abnormal returns are measured by an intercept from the Carhart (1997) four-factor model estimated over the 180 calendar days subsequent to the transaction date. Average monthly abnormal returns are measured by intercepts from the Carhart (1997) four-factor model using the monthly time-series portfolio approach. To form portfolios, in each month between July 1997 and December 2011, we assign a sample firm into a net purchase (net sales) group based on the net number of shares purchased by insiders of the firm during the month, and then, in each month starting from January 1998, we form net purchase (sale) portfolios using all firms belonging to the net purchase (sales) group at least once over the past six-month period. In a similar way, we form net purchase (sales) portfolios that are composed of only those firms in each governance group. For each portfolio, monthly value-weighted portfolio returns are calculated and used in the regressions. The abnormal returns are reported on top and *p*-values are provided in parentheses. For *Profit<sub>portfolio</sub>*, their *p*-values are based on heteroskedasticity-adjusted standard errors.

In Table 2, we report average abnormal returns by transaction type (i.e., purchases and sales) and the quality of corporate governance. In each calendar year, we divide sample firms into three groups, high (top 30%), medium (middle 40%), and low (bottom 30%), based on CG scores. Mean abnormal returns measured by ProfitBHAR (%) and ProfitAlpha (basis point) are reported in the columns (1)-(6). In addition, we measure abnormal returns as the average monthly abnormal returns of each group based on the Carhart's (1997) four-factor model. We follow Loughran and Ritter (1995) and Cohen et al. (2012) and use the monthly calendar time portfolio approach to calculate the abnormal returns, Profitportfolio (%).<sup>13</sup> The results are presented in columns (7)-(9).

The results show that during our sample period, insiders earn significantly positive abnormal returns over six months following their purchase transactions but not following their sales transactions. For example, the average ProfitBHAR for purchases is a significant 3.70%, while the average ProfitBHAR for sales is a significant -0.64%. More importantly, we find that corporate governance is not significantly associated with abnormal returns earned from insider purchases, but it is negatively and significantly associated with abnormal returns earned from insider sales. The difference in ProfitBHAR between high and low CG firms is significant for insider sales (High–Low difference = -1.236, p-value = 0.000), while it is insignificant for insider purchases (High–Low difference = -2.205, p-value = 0.174). The results are similar when abnormal returns are measured by ProfitAlpha or Profitportfolio. Compared to insiders of poorly governed firms, those of better-governed firms earn significantly smaller abnormal profits from their sales transactions, but not from their purchase transactions, suggesting that corporate governance limits insiders' ability to profit from their negative private information, thereby reducing firms' legal risk.<sup>14</sup>

### 3 Empirical methodology and main results

#### 3.1 Empirical methodology

To examine whether corporate governance plays a role in limiting the profitability of insider trading, we estimate the following regression:

$$\begin{aligned} Profit_{BHAR} (Profit_{Alpha}) = & \alpha + \beta_1 Governance + \beta_2 Size + \beta_3 MB + \beta_4 Return \\ & + \beta_5 Trade_{Size} + \beta_6 Trade_{Recent} + \beta_7 R\&D + \beta_8 Loss + \beta_9 Dispersion \\ & + \beta_{10} IT-Policy + \beta_{11} G-Counsel + \beta_{12} Fixed\ Effects + \varepsilon, \end{aligned} \quad (1)$$

where ProfitBHAR (ProfitAlpha) is market-adjusted buy-and-hold abnormal returns over the 180 calendar days following the transaction date (intercept from the Carhart (1997) four-factor model estimated over the 180 calendar

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<sup>13</sup> Specifically, we assign a sample firm into a net purchase (net sale) group based on the net number of shares purchased by insiders of the firm during the month. Then, in each month, we form net purchase (sale) portfolios using all firms classified as net purchase (sale) firms at least once over the past six-month period and calculate value-weighted portfolio returns. For aggregate portfolios, we include all firms in net purchase and sale portfolios but multiply the returns of the firms in net sale portfolios by -1. For each portfolio, we run monthly time-series regressions based on the Carhart's (1997) four-factor model to estimate  $Profit_{portfolio}$ .

<sup>14</sup> In untabulated results, we find that insiders in better-governed firms earn significantly smaller abnormal profits from their sales transactions but not from their purchase transactions in both pre- and post-SOX periods.

days subsequent to the transaction date); Governance represents various governance measures including CG, CGBroad, and CGISS.<sup>15</sup>

**Table 3** Corporate governance and profitability of insider trading

| Dependent variable            | <i>Profit<sub>BHAR</sub></i> |                      |                                        |                      |                                            |                     |
|-------------------------------|------------------------------|----------------------|----------------------------------------|----------------------|--------------------------------------------|---------------------|
|                               | <i>Governance – CG</i>       |                      | <i>Governance – CG<sub>Broad</sub></i> |                      | <i>Governance – log (CG<sub>ISS</sub>)</i> |                     |
|                               | Purchases                    | Sales                | Purchases                              | Sales                | Purchases                                  | Sales               |
|                               | (1)                          | (2)                  | (3)                                    | (4)                  | (5)                                        | (6)                 |
| <i>Governance</i>             | 0.360<br>(0.523)             | -0.603**<br>(0.032)  | 0.058<br>(0.885)                       | -0.391*<br>(0.054)   | 0.784<br>(0.886)                           | -2.740**<br>(0.025) |
| <i>Size</i>                   | -3.793***<br>(0.000)         | -0.108<br>(0.850)    | -3.758***<br>(0.000)                   | -0.048<br>(0.934)    | -3.936***<br>(0.000)                       | -0.132<br>(0.850)   |
| <i>MB</i>                     | -0.450**<br>(0.012)          | 0.377**<br>(0.032)   | -0.451**<br>(0.012)                    | 0.373**<br>(0.034)   | -0.121<br>(0.299)                          | 0.617***<br>(0.000) |
| <i>Return</i>                 | -0.044*<br>(0.070)           | 0.020<br>(0.196)     | -0.044*<br>(0.070)                     | 0.020<br>(0.193)     | 0.110***<br>(0.001)                        | 0.020<br>(0.297)    |
| <i>Trade<sub>Size</sub></i>   | -1.410<br>(0.233)            | 0.891<br>(0.196)     | -1.447<br>(0.224)                      | 0.868<br>(0.211)     | 1.555<br>(0.594)                           | 1.033<br>(0.347)    |
| <i>Trade<sub>Recent</sub></i> | -0.750*<br>(0.085)           | -0.333**<br>(0.044)  | -0.752*<br>(0.084)                     | -0.337**<br>(0.042)  | -0.877***<br>(0.002)                       | -0.041<br>(0.879)   |
| <i>R&amp;D</i>                | 2.612**<br>(0.027)           | -1.491***<br>(0.003) | 2.631**<br>(0.025)                     | -1.492***<br>(0.003) | 0.610<br>(0.572)                           | -0.062<br>(0.907)   |
| <i>Loss</i>                   | -13.081***<br>(0.000)        | 7.784***<br>(0.000)  | -13.082***<br>(0.000)                  | 7.778***<br>(0.000)  | -5.370**<br>(0.047)                        | 9.936***<br>(0.000) |
| <i>Dispersion</i>             | 3.926***<br>(0.007)          | 1.309<br>(0.128)     | 3.944***<br>(0.007)                    | 1.309<br>(0.128)     | -1.397<br>(0.538)                          | 0.262<br>(0.919)    |
| <i>IT-Policy</i>              | -1.233<br>(0.245)            | -1.253**<br>(0.021)  | -1.251<br>(0.249)                      | -1.237**<br>(0.028)  | -0.673<br>(0.664)                          | -0.817**<br>(0.049) |
| <i>G-Counsel</i>              | -2.463<br>(0.122)            | -2.919**<br>(0.010)  | -2.571<br>(0.120)                      | -2.914**<br>(0.011)  | -1.402<br>(0.210)                          | -1.649**<br>(0.027) |
| Intercept                     | 18.535***<br>(0.000)         | 3.441<br>(0.239)     | 18.681***<br>(0.000)                   | 3.231<br>(0.265)     | 11.540<br>(0.547)                          | 9.443<br>(0.592)    |
| Fixed effects                 | IY                           | IY                   | IY                                     | IY                   | IY                                         | IY                  |
| Adjusted R <sup>2</sup>       | 19.29%                       | 3.43%                | 19.27%                                 | 3.41%                | 16.15%                                     | 7.71%               |
| Sample size                   | 31,840                       | 431,687              | 31,840                                 | 431,687              | 11,795                                     | 242,811             |

This table presents the results of regressions of six-month market-adjusted abnormal returns (Profit<sub>BHAR</sub>) earned by insiders from their trading on the effectiveness of corporate governance and other control variables. The sample consists of 463,527 insider transactions made by officers and directors between 1998 and 2011.

<sup>15</sup> For CG<sub>ISS</sub> that is not based on the principal component analysis, we use log (CG<sub>ISS</sub>) in the regression analysis to minimize the possible outlier effect.

Variables are defined in Appendix 2. Industry and year fixed effects are controlled. P-values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

Regarding control variables, Size is the inflation-adjusted market capitalization of equity at the end of the most recent fiscal quarter (in 1998 dollars); MB is the ratio of the market value of equity to the book value of equity at the end of the most recent fiscal quarter; Return is the market-adjusted buy-and-hold abnormal returns over the 180 calendar days prior to the insider trading date; R&D is the indicator that takes the value of one if the firm reports non-zero research and development expenditures in the most recent fiscal year and zero otherwise; TradeSize is the absolute value of the net number of shares purchased by all insiders of a firm on the transaction date divided by the total number of shares outstanding of the firm; TradeRecent is the sum of absolute values of the daily net numbers of shares purchased by all insiders of the same firm during the ten days prior to the transaction date, scaled by the total number of shares outstanding; Loss is the indicator that takes the value of one if the firm reports negative net income before extraordinary items for the most recent fiscal year and zero otherwise; and Dispersion is the standard deviation of earnings per share (EPS) forecasts for the current fiscal year divided by the average of EPS forecasts made during the month of transaction date. Moreover, we include IT-Policy (an indicator that takes the value of one if the firm has ITPs and zero otherwise) and G-Counsel (an indicator that takes the value of one if the firm has a GC preapproval requirement and zero otherwise) in the baseline model.

Following Lakonishok and Lee (2001), we include Size and MB to control for size and book-to-market effects (Fama and French, 1993). In addition, following Brochet (2010), we control for Return, R&D, TradeSize, TradeRecent, Loss, and Dispersion. We include Return to control for insiders' contrarian behavior. R&D and Dispersion are included since insider sales and purchases are likely to be more informative in firms with higher R&D intensity or those with greater analysts forecast dispersion, in which information asymmetry problems are perceived to be greater (Aboody and Lev, 2000; Huddart and Ke, 2007). We include TradeSize to control for the possible link between the importance of private information and trade size, and TradeRecent to control for either preemptions of a trade's information content or reinforcements of prior signals. We also include Loss to control for the potential reversal of poor accounting performance. We include IT-Policy and G-Counsel in the regression to control for previously documented effects of these ITPs on the profitability of insider trading (Bettis et al., 2000; Jagolinzer et al., 2011).

Our key variable of interest is Governance. If the corporate governance system reduces the profitability of insider trading, we expect the coefficient estimate on Governance to be negative. We mitigate the potential bias caused by omitted unobservable industry characteristics by including industry fixed effects in the regressions using Fama-French (1997) 48 industry indicators. We also include year fixed effects to control for potential time trend effects. To incorporate the guidance suggested by Petersen (2009) about the use of panel data sets, we use clustered standard errors at the individual firm level.

### **3.2 Corporate governance and profitability of insider trading**

The results using ProfitBHAR as the dependent variable are reported in Table 3. Given the differential effects of corporate governance on insider purchases and sales (as indicated in Table 2), we run the regressions separately for these two types of insider trades. We also run the regressions separately for three alternative governance measures: CG, CGBroad, and CGISS. Consistent with univariate results in Table 2, we find that the coefficient estimates on all three governance measures are insignificant for purchase transactions but significantly negative at the 10% level or better for sales transactions, suggesting that better corporate governance significantly reduces the profitability of insider

sales but not insider purchases.<sup>16</sup> Thus, better corporate governance discourages insiders from exploiting negative private information, but not from exploiting positive private information.<sup>17</sup>

We also find that the effect of corporate governance on the profitability of insider sales is economically large and significant. For example, when CG is used as the governance measure, its coefficient estimate is -0.603 for sales transactions, suggesting that one standard deviation increase in CG (1.260) is associated with 0.76% lower abnormal returns earned by insiders from their sales transactions. Among control variables, we find that the coefficient estimates on Size are significantly negative only for purchase transactions. In contrast, the coefficient estimates on MB and Loss are significantly positive for sales transactions, while they are significantly negative for purchase transactions.

Turning to the effect of voluntary insider trading restriction policies on the profitability of insider trading, we find that the coefficient estimates on IT-Policy and G-Counsel are negative but insignificant for purchase transactions, whereas they are significantly negative for sales transactions, indicating that these policies are effective in preventing insiders from exploiting negative private information only. More importantly, our finding that the coefficient estimates on corporate governance variables are significant for insider sales even after controlling for these ITPs suggests that corporate governance has a disciplinary effect on insider sales that is above and beyond the effects of IT-Policy and G-Counsel on insider trading.<sup>18</sup>

### 3.3 Sensitivity analysis

To check the robustness of the above results, we perform several additional tests in Table 4. We first examine whether our results are sensitive to alternative measures of corporate governance. The results are reported in Panel A. For brevity, we report only the coefficient estimates on governance measures. We find that our results of CG in Table 4 are robust to using alternative corporate governance measures: the changes in CG, CGBroad, and CGISS, or the individual governance measures, including board independence (CG1), compensation committee independence (CG2), institutional ownership (CG3), and independent & long-term institutional ownership (CG4).

**Table 4** Sensitivity analysis

Panel A: Alternative measures of corporate governance

|          | $\Delta CG$      | $\Delta CG_{Broad}$ | $\log(\Delta CG_{ISS})$ | $CG1$             | $CG2$            | $CG3$            | $CG4$             |
|----------|------------------|---------------------|-------------------------|-------------------|------------------|------------------|-------------------|
|          | (1)              | (2)                 | (3)                     | (4)               | (5)              | (6)              | (7)               |
| Purchase | 0.403<br>(0.161) | 0.096<br>(0.552)    | 0.847<br>(0.474)        | -3.434<br>(0.469) | 1.027<br>(0.827) | 2.520<br>(0.102) | -4.376<br>(0.585) |

<sup>16</sup> Fidrmuc et al. (2006) find that the market reaction to insider trading filings is positively associated with institutional ownership in the U.K., opposite to our findings, which might be due to different institutional environment between the U.S. and the U.K.

<sup>17</sup> In untabulated test, we check whether our results are robust to controlling for the GIM index, a governance measure used in Ravina and Sapienza (2010), by estimating the regressions that are similar as their regressions and find quantitatively similar evidence. Moreover, we use a similar approach as that used by Piotroski and Roulstone (2005) and examine the role of corporate governance in restricting different types of information. We find that corporate governance discourages insiders from exploiting private information but not from making contrarian trades based on public information.

<sup>18</sup> Abnormal performance of insider sales is likely to be underestimated if firms are dropped from the sample due to stock-price decreases following insider sales. This sample selection bias problem is not a major concern for our study since our sample includes both active and inactive S&P 1500 companies.

|                                                                                                                         |                         |                      |                      |                     |                             |                      |                      |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|----------------------|---------------------|-----------------------------|----------------------|----------------------|
| Sales                                                                                                                   | -0.672***<br>(0.007)    | -0.309**<br>(0.011)  | -1.072**<br>(0.019)  | -5.441**<br>(0.048) | -1.932**<br>(0.018)         | -3.954***<br>(0.001) | -6.632***<br>(0.083) |
| Panel B: Alternative measure of trading profitability and alternative empirical specifications                          |                         |                      |                      |                     |                             |                      |                      |
|                                                                                                                         | Profit <sub>Alpha</sub> | Firm-FE              | Insider-FE           | Pre-Sox             | Post-Sox                    | Firm-Daily           |                      |
|                                                                                                                         | (1)                     | (2)                  | (3)                  | (4)                 | (5)                         | (6)                  |                      |
| Purchase                                                                                                                | 0.144<br>(0.760)        | -0.425<br>(0.136)    | 0.238<br>(0.301)     | -0.146<br>(0.768)   | 0.948<br>(0.229)            | -0.145<br>(0.700)    |                      |
| Sales                                                                                                                   | -0.432***<br>(0.009)    | -0.630***<br>(0.001) | -0.856***<br>(0.000) | -0.700*<br>(0.079)  | -0.605*<br>(0.073)          | -0.573**<br>(0.012)  |                      |
| Panel C: Equity-linked compensation and/or transparency matched sample (coefficients on an indicator for good CG firms) |                         |                      |                      |                     |                             |                      |                      |
|                                                                                                                         | Equity Comp.            | Obs.                 | Transparency         | Obs.                | Equity Comp. + Transparency | Obs.                 |                      |
|                                                                                                                         | (1)                     |                      | (2)                  |                     | (3)                         |                      |                      |
| Purchase                                                                                                                | 0.929<br>(0.465)        | 23,443               | 0.727<br>(0.637)     | 23,443              | 1.689<br>(0.285)            | 23,443               |                      |
| Sales                                                                                                                   | -0.956**<br>(0.022)     | 325,027              | -1.097**<br>(0.025)  | 325,027             | -0.734**<br>(0.040)         | 325,027              |                      |
| Panel D: Moderating effects of trading policy, general counsel, and insider type                                        |                         |                      |                      |                     |                             |                      |                      |
|                                                                                                                         | CG × ITPolicy           | CG × GCounsel        | Obs.                 | CG × Officer        | CG × Director               | Obs.                 |                      |
|                                                                                                                         | (1)                     |                      |                      | (2)                 |                             |                      |                      |
| Purchase                                                                                                                | -2.595<br>(0.151)       | 0.082<br>(0.948)     | 31,840               | 1.302<br>(0.222)    | -0.165<br>(0.741)           | 38,052               |                      |
| Sales                                                                                                                   | -0.792**<br>(0.011)     | -0.699**<br>(0.046)  | 431,687              | -0.567*<br>(0.065)  | -0.690*<br>(0.075)          | 604,349              |                      |

This table presents the results of sensitivity analyses for the regressions of abnormal returns earned by insiders following their trading. The dependent variable is the six-month market-adjusted abnormal returns (ProfitBHAR) earned by insiders from their trading unless otherwise indicated. The sample consists of 463,527 insider transactions made by officers and directors between 1998 and 2011. Panel A reports the results using alternative measures of corporate governance (changes in CG, CGBroad, and CGISS and individual governance mechanisms including board independence (CG1), compensation committee independence (CG2), institutional ownership (CG3), and independent & long-term institutional ownership (CG4)). Panel B presents the results using alternative measure of trading profitability (ProfitAlpha) and alternative empirical specifications such as including firm or insider fixed effects, re-estimating regressions before or after the enactment of SOX, and aggregating the trades made on the same date by all insiders of the same firm. Panel C reports the coefficients on the indicator for good CG firms (above the sample median CG) using sales (purchase) transactions made by insiders of both good CG firms and their control firms matched by equitylinked compensation (captured by the percentage of annual equity-linked compensation and insider ownership and/or transparency (captured by Size, R&D, Dispersion, analyst following, and earnings quality). Panel D provides the results of the tests that examine the moderating effects of trading policy, GC, and insider type. In columns (3) and (4), insider trades made by large shareholders are added back to the sample. All variables are defined in Appendix 2. Industry and year fixed effects are controlled if not specified. P-values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.



In Panel B, we perform sensitivity tests by (1) using alpha estimates from the Carhart's (1997) four-factor model (ProfitAlpha) to measure insider trading profits; (2) including firm fixed effects and insider fixed effects to address potential endogeneity bias caused by omitted unobservable firm and insider characteristics, respectively; (3) re-estimating regressions using subsamples of insider trades that took place before or after the 2002 enactment of the SOX; and (4) aggregating the transactions made on the same date by all insiders of a firm.<sup>19</sup> Our results remain qualitatively similar.

In Panel C, we check whether our results are driven by differences in equity-linked compensation and information asymmetry across firms with different governance quality. It is possible that better-governed firms use more equity-linked compensation, leading to more liquidity trading and thus lowering the profitability of sales, but not the profitability of purchases. Similarly, better governed firms are likely to be more transparent, providing insiders fewer opportunities to exploit private information. To test these predictions, we first divide our sample into good and bad CG firms according to the sample industry median CG score in each year. For each good CG firm, we then select a bad CG firm that tends to have similar governance attributes in terms of equity compensation and/or transparency. Finally, we run the regressions using sales (purchase) transactions made by insiders of both good CG firms and their matched bad CG firms, and examine whether insiders of good CG firms still earn more abnormal profits than insiders of bad CG firms after controlling for equity-linked compensation and/or transparency.

We use a probit model to estimate a firm's probability of being selected as one of good CG firms. More specifically, we first regress an indicator for being a good CG firm on the percentage of annual equity compensation (stock and option compensation over total compensation) and insider ownership. We then match a good CG firm with a bad CG control firm that has the closest propensity score based on the predicted probability calculated using the coefficient estimates from the probit regression. Similarly, we regress an indicator for being a good CG firm on several transparency measures including Size, R&D, Dispersion, the number of analysts following, and earnings quality, and then match a good CG firm with a bad CG control firm that has the closest propensity score. We also select matching firms based on these transparency measures and two equity-linked compensation variables used above.<sup>20</sup> In Panel C, we find that the coefficient on an indicator for good CG firms is significantly negative only for sales transactions, suggesting that differences in equity-linked compensation and information asymmetry across good and bad CG groups are not likely to drive the results in the previous sections.<sup>21</sup>

In Panel D, we first test whether the role of governance in discouraging insiders from exploiting private information is different between firms that adopt IT-Policy and G-Counsel and those that do not, by including the interaction terms,  $CG \times IT\text{-Policy}$  and  $CG \times G\text{-Counsel}$ . In model (1), we find that for sales transactions, the coefficients on  $CG \times IT\text{-Policy}$  and  $CG \times G\text{-Counsel}$  are significantly negative at the 5% level, which suggests that the role of corporate governance in discouraging insiders from exploiting negative private information becomes stronger when better governance is accompanied by insider trading restriction policies. Alternatively, the result may suggest that ITPs become more effective when firms have better corporate governance. In addition, we find that the coefficient on CG is negative and significant (not reported), suggesting that corporate governance affects the profitability of insider sales not only through

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<sup>19</sup> This aggregate approach can address the potential concern about cross-sectional dependence that arises when different insiders of a firm simultaneously purchase (sell) stocks several times on the same trading date and these trades are counted as separate observations in the regression, which leads to biased estimation of *t*-statistics. If the number of shares purchased (sold) during the day in a given firm is greater than the number of shares sold (purchased) during the same day, we define the aggregate transaction as an insider purchase (sale). Our results are also quantitatively similar when insider trade transactions are aggregated at the monthly level.

<sup>20</sup> Earnings quality is measured as the absolute value of discretionary accruals estimated using the modified Jones model (Dechow et al., 1995).

<sup>21</sup> We repeat the analyses by replacing an indicator for good CG firms with CG and find qualitatively similar results.

the ex-ante preventive measures (e.g., IT-Policy and G-Counsel), but also through mechanisms other than these measures.

In model (2), we perform falsification tests by comparing the profitability of transactions made by officers and directors with that of transactions made by large shareholders. Given that corporate governance is not designed to control large shareholders' transactions, we expect the effect of CG to be stronger for officers and directors than for large shareholders. We add all transactions made by large shareholders to our main sample, and then re-estimate the regressions after including  $CG \times Officer$ ,  $CG \times Director$ ,  $Officer$ , and  $Director$  in our baseline model, where  $Officer$  and  $Director$  are indicators for transactions made by officers and directors, respectively.

As expected, for sales transactions, we find that CG matters more for the trades made by officers and directors than those made by large shareholders. The results for purchase transactions are insignificant as before.

### 3.4 Endogeneity bias

In Table 5, we address the concern that insider trading profit and corporate governance are endogenously and simultaneously determined, which could result in biased coefficient estimates on CG.

First, we follow Deng and Gao (2011), and run three-stage least squares (3SLS) regressions using state-median CG, IT-Policy, and G-Counsel as the instrumental variables (IV).<sup>22</sup> To the extent that firms in the same state follow similar practices in establishing corporate governance systems, ITPs and GC pre-approval requirement policies, we expect these state IVs to be positively related to firm-level governance measures, thus satisfying the relevance requirement of the IVs. Moreover, these state-level governance variables are not likely to have any direct effects on the profitability of an individual firm's insider trading, other than affecting the profitability of insider trading only through their correlation with the endogenous variables (i.e., CG, IT-Policy, and G-Counsel), satisfying the exclusion requirement of the IVs.

**Table 5** Addressing endogeneity bias

*Panel A: Results of 3SLS regressions*

| Dependent variable     | <i>CG</i>           | Purchases           |                     | Main Model                   |
|------------------------|---------------------|---------------------|---------------------|------------------------------|
|                        |                     | First Stage         |                     |                              |
|                        |                     | <i>IT-Policy</i>    | <i>G-Counsel</i>    | <i>Profit<sub>BHAR</sub></i> |
|                        | (1)                 | (2)                 | (3)                 | (4)                          |
| <i>State CG</i>        | 0.352***<br>(0.000) |                     |                     |                              |
| <i>State IT-Policy</i> |                     | 0.062***<br>(0.000) |                     |                              |
| <i>State G-Counsel</i> |                     |                     | 0.077***<br>(0.000) |                              |

<sup>22</sup> In untabulated tests, we use industry-median as the instruments and find similar results.

|                                                    |                     |                     |                     |                        |
|----------------------------------------------------|---------------------|---------------------|---------------------|------------------------|
| Instrumented CG                                    |                     |                     |                     | 1.343<br>(0.173)       |
|                                                    |                     |                     |                     |                        |
|                                                    |                     | Sales               |                     |                        |
|                                                    |                     | First Stage         | Main Model          |                        |
| Dependent variable                                 | CG                  | IT-Policy           | G-Counsel           | Profit <sub>BHAR</sub> |
|                                                    | (1)                 | (2)                 | (3)                 | (4)                    |
|                                                    |                     |                     |                     |                        |
| State CG                                           | 0.614***<br>(0.000) |                     |                     |                        |
| State IT-Policy                                    |                     | 0.241***<br>(0.000) |                     |                        |
| State G-Counsel                                    |                     |                     | 0.520***<br>(0.000) |                        |
| Instrumented CG                                    |                     |                     |                     | -1.284***<br>(0.000)   |
|                                                    |                     |                     |                     |                        |
| Panel B: Impact threshold for confounding variable |                     |                     |                     |                        |
|                                                    |                     |                     |                     |                        |
| Sale Profit <sub>BHAR</sub>                        |                     |                     |                     |                        |
|                                                    |                     |                     |                     |                        |
| Dependent variable                                 |                     | Impact              |                     | Impact <sub>raw</sub>  |
|                                                    |                     |                     |                     |                        |
| Size                                               |                     | 0.0000              |                     | 0.0011                 |
| MB                                                 |                     | 0.0008              |                     | -0.0035                |
| Return                                             |                     | -0.0007             |                     | 0.0008                 |
| Trade <sub>Size</sub>                              |                     | 0.0001              |                     | 0.0001                 |
| Trade <sub>Recent</sub>                            |                     | 0.0009              |                     | 0.0002                 |
| R&D                                                |                     | 0.0000              |                     | 0.0003                 |
| Loss                                               |                     | 0.0005              |                     | 0.0015                 |
| Dispersion                                         |                     | 0.0001              |                     | 0.0007                 |
| IT-Policy                                          |                     | 0.0002              |                     | -0.0003                |
| G-Counsel                                          |                     | 0.0013              |                     | 0.0004                 |
|                                                    |                     |                     | -0.0093             |                        |
| Impact threshold for confounding variable          |                     |                     |                     |                        |

This table presents the results of endogeneity analyses. Panel A reports the results from 3SLS regressions in which state median *CG*, *IT-Policy*, and *G-Counsel* are used as the instrumental variables, where control variables are unreported for brevity. *P*-values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively. Panel B reports the impact threshold for confounding variable in regression where *Profit<sub>BHAR</sub>* is dependent variable, and *CG* is main variable of interest following Larcker and Rusticus (2010). The impact factors of control variables are also reported. All variables are defined in Appendix 2.

Models (1) to (3) of Panel A report the coefficient estimates on IVs in the first-stage regressions and model (4) reports the coefficient estimate on Instrumented *CG* in the main regressions in which *Profit<sub>BHAR</sub>* is the dependent variable. We find that all three instruments are positively and significantly related to endogenous variables for both purchase and sales transactions, suggesting that our IVs satisfy the relevance requirement. The results in the main model show that after controlling for the endogeneity of *CG*, *ITP*, and *GC*, the coefficient estimate on *CG* is still significantly negative in sales transactions. Thus, our finding regarding the effectiveness of corporate governance in preventing insiders from exploiting only negative private information remains robust after controlling for endogeneity concerns.

Second, to further ensure that our results are not driven by endogeneity concern, we follow Larcker and Rusticus (2010) and assess how severe the endogeneity problem should be to overturn our main results. It is well known that the bias induced by the omitted variable is determined by the omitted variable's correlation with the independent variable of interest and its correlation with the dependent variable. The stronger the two correlations are, the more biased the coefficient estimate is. A product of the two correlations therefore reflects the extent of the bias. We assess the bias in our tests by computing the Impact Threshold for Confounding Variable (ITCV). Specifically, ITCV is the lowest product of the two correlations (the partial correlations between the dependent variable and the confounding variable and between the independent variable of interest and the confounding variable), at which the impact of a confounding variable would alter the statistical inference about the predictor if the confounding variable were controlled in the regression model (Frank, 2000). The larger (smaller) the magnitude of ITCV, the more (less) robust the OLS results are to omitted variables concerns.

In Panel B, we estimate ITCV in the baseline model by regressing *Profit<sub>BHAR</sub>* on *CG* for sales transactions. The estimated ITCV of -0.0093 means that the correlation between *Profit<sub>BHAR</sub>* (*CG*) and the unobserved confounding variable needs to be around 0.106 ( $=0.00930.5$ ) in order to overturn the OLS results.

To evaluate the degree of the endogeneity concern, we calculate a benchmark level for the magnitude of likely correlations involving the unobserved confounding variable for each of our control variables. Specifically, we calculate Impact for each of our control variables, which is measured as the product of the partial correlations between *CG* (and *Profit<sub>BHAR</sub>*) and the control variable. We then calculate Impactraw for each of the control variables, on the basis of the raw correlations instead of the partial correlations. As shown in Panel B, none of the control variables has an Impact or Impactraw with a greater value than the relevant ITCV. These results suggest that any unobservable confounding variable must be more correlated with *Profit<sub>BHAR</sub>* and *CG* than any of our existing control variables in order to overturn our main findings, which is very unlikely.

### 3.5 Corporate governance and legal risk

In this subsection we examine whether the role of corporate governance in limiting the profitability of insider trading is particularly strong for firms and transactions with potentially high litigation risk. As discussed earlier, if shareholders are concerned about legal risk arising from insider trading, they should have strong incentives to reduce such risk by designing and implementing good corporate governance systems.

We focus on two cases in which shareholders have strong incentives to limit insiders' ability to profit from their transactions in order to reduce legal risk: 1) the case in which firms face high ex-ante litigation risk and 2) the case in which insiders engage in informative opportunistic trades. To the extent that firms with higher ex-ante litigation risk and firms whose insiders engage in opportunistic trades face higher legal risk in the presence of informed insider transactions, we expect the impact of a firm's governance on the informativeness of insider trading to be more pronounced for these firms and transactions.

**Table 6** Effects of corporate governance on the profitability of insider trading for firms with high litigation risk and for opportunistic insider trades

| Dependent variable            | <i>Profit<sub>BHAR</sub></i>  |                      |                                  |                      |
|-------------------------------|-------------------------------|----------------------|----------------------------------|----------------------|
|                               | Indicator - <i>Litigation</i> |                      | Indicator - <i>Opportunistic</i> |                      |
|                               | Purchases<br>(1)              | Sales<br>(2)         | Purchases<br>(3)                 | Sales<br>(4)         |
| <i>CG</i>                     | 0.381<br>(0.589)              | -0.345**<br>(0.022)  | 0.448<br>(0.434)                 | -0.480**<br>(0.011)  |
| <i>CG × Risk indicator</i>    | -0.089<br>(0.928)             | -0.822**<br>(0.023)  | -2.957** (0.042)                 | -1.359**<br>(0.024)  |
| <i>Risk indicator</i>         | -0.869<br>(0.579)             | 4.176***<br>(0.000)  | 1.054**<br>(0.045)               | 1.294**<br>(0.025)   |
| <i>Size</i>                   | -3.540*** (0.000)             | -1.635**<br>(0.016)  | -3.824*** (0.000)                | -0.120<br>(0.833)    |
| <i>MB</i>                     | -0.446**<br>(0.013)           | 0.356** (0.037)      | -0.456*** (0.010)                | 0.379**<br>(0.030)   |
| <i>Return</i>                 | -0.047**<br>(0.046)           | 0.022<br>(0.156)     | -0.044* (0.070)                  | 0.020<br>(0.205)     |
| <i>Trade<sub>Size</sub></i>   | -1.381<br>(0.240)             | 0.950<br>(0.169)     | -1.419 (0.231)                   | 0.868<br>(0.206)     |
| <i>Trade<sub>Recent</sub></i> | -0.741* (0.083)               | -0.313* (0.062)      | -0.766* (0.077)                  | -0.334**<br>(0.043)  |
| <i>R&amp;D</i>                | 2.582** (0.028)               | -1.439***<br>(0.004) | 2.587** (0.028)                  | -1.484***<br>(0.003) |
| <i>Loss</i>                   | -13.006*** (0.000)            | 7.348*** (0.000)     | -13.168***<br>(0.000)            | 7.725***<br>(0.000)  |
| <i>Dispersion</i>             | 3.956*** (0.006)              | 1.097<br>(0.217)     | 3.930*** (0.007)                 | 1.287<br>(0.135)     |
| <i>IT-Policy</i>              | -1.204<br>(0.463)             | -1.283**<br>(0.020)  | -1.222 (0.459)                   | -1.250**<br>(0.022)  |
| <i>G-Counsel</i>              | -2.460<br>(0.220)             | -2.908***<br>(0.009) | -2.387 (0.225)                   | -3.011***<br>(0.008) |

|                  |                      |                     |                      |                    |
|------------------|----------------------|---------------------|----------------------|--------------------|
| <i>Intercept</i> | 17.538***<br>(0.000) | 9.970***<br>(0.002) | 18.670***<br>(0.000) | 3.616**<br>(0.021) |
| Fixed effects    | IY                   | IY                  | IY                   | IY                 |
| Adjusted $R^2$   | 19.30%               | 3.80%               | 19.33%               | 3.48%              |
| Sample size      | 31,840               | 431,687             | 31,840               | 431,687            |

This table presents the results of regressions of six-month market-adjusted abnormal returns ( $Profit_{BHAR}$ ) earned by insiders from their trading on the effectiveness of corporate governance ( $CG$ ) and other control variables. The sample consists of 463,527 insider transactions made by officers and directors between 1998 and 2011. Two variables are used to measure firms' litigation risk. *Litigation* is an indicator that takes the value of one if the ex-ante litigation risk estimated using the Rogers and Stocken (2005) approach is higher than the 90 percentile and zero otherwise. *Opportunistic* is an indicator that takes the value of one for transactions by insiders who do not trade stocks in the same calendar month in the past three years and zero otherwise. Other variables are defined in Appendix 2. Industry and year fixed effects are controlled. *P*-values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

We measure a firm's ex-ante litigation risk using an indicator, *Litigation*, which takes the value of one if the estimated probability of a firm's litigation risk is above the 90th percentile and zero otherwise.<sup>23</sup> We define an indicator, *Opportunistic*, taking the value of one if the transactions are classified as opportunistic trades and zero otherwise.<sup>24</sup> We then add these two indicators and their interaction terms with  $CG$  to the main model. The results are reported in Table 6. We find that for insider sales, the coefficient estimates on the interaction terms,  $CG \times Litigation$  and  $CG \times Opportunistic$ , are negative and significant, while they are insignificant for insider purchases. Additional tests show that the sums of the coefficients on  $(CG + CG \times Litigation)$  and  $(CG \times Opportunistic)$  are also significantly negative for insider sales. These results suggest that corporate governance plays a particularly important role in limiting the profitability of sales transactions made by insiders of firms that are exposed to high litigation risk, and opportunistic insider sales that are likely to attract greater legal problems.

#### 4 Mechanisms through which corporate governance affects the profitability of insider trading

In this section we investigate the potential mechanisms through which corporate governance affects the profitability of insider trading.

##### 4.1 Ex-ante preventive measures

<sup>23</sup> We estimate the probability of a firm's ex-ante litigation risk, by using a probit model as in Francis et al. (1994), Johnson et al. (2001) and Rogers and Stocken (2005), for a sample of 457,999 firm-quarter observations over the 1998 to 2011 period. Specifically, we run a regression in which the dependent variable is an indicator that takes the value of one if a Rule 10b-5 lawsuit is filed against a firm in a given quarter and zero otherwise. The independent variables include firm size, beta, daily turnover, cumulative quarterly return, standard deviation of daily returns, minimum of daily returns, and skewness of daily returns and indicators for high-risk industries.

<sup>24</sup> Similar to Cohen et al. (2012), in each calendar year, we first define routine traders as those insiders who trade stocks consistently in the same calendar month for at least three years in a row in the past. All others are defined as opportunistic traders. All trades made by routine (opportunistic) traders are defined as routine (opportunistic) transactions.

One way through which firms with better corporate governance can prevent insiders from exploiting private information is to adopt ex-ante preventive measures such as ITPs or a policy that requires GC pre-approval.

To examine whether firms with better corporate governance are indeed more likely to adopt these ex-ante preventive measures, we estimate a probit model in which the dependent variable is either IT-Policy or G-Counsel. Following Roulstone (2003), we control for firm size (*Size*), stock return volatility (*VolatilityAdj*), insider ownership (*OwnInsiders*), insider trading volume (*TradeFirm*), analyst following (*Following*), institutional ownership (*OwnInstitution*), and litigation probability estimated using the Rogers and Stocken (2005) approach (*Litigation*). In addition, we control for industry and year fixed effects.

**Table 7** Likelihood of adopting ex-ante preventive measures of insider trading

| Dependent variable    | <i>IT-Policy</i>   | <i>G-Counsel</i>    |
|-----------------------|--------------------|---------------------|
|                       | (1)                | (2)                 |
| <i>CG</i>             | 0.022**<br>(0.013) | 0.060***<br>(0.004) |
| <i>Size</i>           | 0.056** (0.028)    | 0.099*** (0.003)    |
| <i>VolatilityAdj</i>  | 4.588** (0.011)    | 7.253*** (0.005)    |
| <i>OwnInsiders</i>    | -0.696*** (0.001)  | -1.373*** (0.001)   |
| <i>TradeFirm</i>      | -0.001 (0.331)     | -0.001 (0.515)      |
| <i>Following</i>      | 0.141*** (0.000)   | 0.113*** (0.004)    |
| <i>OwnInstitution</i> | 0.112** (0.034)    | 0.250** (0.011)     |
| <i>Litigation</i>     | 11.574** (0.031)   | 17.659** (0.020)    |
| <i>Intercept</i>      | -0.016 (0.924)     | -1.401*** (0.000)   |
| Fixed effects         | IY                 | IY                  |
| Adjusted $R^2$        | 30.56%             | 7.86%               |
| Sample size           | 10,339             | 10,339              |

This table presents the results of probit regressions in which the dependent variable is either an indicator that takes the value of one if the firm adopts a voluntary insider trading policy and zero otherwise (*IT-Policy*), or an indicator that takes the value of one if the firm requires a general counsel's pre-approval prior to insider trading and zero otherwise (*G-Counsel*). The sample consists of 10,339 firm-year observations between 1998 and 2011. *VolatilityAdj* is the annualized standard deviation of daily market adjusted stock returns. *OwnInsiders* is the percentage of shares held by insiders including firm officers and directors. *TradeFirm* is the ratio of total insider trading volume over a year to shares outstanding. *Following* is the number of analysts following a firm in a year. *OwnInstitution* is the percentage of shares held by institutions. *Litigation* is the ex-ante litigation likelihood estimated using the Rogers and Stocken (2005)

approach. Other variables are defined in Appendix 2. Industry and year fixed effects are controlled. *P*-values in parentheses are based on standard errors clustered at the firm level.\*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

The results are reported in Table 7. The sample consists of 10,339 firm-year observations between 1998 and 2011.<sup>25</sup> We find that the coefficient estimates on CG are positive and significant in both regressions that use IT-Policy and G-Counsel as the dependent variables, respectively. The coefficient estimates on control variables are consistent with those reported in Roulstone (2003). Our results are quantitatively similar when we alternatively identify firms with the ITP following the approach used by Roulstone (2003). These results suggest that firms with better corporate governance are more likely to adopt ex-ante preventive measures to prevent insiders from engaging in profitable insider trading, especially for sales transactions that exploit negative private information.

#### 4.2 Implementation of ex-ante preventive measures

Besides increasing the likelihood of adopting ex-ante preventive measures, corporate governance can also make firms implement these measures more effectively. If firms with better governance implement ex-ante mechanisms more effectively, conditional on firms' adoption of such mechanisms, we will expect insider trading in firms with better governance to be less likely to contain private information.

We test this prediction as follows. First, to the extent that insider transactions that occur during the period allowed to trade without pre-clearance, typically within one month following earnings announcements, are less likely to contain private information (Bettis et al., 2000), we expect that conditional on firms' adoption of IT-Policy and G-Counsel, these policies are associated with a higher percentage of these transactions (Safe). Second, conditional on firms' adoption of IT-Policy and G-Counsel, these policies are associated with a higher percentage of insider transactions by routine traders (Routine) who trade stocks in the same calendar month in the past three years (Cohen et al, 2011), which are more likely to be driven by insiders' liquidity motives rather than by their private information. We test these predictions by estimating an OLS regression model in which the dependent variable is Safe (Routine) and the key independent variables of interest are CG and its interaction with IT-Policy (G-Counsel). Given that the factors that determine effective implementation of these policies are expected to be similar to those that determine ITPs, we use the same set of control variables as those used in the regression models in Table 7.

**Table 8** Percentage of insider trades that are less likely to contain private information

| Dependent variable | centage of<br>of<br>trades |                  | age of routine<br>trades |                     |
|--------------------|----------------------------|------------------|--------------------------|---------------------|
|                    | (1)                        | (2)              | (3)                      | (4)                 |
| <i>CG</i>          | 0.012***<br>(0.002)        | 0.010*** (0.004) | 0.014***<br>(0.002)      | 0.011***<br>(0.003) |
| <i>IT-Policy</i>   |                            | 0.008** (0.046)  |                          | 0.010**<br>(0.032)  |
| <i>G-Counsel</i>   |                            | 0.001*           |                          | 0.014**             |

<sup>25</sup> In Tables 7, 8, and 9, we conduct the analyses by aggregating transaction-level data used in previous sections to the firm level.



|                                  |          |                  |          |          |
|----------------------------------|----------|------------------|----------|----------|
|                                  |          | (0.095)          |          | (0.031)  |
| <i>CG*IT-Policy</i>              |          | 0.004*           |          | 0.001*   |
|                                  |          | (0.056)          |          | (0.060)  |
| <i>CG*G-Counsel</i>              |          | 0.002*           |          | 0.003*   |
|                                  |          | (0.088)          |          | (0.056)  |
| <i>Size</i>                      | 0.014**  | 0.014*           | 0.008*** | 0.008*** |
|                                  | (0.049)  | (0.051)          | (0.002)  | (0.003)  |
| <i>Volatility<sub>Adj</sub></i>  | 0.306    | 0.273            | 0.069    | 0.109    |
|                                  | (0.507)  | (0.553)          | (0.724)  | (0.580)  |
| <i>Own<sub>Insiders</sub></i>    | -0.098*  | -0.099* (0.076)  | 0.045    | 0.048*   |
|                                  | (0.077)  |                  | (0.107)  | (0.088)  |
| <i>Trade<sub>Firm</sub></i>      | -0.000   | -0.000 (0.232)   | 0.000    | 0.000    |
|                                  | (0.236)  |                  | (0.256)  | (0.219)  |
| <i>Following</i>                 | 0.032*** | 0.031*** (0.000) | 0.009*** | 0.008**  |
|                                  | (0.000)  |                  | (0.006)  | (0.010)  |
| <i>Own<sub>Institution</sub></i> | 0.025**  | 0.025** (0.042)  | 0.009**  | 0.009**  |
|                                  | (0.041)  |                  | (0.041)  | (0.039)  |
| <i>Litigation</i>                | 2.541**  | 2.508** (0.041)  | 0.225*   | 0.224*   |
|                                  | (0.040)  |                  | (0.081)  | (0.080)  |
| <i>Intercept</i>                 | 0.689*** | 0.694***         | 0.014    | 0.007    |
|                                  | (0.000)  | (0.000)          | (0.431)  | (0.684)  |
| Fixed effects                    | IY       | IY               | IY       | IY       |
| Adjusted R <sup>2</sup>          | 4.86%    | 4.98%            | 4.83%    | 5.14%    |
| Sample size                      | 10,339   | 10,339           | 10,339   | 10,339   |

This table presents the results of OLS regressions in which the dependent variable is either the percentage of insider transactions occurred within one month after earnings announcement (*Safe*), or the percentage of transactions by insiders who trade stocks in the same calendar month in the past three years (*Routine*). The sample consists of 10,339 firm-year observations between 1998 and 2011. *Volatility<sub>Adj</sub>* is the annualized standard deviation of daily market adjusted stock returns. *Own<sub>Insiders</sub>* is the percentage of shares held by insiders including firm officers and directors. *Trade<sub>Firm</sub>* is the ratio of total insider trading volume over a year to shares outstanding. *Following* is the number of analysts following a firm in a year. *Own<sub>Institution</sub>* is the percentage of shares held by institutions. *Litigation* is the ex-ante litigation likelihood estimated using the Rogers and Stocken (2005) approach. Other variables are defined in Appendix 2. Industry and year fixed effects are controlled. *P*-values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

The results are reported in Table 8. We find that the coefficient estimates on CG are positive and significant, suggesting that inside transactions in better governed firms contain higher percentages of *Safe* or *Routine* insider trades. More importantly, we find that the coefficient estimates on the interaction term between CG and IT-Policy (G-Counsel) are positive and significant, indicating that corporate governance improves effective implementation of ex-ante measures. Taken together, these results add to the existing studies on insider trading (e.g., Bettis et al., 2000; Jagolinzer et al., 2011) by showing that better governance facilitates firms' effective implementation of ex-ante IT-Policy and G-Counsel.

### 4.3 Ex-post disciplinary actions

In addition to adopting and effectively implementing ex-ante preventive measures of insider trading, better-governed firms may use ex-post disciplinary measures to inflict a sanction on top executives who engaged in informed insider trading, thereby discouraging other top executives from engaging in informed insider trading. Of several potential ex-post disciplinary actions, we focus on forced CEO turnover since it is considered to be one of the most aggressive corporate governance actions (e.g., Kaplan and Minton, 2012).

We identify forced CEO turnover following the procedures used by Parrino (1997), Bushman et al. (2010) and Li and Srinivasan (2011).<sup>26</sup> We then estimate a probit regression in which the dependent variable is an indicator that takes the value of one if forced CEO turnover takes place during the fiscal year following the year when CEOs trade the shares of their firms and zero otherwise. As key independent variables of interest, we include ProfitCEO (valueweighted average market-adjusted abnormal return over 180 calendar days subsequent to a CEO transaction made during a fiscal year), CG, and the interaction term between these two variables. The coefficient estimate on the interaction term measures whether the likelihood of forced CEO turnover, Turnover, is higher for better-governed firms whose insiders earn higher market-adjusted returns from their transactions. Following Hazarika et al. (2012), we control for several factors that influence the likelihood of CEO turnover including market capitalization of equity (Size), market to book ratio of equity (MB), industry-adjusted return (Returnfirm), return on assets (ROA), industry median annual stock return (ReturnIndustry), annual sales growth rate (Growth), volatility of daily stock returns of the firm during a fiscal year (VolatilityRaw), and leverage (Leverage), as well as industry and year fixed effects.

**Table 9** Likelihood of taking ex-post disciplinary actions - forced CEO turnover

| Dependent variable               | Turnover          |                    |                   |                    |
|----------------------------------|-------------------|--------------------|-------------------|--------------------|
|                                  | Purchases<br>(1)  | Sales<br>(2)       | Purchases<br>(3)  | Sales<br>(4)       |
| <i>Profit<sub>CEO</sub></i>      | -0.076<br>(0.707) | 0.328**<br>(0.042) | 0.265<br>(0.422)  | 0.156*<br>(0.052)  |
| <i>Profit<sub>CEO</sub> × CG</i> |                   |                    | 0.266<br>(0.309)  | 0.157**<br>(0.041) |
| <i>CG</i>                        |                   |                    | -0.073<br>(0.300) | -0.011*<br>(0.082) |

<sup>26</sup> Specifically, in each fiscal year, we identify CEO turnover by comparing the names of CEOs in current and following fiscal years using the ExecuComp database. We then search the Factiva news database to determine whether the turnover is routine or forced. Turnover is classified as forced if the articles report that the CEO is fired or demoted, or resigns under questionable circumstances (e.g., policy differences, pressure, lawsuits, or suspected earnings management). Among routine turnover events, we further classify them as forced turnover if the CEO retires at age below 60 or if the news article does not report the reason being death, poor health, or the acceptance of another position. We exclude CEO turnover due to death, interim appointments, mergers, or spinoffs from the sample.

|                                  |                      |                      |                      |                      |
|----------------------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Size</i>                      | 0.122***<br>(0.002)  | 0.079***<br>(0.001)  | 0.161**<br>(0.016)   | 0.069**<br>(0.043)   |
| <i>MB</i>                        | 0.025<br>(0.137)     | -0.008<br>(0.411)    | 0.032<br>(0.159)     | -0.005<br>(0.747)    |
| <i>Return<sub>firm</sub></i>     | -0.597***<br>(0.000) | -0.164**<br>(0.011)  | -0.794***<br>(0.003) | -0.031<br>(0.727)    |
| <i>ROA</i>                       | -0.630<br>(0.211)    | -0.374<br>(0.290)    | -0.813<br>(0.320)    | -0.367<br>(0.462)    |
| <i>Return<sub>Industry</sub></i> | 0.008<br>(0.974)     | -0.153<br>(0.320)    | -0.200<br>(0.574)    | 0.023<br>(0.908)     |
| <i>Growth</i>                    | -0.179<br>(0.152)    | 0.022<br>(0.455)     | -0.222<br>(0.225)    | -0.024<br>(0.798)    |
| <i>Volatility<sub>Raw</sub></i>  | 3.092<br>(0.554)     | 8.689**<br>(0.011)   | 7.810<br>(0.316)     | 8.750*<br>(0.066)    |
| <i>Leverage</i>                  | -0.676**<br>(0.020)  | 0.130<br>(0.491)     | -1.089**<br>(0.018)  | -0.052<br>(0.845)    |
| <i>Intercept</i>                 | -10.644<br>(0.974)   | -3.402***<br>(0.000) | -10.437<br>(0.970)   | -3.292***<br>(0.000) |
| Fixed effects                    | IY                   | IY                   | IY                   | IY                   |
| Pseudo $R^2$                     | 5.14%                | 1.41%                | 7.39%                | 1.90%                |
| Sample size                      | 2,308                | 7,646                | 1,158                | 4,344                |

The table provides the results of probit regressions of forced CEO turnover on the average six-month market-adjusted abnormal returns ( $Profit_{CEO}$ ) earned by CEO from insider trading. In columns (1) and (2), the sample consists of 9,954 firm-year observations with at least one CEO transaction during the previous fiscal year between 1992 and 2010. In columns (3) and (4), the sample is restricted to those between 1998 and 2010 during which data on  $CG$  are available. The dependent variable,  $Turnover$ , is equal to one if there is forced CEO turnover in a given year and zero otherwise. Forced CEO turnover is assumed to occur if a CEO is forced to leave her position in the fiscal year following CEO transactions.  $Profit_{CEO}$  is the value-weighted average market-adjusted abnormal buy-and-hold return over 180 calendar days subsequent to the insider trading earned by CEO during the previous fiscal year.  $Return_{firm}$  is the difference between annual stock return of the firm and the median annual return of firms in the same Fama-French (1997) 48 industry.  $ROA$  is the ratio of earnings excluding extraordinary items to total assets.

$Return_{Industry}$  is the median annual returns of firms in the same industry.  $Growth$  is the annual growth in firm's sales.  $Volatility_{Raw}$  is the volatility of daily stock returns of the firm during the fiscal year.  $Leverage$  is total liabilities as a ratio of total assets. Other variables are defined in Appendix 2. All control variables are lagged for one year to capture the characteristics of the firms before the year of forced CEO turnover. Industry and year fixed effects are controlled.  $P$ -values in parentheses are based on standard errors clustered at the firm level. \*\*\*, \*\*, and \* stand for statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

The results are presented in Table 9. The sample consists of 9,954 firm-year observations where at least one insider transaction is made by CEOs between 1992 and 2010.<sup>27</sup> In models (1) and (2), we examine whether the likelihood of forced CEO turnover is associated with the average abnormal returns earned from insider transactions made by CEOs during the previous year. The results show that the likelihood of forced CEO turnover is significantly higher when CEOs realize higher abnormal returns from their sales transactions (model 2). For the economic magnitude, the unreported  $Profit_{CEO}$ 's marginal effect of 0.0184 suggests that when  $Profit_{CEO}$  increases by one standard

<sup>27</sup> In untabulated tests, we include firm-year observations with no CEO transactions in the analysis by setting the missing values of  $Profit_{CEO}$  to be zero. We find that the results are qualitatively similar.

deviation (0.146), the likelihood of forced turnover increases by 30 basis points ( $= 0.146 \times 0.0184$ ). This magnitude is economically large, accounting for almost 10% of the mean unconditional forced turnover rate for our sample (3.5%). We do not find such a significant relation for purchase transactions (model 1), in line with findings in prior sections.

In models (3) and (4), we use a subsample of firm-year observations from 1998 to 2010, during which CG data are available. We find that the coefficient estimate on the interaction term between CG and ProfitCEO is significantly positive in model (4), suggesting that the likelihood of forced CEO turnover is higher when the CEOs of better-governed firms earn higher abnormal returns from their sales transactions. However, the coefficient estimate on the interaction term between CG and ProfitCE from purchase transactions is insignificant (model 3). These results suggest that firms with better corporate governance indeed take more disciplinary actions against CEOs' informed transactions that involve greater legal risk (i.e., sales transactions).<sup>28</sup>

## 5 Conclusion

Previous studies show that insiders exploit their information advantage to extract private benefits and that well-designed corporate governance is effective in aligning the interests of shareholders with those of top managers. To the extent that an increase in litigation risk caused by informed insider transactions harms the interests of shareholders, corporate governance is expected to play an instrumental role in discouraging insiders from engaging in such transactions. Since legal risk tends to be higher in informed insider sales than in insider purchases (Cheng and Lo, 2006; Rogers, 2008) and abnormal profits earned from insider sales cannot be considered an optimal way to compensate managerial success, we hypothesize that corporate governance is particularly effective in reducing the profitability of insider sales.

Consistent with our hypothesis, we find that the average abnormal profits earned over the 180 calendar days following the sales transaction date are significantly less for insiders of better governed firms than for insiders of poorer-governed firms. We do not find such results for purchase transactions. The effect of corporate governance on the profitability of sales transactions is economically meaningful: a one-standard-deviation increase in the governance score, CG, lowers six-month abnormal returns earned by insiders from their sales transactions by 0.76%. The results continue to hold even after controlling for firms' ITPs and the policy that requires GC pre-approval, and are robust to using a variety of model specifications, alternative methods to estimate abnormal returns, and alternative measures of the quality of corporate governance.

We further find that the restriction effects of corporate governance on the profitability of insider trading are particularly strong for insider sales that involve higher litigation risk, that is, sales made by insiders of firms with higher ex-ante litigation risk and sales made by opportunistic insider traders. These results suggest that legal risk is one of important reasons why well-governed firms devote their efforts to prevent insiders from exploiting private information. In addition, we find that important characteristics of better-governed firms such as high equity linked compensation and low information asymmetry are unlikely to drive our main results. Rather, three mechanisms that corporate governance uses to restrict informed insider trading drive our results: we find that better-governed firms are more likely to place ex-ante preventive measures of informed insider trading (e.g., adopting voluntary insider trading restriction policies),

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<sup>28</sup> In untabulated tests, to address the potential endogeneity concerns, we use a 3SLS regression approach in which we use state median ITP and GC as IVs for Profit<sub>CEO</sub>, and state median CG as IV for CG. To the extent that state median ITP and GC are significantly related to Profit<sub>CEO</sub> but unlikely to directly affect firms' forced CEO turnover, these two variables meet both the relevance and exclusion requirements of instrumental variables. We find similar results in the 3SLS regression.

implement such ex-ante measures more effectively, and take an ex-post disciplinary action more actively against CEOs who engaged in opportunistic insider trading.

Our findings have important implications for investors, regulators, and corporate managers, and highlight the monitoring role of corporate governance in restricting informed insider trading. Our paper also suggests that future research on corporate governance should consider the role of governance in reducing legal risk, and devote more efforts in identifying the channels through which governance systems operate in mitigating agency costs and legal risk.

**Appendix 1** Description of corporate governance (*CG* and *CG<sub>Broad</sub>*) component variables

| Category                                      | Item | CG item                                              | Good<br>CG | Definition                                                                                                             | Source            | Reference                                                                                                                                                                                                         |
|-----------------------------------------------|------|------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CG<br>components                              | 1    | Board independence<br>(CG1)                          | +          | Percentage of independent directors on the board.                                                                      | RiskMetrics       | Laksmna (2008), Hoitash et al. (2009), Li and Srinivasan (2011), Chen et al. (2012), Chhaochhaia et al. (2012), Hazarika et al. (2012), Masulis et al. (2012), Morellec et al. (2012), and Wintoki et al. (2012). |
|                                               | 2    | Compensation committee independence<br>(CG2)         | +          | Percentage of independent directors on the compensation committee.                                                     | RiskMetrics       | Laksmna (2008), and Chhaochhaia et al. (2012).                                                                                                                                                                    |
|                                               | 3    | Institutional ownership<br>(CG3)                     | +          | Percentage of shares held by institutional investors.                                                                  | Thomson Financial | Laksmna (2008), Li and Srinivasan (2011), Chen et al. (2012), Hazarika et al. (2012), and Morellec et al. (2012).                                                                                                 |
|                                               | 4    | Independent & longterm institutional ownership (CG4) | +          | Percentage of shares held by the top five independent, long-term, and dedicated/quasi-indexer institutional investors. | Thomson Financial | Chen et al. (2007).                                                                                                                                                                                               |
| Other <i>CG<sub>Broad</sub></i><br>components | 5    | Board size                                           | -          | Number of directors on the board.                                                                                      | RiskMetrics       | Laksmna (2008), Hoitash et al. (2009), Li and Srinivasan (2011), Chen et al. (2012), Hazarika et al. (2012), Hoechle et al. (2012), Masulis et al. (2012), and Wintoki et al. (2012).                             |
|                                               | 6    | Old director                                         | -          | Percentage of directors who are older than 72.                                                                         | RiskMetrics       | Armstrong et al. (2012), and Hoechle et al. (2012).                                                                                                                                                               |

|         |                                                                                     |                                                                                                                    |                                                                                                        |
|---------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 7       | Busy director<br>- RiskMetrics percentage                                           | Percentage of independent directors who hold three or more board directorships. (2012), and Masulis et al. (2012). | Laksmana (2008), Hoitash et al. (2009), Hoechle et al.                                                 |
| 8       | Block independent<br>+ an independent director that is a large RiskMetrics director | An indicator that equals one if a firm has<br>Armstrong et al. (2012).<br>shareholder and zero otherwise.          | Li and Srinivasan (2011), Masulis et al. (2012), and                                                   |
| 33      |                                                                                     |                                                                                                                    |                                                                                                        |
| 9       | Fraction of directors whose tenure predates + CEO                                   | 11 Insider ownership +<br>Percentage of independent directors appointed before the current CEO took office.        | RiskMetrics<br>Laksmana (2008), Hazarika et al. (2012) and Armstrong et al. (2012).                    |
| 10      | CEO/<br>Chairman<br>-                                                               | An indicator that equals one if the CEO and the chairman of the board are the same person and zero otherwise.      | Chen et al. (2012), Hazarika et al. (2012), Masulis et al. ExecuComp (2012) and Wintoki et al. (2012). |
| Duality |                                                                                     | Percentage of equity ownership by all board members and all top 5 officers.                                        | RiskMetrics and Li and Srinivasan (2011), Masulis et al. (2012) and Hazarika ExecuComp et al. (2012).  |

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This appendix provides a detailed description of the construction of the corporate governance variables used in the tables.





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**Appendix 2** Description of variables

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| Variable | Definition |
|----------|------------|
|----------|------------|

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**A. Insider trading profit variables**

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $Profit_{BHAR}$      | Market-adjusted abnormal buy-and-hold return in percentage over 180 calendar days subsequent to the insider trading date, multiplied by -1 for insider sales transactions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| $Profit_{Alpha}$     | Average daily abnormal return in basis points estimated using Carhart's (1997) four-factor model over 180 calendar days subsequent to the insider trading date, multiplied by -1 for insider sales transactions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| $Profit_{portfolio}$ | The intercept from time-series monthly portfolio regressions estimated using the Carhart's (1997) four-factor model in percentage. To form the portfolio, in each calendar month, we first assign a sample firm into a net purchase (net sales) group based on the net number of shares purchased by insiders of the firm during the month. Then, in each month, we form net purchase (sale) portfolios using all firms classified as net purchase (sales) firms at least once over the past six-month period and calculate value-weighted portfolio returns. For aggregate portfolios, we include all firms in net purchase and sale portfolios, but multiply the returns of the firms in net sale portfolios by -1. |

**B. Corporate governance variables**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Good CG      | Indicator that takes the value of one for a firm with CG that is above the sample industry median CG calculated in each year and zero otherwise.                                                                                                                                                                                                                                                                                                                                            |
| CG           | The first principal component of board independence, compensation committee independence, institutional ownership, and independent & long-term institutional ownership.                                                                                                                                                                                                                                                                                                                     |
| $CG_{Broad}$ | The first principal component of board independence, compensation committee independence, institutional ownership, independent & long-term institutional ownership, and seven other governance attributes described in Appendix 1.                                                                                                                                                                                                                                                          |
| $CG_{ISS}$   | Corporate governance score constructed by <i>Institutional Shareholder Services</i> , equal to the number of minimally acceptable governance attributes met by a firm out of 64 governance attributes along eight major dimensions, with a higher ISS score indicating better governance. For a detailed description of the governance attributes used in the calculation of ISS, see Aggarwal and Williamson (2006) and Aggarwal et al. (2009). Log value is taken in regression analysis. |

**C. Control variables in main analysis**

|      |                                                                                                                                                      |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size | The inflation-adjusted market value of equity in \$millions at the end of the most recent fiscal quarter. Log value is taken in regression analysis. |
| MB   | Ratio of the market value of equity to the book value of equity in the most recent fiscal quarter.                                                   |

|                               |                                                                                                                                                                                                    |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Return</i>                 | Cumulative market-adjusted excess return in percentage over 180 calendar days prior to the insider trading date, multiplied by -1 for insider sales transactions.                                  |
| <i>Trade<sub>Size</sub></i>   | Absolute value of the net number of shares purchased by all insiders of a firm on the transaction date divided by the total number of shares outstanding of the firm in percentage.                |
| <i>Trade<sub>Recent</sub></i> | Sum of absolute values of the daily net numbers of shares purchased by all insiders of a firm during ten days prior to the transaction date, scaled by the total shares outstanding in percentage. |
| <i>R&amp;D</i>                | Indicator that takes the value of one if a firm reports non-zero R&D expenditures in the most recent fiscal year and zero otherwise.                                                               |
| <i>Loss</i>                   | Indicator that takes the value of one if net income before extraordinary items in the most recent fiscal year is strictly negative and zero otherwise.                                             |
| <i>Dispersion</i>             | Monthly standard deviation of current-fiscal-year EPS forecasts divided by the mean of the forecasts for the most recent fiscal quarter.                                                           |
| <i>IT-Policy</i>              | Indicator that takes the value of one for firms with an insider trading policy and zero otherwise.                                                                                                 |
| <i>G-Counsel</i>              | Indicator that takes the value of one for firms with a general counsel pre-approval requirement and zero otherwise.                                                                                |

#### **D. Other variables in additional analysis**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Officer</i>                  | An indicator that takes the value of one for transactions made by officers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>Director</i>                 | An indicator that takes the value of one for transactions made by board of directors.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <i>Litigation</i>               | Ex-ante litigation likelihood estimated using the Rogers and Stocken (2005) approach. Specifically, it is estimated using a probit model in which the dependent variable is an indicator that takes the value of one if a Rule 10b-5 lawsuit is filed against a firm in a given quarter and zero otherwise. The independent variables include firm size, beta, daily turnover, cumulative quarterly return, standard deviation of daily returns, minimum of daily returns, and skewness of daily returns and indicators for high-risk industries. |
| <i>Opportunistic</i>            | An indicator that takes the value of one for transactions by insiders who do not trade stocks in the same calendar month in the past three years and zero otherwise.                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Safe</i>                     | Percentage of insider transactions occurred within one month after earnings announcement.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Routine</i>                  | Percentage of transactions by insiders who trade stocks in the same calendar month in the past three years.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>Volatility<sub>Adj</sub></i> | Annualized standard deviation of daily market adjusted stock returns. Log value is taken in regression analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Own<sub>Insiders</sub></i>   | Percentage of shares held by insiders including firm officers and directors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <i>Trade<sub>Firm</sub></i>     | Ratio of total insider trading volume over a year to shares outstanding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                  |                                                                                                                                                                                                                                                          |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>OwnInstitution</i>            | Percentage of shares held by institutional investors                                                                                                                                                                                                     |
| <i>Profit<sub>CEO</sub></i>      | Average six-month market-adjusted abnormal returns earned by CEO from insider trading.                                                                                                                                                                   |
| <i>Turnover</i>                  | Indicator that takes the value of one if forced CEO turnover takes place following the year when CEOs trade the shares of their firms and zero otherwise, which identified based on Parrino (1997), Bushman et al. (2010), and Li and Srinivasan (2011). |
| <i>Return<sub>firm</sub></i>     | Difference between annual stock return of the firm and the median annual return of firms in the same Fama-French (1997) 48 industry.                                                                                                                     |
| <i>ROA</i>                       | Ratio of earnings excluding extraordinary items to total assets.                                                                                                                                                                                         |
| <i>Return<sub>Industry</sub></i> | Median annual returns of firms in the same industry.                                                                                                                                                                                                     |
| <i>Growth</i>                    | Annual growth in firm's sales.                                                                                                                                                                                                                           |
| <i>Volatility<sub>Raw</sub></i>  | Volatility of daily stock returns of the firm during the fiscal year.                                                                                                                                                                                    |
| <i>Leverage</i>                  | Total liabilities as a ratio of total assets.                                                                                                                                                                                                            |

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This appendix provides a detailed description of the construction of the variables used in the tables.

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