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Does increased board independence reduce earnings management? Evidence from recent regulatory reforms

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Abstract

In this paper, we examine whether recent regulatory reforms requiring majority board independence are effective in reducing the extent of earnings management. Firms that did not have a majority of independent directors prior to the reforms (referred to as non-compliance firms) are required to increase their board independence. We find that, while non-compliance firms on average do not experience a significant decrease in earnings management after the reforms compared to other firms, non-compliance firms with low information acquisition cost experience a significant reduction in earnings management. The results are similar when we examine audit committee independence and when we use alternative proxies for information acquisition cost and earnings management. These findings indicate that independent directors' monitoring is more effective in a richer information environment.

Key words: earnings management, corporate governance, board independence, information environment

JEL codes: G32, M40

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1. Introduction

In response to the widespread corporate and accounting scandals in the late 1990s and early 2000s, in 2002, the New York Stock Exchange (NYSE) and the National Association of Securities Dealers (NASD) proposed new corporate governance rules for the listed firms, which were approved by the Securities and Exchange Commission (SEC) in 2003. These rules required the listed firms to have a majority of independent directors on their boards. One of the primary objectives of this reform is to enhance the monitoring by the board, particularly the monitoring of the financial reporting process. Duchin et al. (2010) examine the impact of this board structure reform on firm performance and valuation. They find that after the reform, firms with an increase in board independence experience an improvement in firm performance if the information acquisition cost for independent directors is low. However, ex ante, it is unclear how the increased board independence as a result of this reform will affect earnings management and whether earnings management is a channel through which this reform influences firm performance, given the mixed evidence on the association of board structure and earnings management in the literature.[1]

In this paper, we directly test whether an increase in board independence in response to this reform is associated with a decrease in earnings management. Moreover, in light of the potential ineffectiveness of outside directors' monitoring due to the lack of information (e.g., Jensen 1993; Adam and Ferreira 2007; Duchin et al. 2010), we investigate whether the impact of the increase in board independence on earnings management varies with the cost of information acquisition. If independent directors' monitoring is more effective when the cost of information acquisition is low, we expect to find a stronger association between the increase in board independence and the

[1] While some studies (e.g., Beasley 1996; Klein 2002; Bédard et al. 2004) document a negative association between earnings management and the independence of board and/or audit committee, other studies (e.g., Vafeas 2005; Larcker et al. 2007) provide conflicting results. See Section 2.2 for detailed discussions.

reduction in earnings management for firms with lower information acquisition cost than for those with higher information acquisition cost. Our tests thus (1) provide evidence on the effectiveness of the board structure reform in reducing the extent of earnings management and (2) complement Duchin et al. (2010) by shedding light on one of the channels through which increases in board independence can enhance firm value.

Our sample includes 1,587 firms with board data from BoardEx for the period 2000-2005. We split the sample into two groups. The first group, 55 percent of the sample, satisfied the regulatory requirement before the reform and is referred to as compliance firms; the second group, 45 percent of the sample, is referred to as non-compliance firms. To comply with the regulatory requirements, non-compliance firms have to increase board independence. Exploiting this exogenous change in board independence for non-compliance firms, we adopt a difference-in-differences research design. Specifically, we use an indicator for non-compliance firms as the instrument for the ex-post increase in board independence and use compliance firms to control for the time-trend of earnings management during our sample period (e.g., Cohen et al. 2008). In the main tests, we examine whether there is a significant reduction in earnings management from the pre- to post-regulation period for non-compliance firms relative to compliance firms and whether the reduction is greater for non-compliance firms with lower information acquisition cost. As an alternative research design, we use the non-compliance indicator to predict the change in board independence and base our tests on the predicted change in board independence; we obtain similar results.

Both anecdotal evidence and our own exploration suggest that increases in board independence primarily occur between 2002 and 2004 and that board independence levels are relatively stable prior to 2002 and after 2004. Thus, we use the period 2000-2001 as the pre-regulation period and 2005-2006 as the post-regulation period. The extent of earnings

management in the pre- or post- regulation period is proxied by the average of the absolute value of performance-matched discretionary accruals (|DA|) over the corresponding period.

We find that on average, compared to compliance firms, non-compliance firms do not experience a significant reduction in earnings management from the pre- to post-regulation period. More interestingly, we find that the reduction in earnings management for non-compliance firms decreases with information acquisition cost. Non-compliance firms with low information acquisition cost experience a significant decrease in earnings management compared to non-compliance firms with high information acquisition cost. These results indicate that while the increase in board independence itself does not reduce earnings management, a richer information environment can facilitate independent directors' monitoring, resulting in a decrease in earnings management. These findings hold for various proxies of information acquisition cost. In the main analyses, we use an aggregate information score, based on trading volume, bid-ask spread, analyst coverage and forecast error, as the inverse proxy for information acquisition cost faced by outsiders in obtaining firm-specific information (Andersen et al. 2009). In the sensitivity tests we use other proxies, including the information cost measure in Duchin et al. (2010), analyst coverage, and industry homogeneity.

We conduct several additional analyses to provide additional insights. First, we obtain similar inferences when we use the latent analysis. Under the latent analysis, the sample is grouped into clusters so that observations within each cluster follow a similar model.[2] For our tests, the number of clusters is determined to be two. In cluster I, an increase in board independence is significantly associated with a decrease in earnings management; whereas in cluster II, the association is insignificant. We find that firms in cluster I have significantly lower information acquisition cost than those in cluster II, consistent with the inference that low

[2] See Larcker and Richardson (2004) for detailed discussions of the latent analysis.

information acquisition cost is an important condition for the link between increases in board independence and decreases in earnings management. Second, the inferences hold for the Dechow and Dichev's (2002) earnings quality measure or the Roychowdhury's (2006) real earnings management proxy. Third, we examine audit committee independence and find qualitatively similar results.[3] Fourth, we directly link our findings to Duchin et al. (2010) by investigating whether the reduction in earnings management is one of the channels through which board independence increases firm value. Using a similar research design as in Core et al. (1999) and Bowen et al. (2008), we find that the change in earnings management explained by the increased board independence and information acquisition cost is negatively correlated with future performance. That is, the larger the reduction in earnings management, the better the future performance is. Such evidence indicates that increased board independence reduces *opportunistic* earnings management when information acquisition cost is low, leading to better firm performance. Lastly, we conduct additional analyses to address an alternative explanation that firms with low information acquisition cost are under greater pressure to hire better qualified directors, and the difference in director qualifications drives the documented results. When we compare the characteristics of newly appointed independent directors between non-compliance firms with high and those with low information acquisition cost, we find that those directors have similar employment background and do not differ in financial expertise. We also find that these two groups of firms have a similar number of board meetings, a proxy for directors' effort. Thus, we find no evidence supportive of this alternative explanation.

Our paper contributes to the literature in several important ways. First, it provides direct

[3] We focus on board independence in the main analyses and examine audit committee independence in the additional analyses for the following reasons. First, while the audit committee directly oversees the financial reporting process, it reports to the board, which is ultimately responsible for all important decisions. Second, as discussed in detail in Section 2.1, regulatory reforms on audit committee independence spanned a longer period, making the difference-in-differences research design less powerful.

evidence on whether and under what conditions recent regulatory reforms on board independence affect earnings management. These regulatory reforms represent unprecedented responses to several high-profile corporate scandals. Since earnings management is one of the main drivers of the reforms, it is important to investigate whether these reforms effectively curb earnings management. Second, our paper complements Duchin et al. (2010) by showing that the reduction in earnings management is a channel through which increases in board independence improve firm value. Third, our paper contributes to the broad literature on corporate governance and earnings management. Board independence and earnings management are likely endogenously determined (e.g., Larcker et al. 2007; Guay 2008; Bushman 2009). Unlike prior studies, we exploit an exogenous change in board structure.[4] Such an analysis is less likely to be subject to endogeneity. We also build on the notion that outside directors' monitoring is enhanced by their access to firm-specific information and shed light on the circumstances under which the monitoring of outside directors is more effective.[5]

Over the sample period, there are other concurrent regulatory changes such as the internal control disclosure requirement under Section 404 of the Sarbanes-Oxley Act (SOX). We use a difference-in-differences approach to control for the other regulatory and economic changes during the sample period that may affect the extent of earnings management. We have also conducted additional tests to ensure that our inferences are robust to other regulatory changes. Nonetheless, we would like to point out that because of the many regulatory changes over the

[4] While regulatory reforms are not exogenous in the sense that they are responses to corporate scandals, the regulatory requirements are largely exogenous to individual firms.

[5] Given that we find that increased board independence reduces earnings management for firms with better information environment, it is natural to ask why these firms do not choose to increase board independence before the reforms. There are several possible reasons. First, managers may be entrenched and reluctant to do so. The market force may not be powerful enough to lead to the desired change in board structure due to free rider and information asymmetry problems (e.g., Adams and Ferreira 2007; Duchin et al. 2010). Second, even if managers are not entrenched, there are transaction costs associated with changing board structure, including costs of board selection, contract costs with directors, and legal costs (Coles et al. 2008). The transaction costs can explain firms' deviation from optimal board structure for a prolonged period of time.

sample period, we cannot completely rule out the possibility that our results might be attributed to the other contemporaneous regulatory changes.

The rest of the paper is organized as follows. Section 2 discusses the regulatory background, related research and our hypotheses; Section 3 describes the sample and data; Section 4 presents the main analyses; Section 5 reports additional analyses; and Section 6 concludes.

2. Background, related research and hypothesis development

2.1 Recent regulatory reforms on board independence

In response to several highly publicized financial reporting failures (e.g., Enron and WorldCom), in 2002 the NYSE and NASD proposed new corporate governance rules requiring that the board consist of a majority of independent directors. The criteria for independent directors are greatly clarified. In essence, a director is independent if (s)he does not accept any significant compensatory fee from the firm (other than the director fee) and is not an affiliated person of the firm or its subsidiary. These new rules were approved by the SEC in 2003. Listed companies had until the first annual meeting in 2004 to comply with the new rules.

The reforms related to audit committee independence spanned a longer period. There had been exchange rules in place regarding audit committee independence since 1980's, and the exchanges further tightened the rules in 1999.[6] Responding to calls to improve the financial reporting process, in 1999 the NYSE and NASD required that the listed firms maintain an audit committee of at least three directors, all of whom must be independent. Section 301 of the Sarbanes-Oxley Act (SOX) of 2002 has similar requirements and enhances the exchange rules by spelling out the responsibilities of the audit committee.

[6] For example, in 1987 the NYSE required that the listed firms have an audit committee consisting solely of independent directors, and in 1989 the NASD required that the listed firms have an audit committee with the majority of the members being independent. Despite these rules, the definition of independent directors is not entirely clear, and firms often have affiliated directors sitting on audit committees (Vicknair et al. 1993).

Because the regulatory reforms on audit committee independence spanned a longer period, the analysis of the change in audit committee independence is more likely to be confounded by contemporaneous events. As a result, we focus on the increase in the overall board independence in the main analyses and examine the increase in audit committee independence in an additional analysis.

2.2 Related research

Prior research has examined the association between board independence and earnings management, but the evidence to date is somewhat mixed. Using a sample of 692 firm-years in the period 1992-1993, Klein (2002) finds that the extent of earnings management is negatively correlated with board and audit committee independence. While some later studies confirm the negative association between earnings management and the independence of board and/or audit committee (e.g., Bedard et al. 2004), other studies find conflicting results. For example, Vafeas (2005), Agrawal and Chadha (2005), and Larcker et al. (2007) document an insignificant correlation between board/audit committee independence and earnings management. [7]

The mixed evidence in prior studies may be related to the endogeneity between board independence and earnings management. As pointed out by Larcker et al. (2007), Guay (2008), and Bushman (2009), board independence and earnings management can be part of a general equilibrium and be endogenously determined. Using change regressions does not solve this issue either, because the change in earnings management and the change in board independence can be driven by the same unobservable firm and CEO characteristics. Compared to the prior studies, we take advantage of the regulatory requirement of increases in board independence, an exogenous shock to the firms affected. While not a perfect setting (e.g., there may be confounding concurrent

[7] Romano (2005) surveys the literature on the impact of audit committee independence on earnings management and finds that while six studies find a negative association, 10 others fail to find a significant association.

regulatory changes), the endogeneity problem is less of a concern here than in prior research. In addition, we extend the literature by investigating whether the effectiveness of boards in reducing earnings management varies with information acquisition cost faced by outside directors.

Our paper is also related to several recent studies that use the same setting to examine the impact of the board structure reforms on firm performance and value. Apart from Duchin et al. (2010), as discussed earlier, Chhaochharia and Grinstein (2007) study the overall market reaction to the rule announcements and find that firms that are not compliant with the rules prior to the reform (i.e., non-compliance firms) are associated with positive abnormal returns compared to other firms, but the positive abnormal returns only apply to large non-compliance firms. Our study complements the above two studies by focusing on earnings management. The findings on the overall firm value do not necessarily apply to individual corporate decisions, as shown in the case of compensation practices.[8] By providing direct evidence on earnings management, our study sheds light on one of the channels through which increases in board independence can enhance firm value. To further establish the link, we find that the decrease in the extent of earnings management, as explained by the change in board independence, is associated with an improvement in firm performance.

2.3 Increases in board independence and earnings management: H1

Under the new rules, firms must have a majority of independent directors on their boards. Prior to this requirement, firms had different levels of board independence. Some firms already had a majority independent board. The reforms, therefore, did not affect them, and we refer to them as compliance firms. Other firms, in contrast, did not have a majority independent board prior to the reforms. We refer to those as non-compliance firms. Non-compliance firms have to

[8] Guthrie et al. (2012) find that the increase in board independence is not associated with a reduction in excessive executive compensation. While Chhaochharia and Grinstein (2009) document a reduction in excessive executive compensation for non-compliance firms after the reform, Guthrie et al. (2012) find that their results are driven by a few outliers. Our results are robust to outliers. See Section 4 for detail.

increase board independence in order to comply with the new rules.

Compared to other directors, independent directors are less subject to managers' influence and are hence more objective. If independent directors are more effective monitors than other directors, an increase in board independence can reduce the extent of earnings management. If this is the case, non-compliance firms are expected to have a larger decrease in earnings management from the pre- to the post-regulation period, compared to compliance firms. Our first hypothesis is thus stated as (in alternative form):

H1: Compared to compliance firms, non-compliance firms experience a larger decrease in earnings management from the pre- to the post-regulation period.

We might not find results consistent with H1 for the following reasons. First, the increase in board independence as a response to the reform may be primarily window dressing (e.g., Romano 2005). Second, the outside directors' monitoring role might be hindered by their lack of information. For example, Adams and Ferreira (2007) argue that "unless boards are given better access to information, simply increasing board independence is not sufficient to improve governance." Below we discuss the information access issue and develop our second hypothesis.

2.4 Information acquisition cost, board independence and earnings management: H2

By their nature, independent directors have less information than managers. While having access to the management for information, independent directors might have difficulty obtaining necessary information for monitoring purposes (Raheja 2005). For example, knowing that independent directors are tougher monitors, managers may be reluctant to share important information with them (Adams and Ferrira 2007; Harris and Raviv 2008).

The information concern is shared by both academia and directors. For example, Jensen (1993, p. 864) states that "the CEO almost always determines the agenda and information given to the board. This limitation on information severely hinders the ability of even highly talented

board members to contribute effectively to the monitoring and evaluation of the CEO and the firm's strategy." The surveys conducted by KPMG in 2004 and 2010 among audit committee members indicate that about half of the audit committee members rate the information prepared by the management before the committee meeting as of moderate or low quality and that audit committee members often have to cultivate relationships with managers in order to obtain useful information. Most of the surveyed board members indicate that one of the most important ways to improve board effectiveness is to improve the information they have.

The above discussions suggest that the effectiveness of outside directors as monitors of financial reporting is hindered by poor information access. Therefore, the monitoring of outside directors will be more effective when information acquisition cost is lower.[9] If this is the case, non-compliance firms with lower information acquisition cost should experience a greater decrease in earnings management from the pre- to the post-regulation period than other non-compliance firms. Thus, our second hypothesis is (stated in alternative form):

H2: Compared to other non-compliance firms, non-compliance firms with lower information acquisition cost experience a greater decrease in earnings management from the pre- to the post-regulation period.

3. Sample and data

3.1 Sample selection and the measurement of earnings management

As mentioned earlier, we use the period 2000-2001 as the pre-regulation benchmark period and 2005-2006 as the post-regulation period. The rule of majority board independence was proposed in 2002 and adopted in 2003; firms are required to comply with it no later than the end of 2004. As in prior studies, we find that firms responded to the new regulations by increasing board independence, primarily over the period 2002-2004.

[9] This is consistent with our private conversations with several directors, who indicate that they periodically obtain information from sources other than the management prior to board meetings. DeFranco et al. (2010) also argue that outside directors are more informed and are more effective monitors when firms make more public disclosures.

We obtain information on the structure of boards from the BoardEx. We start with firms that have board information over 2000-2005 from BoardEx.[10] We first exclude the controlled firms because they are exempt from the majority independent board requirement.[11] We also exclude firms in the financial and utilities industries because the commonly used earnings management measures may be problematic for these industries (e.g., Becker et al. 1998). We then require that the sample firms have financial information from Compustat and stock price information from CRSP for the pre- and post-regulation periods. Lastly, we require that firms have non-missing discretionary accruals for the pre- and post-regulation periods. Our final sample consists of 1,587 firms.

Following prior studies (e.g., Klein 2002; Kothari et al. 2005; Yu 2008; Cohen et al. 2008), we measure the extent of earnings management using the absolute value of performance-matched discretionary accruals (|DA|). As described in Appendix A, we estimate the accruals model using data from the Compustat population for each industry-year that has at least fifteen observations (industries defined as in Fama and French (1997)). To ensure that our results are not driven by a particular year, we compare the average |DA| between the pre-regulation period, 2000-2001, and the post-regulation period, 2005-2006.

3.2 Compliance vs. non-compliance firms and change in board independence

We rely on the BoardEx's definition of independent directors; a director is regarded as independent if he or she is neither affiliated with the firm nor currently an employee of the firm.[12] We separate firms based on whether they satisfied the regulatory requirement of majority

[10] BoardEx covers S&P 1500 firms as well as smaller firms. The most important advantage of using BoardEx is to increase the generalizability of the results. Since the board data for smaller firms in BoardEx is somewhat limited for the period 2000-2002, we hand collect the information on board structure from proxy statements for the period 2000-2002 if such information is missing in BoardEx.

[11] If more than 50 percent of a firm's voting power is held by an individual, a group of individuals who agree to vote together, or another firm, the firm is classified as a controlled firm. We use the proxy statements to identify the controlled firms.

[12] According to the BoardEx, affiliated directors include those who are former employees of the firm, providers of professional services to the firm, customers or suppliers of the firm, or family members of an employee.

independent board in 2000. Firms that did not have a majority independent board in 2000 are referred to as non-compliance firms, and firms that did are referred to as compliance firms. Of the 1,587 firms in our sample, 722 are non-compliance firms and 865 are compliance firms.

Table 1 presents the board independence over time. For compliance firms, the average percentage of independent directors increases modestly from 67.99 percent in 2000 to 76.81 percent in 2005, and the percentage of firms with a majority independent board experiences a small decrease, from 100 percent (by construction) to 98.15 percent. In contrast, for non-compliance firms, the average percentage of independent directors increases from 38.82 percent in 2000 to 69.93 percent in 2005.[13] The percentage of firms with a majority independent board increases from 0 percent (by construction) to 94.32 percent.[14]

As mentioned earlier, because non-compliance firms are required to increase board independence, we use the non-compliance indicator as an instrument for the increase in board independence as a response to the reform. This ex ante indicator is highly correlated with the ex post increase in board independence and has the advantage of being largely exogenous to our dependent variable of interest – the ex post change in earnings management.[15]

In addition, we adopt the two-stage least-squares (2SLS) approach and use the predicted change in board independence as an alternative explanatory variable. Specifically, in the first

[13] Non-compliance firms can increase board independence by (i) hiring new independent directors and/or (ii) retiring old affiliated or insider directors. Overall, our sample firms do not experience a significant change in board size, with a mean (median) board size of 8.51 (8.00) in 2000 and 8.58 (8.00) in 2005 (untabulated).

[14] Based on our reading of firms' proxy statements, the primary reason why some firms did not comply with the requirement by 2005 based on the BoardEx's definition is the difference in the definition of independent directors between the firm and BoardEx. BoardEx's definition tends to be stricter. For example, while the regulatory definition of past employees refers to employees within the last three years, BoardEx tends to regard directors with any employment history with the company as past employees. In some cases, the firm applies the rule loosely. For example, some firms classify directors with business relationships with the firm as independent directors, arguing that these relationships do not interfere with such directors' independence. BoardEx classifies all such directors as affiliated.

[15] Note that we are interested in increases in board independence in general. We use the non-compliance indicator as the instrument for increases in board independence. We are not implying that 50% is the critical threshold for effective board monitoring.

stage, we regress the actual change in board independence from 2000 to 2005 on the non-compliance indicator and firm characteristics in 2000. In the second stage, we use the predicted change in board independence from the first-stage regression to explain the change in earnings management. Using this variable captures variations in the change in board independence among non-compliance firms as well as ensures that our results are robust to alternative measures.

Panel A of Appendix B reports the first-stage regression results. The non-compliance indicator is positively correlated with the change in board independence (coefficient=0.223, t=32.31, Column (1)). As noted above, over the sample period, firms are also required to comply with the rule of 100% independent audit committee, leading to increase in overall board independence. Therefore, in Column (2), we add to the prediction model a non-compliance indicator for audit committee (*Non_Compliance_Audit*), defined as 1 for firms without a 100% independent audit committee in 2000. We find that the coefficient on this variable is also significantly positive (t=12.65) and that adding this variable increases the explanatory power – the adjusted R^2 increases from 45.6% to 50.7%. Hence we use the predicted increase in board independence from the full model in the second stage analyses.

3.3 Proxies for information acquisition cost

For the main analysis, we use an aggregate information score to capture information acquisition cost for independent directors. As discussed in Section 2, independent directors are not as informed as insiders; in order to obtain additional information, they can rely on sources other than management. Hence we use the richness of the information environment (including attributes related to financial analysts) to proxy for information access for outside directors.

We follow Anderson et al. (2009) and construct the information score based on the following four variables: (1) turnover – average daily trading volume scaled by the total number of shares outstanding, (2) average bid-ask spread over the year – bid-ask spread measured as the

difference between bid and ask price scaled by the average of the two, (3) analyst coverage – the number of analysts issuing forecasts in the year, and (4) forecast error – the absolute value of the difference between actual earnings per share and the consensus analyst forecast before earnings announcements, scaled by stock price at the beginning of the year. We take the average of the quintile ranks of these four variables (reverse ranks for bid-ask spread and forecast error) to construct the information score (*I_Score*).[16] The quintile ranks are denoted as 0, 0.25, 0.5, 0.75, and 1; hence *I_Score* has a range of [0,1]. A higher information score implies a more transparent information environment and a lower information acquisition cost. To address the potential endogeneity between board independence and information environment (e.g., Linck et al. 2008; Armstrong et al. 2014), we measure the information score in 2000 (i.e., in the pre-regulation period). This way, the information score should not be confounded by the change in board independence from the pre- to the post-regulation period.

4. Empirical analyses

4.1 Tests of H1: Increases in board independence and changes in earnings management

4.1.1 Research design

To test H1, we regress the change in the absolute value of performance-matched discretionary accruals (|DA|) from the pre- to the post-regulation period on the non-compliance indicator or the predicted change in board independence and control variables:

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (1)$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Board\_Ind + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (1')$$

The coefficient on *Non-Compliance*, α_1, captures the incremental change in |DA| for non-compliance firms compared to compliance firms. Similarly, the coefficient on Δ*Board_Ind*, α_1,

[16] For firms without analysts' forecasts, *I_Score* is based on the average quintile ranks of turnover, bid-ask spread, and analyst coverage.

captures the impact of the increase in board independence on the change in earnings management. H1 predicts α_1 to be negative in both regressions.

We include the following control variables that may affect the magnitude of DA: institutional ownership (*INST*), return on assets (*ROA*), the market-to-book ratio (*M/B*), firm size (*Size*), debt/equity financing (*Financing*), leverage (*LEV*), analyst coverage (*AC*), and the standard deviation of cash flows from operations (*Std_CFO*). These are the commonly used control variables in the earnings management literature. To save space, we discuss their measurement and the rationale for including them in Appendix A. To be consistent with the measurement of the dependent variable, we use the change in these variables between 2000 and 2005 as controls.[17] We also include industry fixed effects to control for the variation in the change in |DA| across industries.[18]

4.1.2 Descriptive statistics

Table 2 reports descriptive statistics on firm characteristics for pre- and post-regulation. We use year 2000 for pre-regulation and year 2005 for post-regulation, except for |DA|, for which the two-year averages over 2000-2001 and over 2005-2006 are reported. We also present the statistical tests of the differences between pre- and post-regulation. Panel A is for the full sample. Consistent with Cohen et al. (2008), the mean (median) |DA| decreases significantly, from 0.069 (0.052) in the pre-regulation period to 0.054 (0.040) in the post-regulation period. The mean (median) information score is 0.508 (0.500) in the pre-regulation period and 0.519 (0.563) in the post-regulation period; the difference is insignificant. With respect to the control variables, we find that while the sample firms have stable performance (*ROA*) over time, they experience a significant increase in institutional ownership, firm size, and analyst coverage, and a significant

[17] Since *Std_CFO*, standard deviation of cash flows from operations, needs to be estimated over multiple years, we use the period 1998-2001 for pre-regulation and the period 2003-2006 for post-regulation.
[18] Industries are defined as in Fama and French (1997). We note that industry composition is similar between compliance and non-compliance firms.

decrease in the market-to-book ratio, the frequency of financing activities, leverage, and operating volatility. Panels B and C show that these patterns apply to both compliance and non-compliance firms.[19] In particular, the change in |DA| from the pre- to post-regulation period is not significantly different between these two groups of firms, which is inconsistent with H1. Next, we formally test H1 using the regression analysis.

4.1.3 Regression results

Table 3 reports the regression results. The coefficient on the *Non_Compliance* indicator is insignificantly different from zero at conventional levels. That is, compared to compliance firms, non-compliance firms do not experience an incremental change in earnings management. When we use the predicted change in board independence in place of the *Non_Compliance* indicator, the inferences remain the same: the coefficient on Δ*Board_Ind* is insignificantly different from zero.

With respect to the control variables, we find that firms with an increase in institutional ownership and *ROA* performance experience a decrease in |DA|, and firms with an increase in firm size and operation volatility experience an increase in |DA|. The other control variables are not significant.

In summary, the results in Table 3 indicate that non-compliance firms on average do not experience an incremental decrease in the extent of earnings management despite the increase in their board independence. However, not all non-compliance firms are the same. It is possible that while some non-compliance firms experience a decrease in earnings management, others do not due to independent directors' lack of information, leading to insignificant results on average. In the next section, we test the role of information access.

[19] We formally compare the change in firm characteristics between the compliance and non-compliance firms (untabulated). We find that these two groups do not differ except that non-compliance firms experience a larger increase in institutional ownership than compliance firms. This finding helps alleviate the concern that systematic differences between compliance and non-compliance firms may drive our results. Note that we control for the change in firm characteristics and industry fixed effects in the regressions to capture any remaining differences between the two groups.

4.2 Tests of H2: The role of information access

To test H2, we add information access score (*I_Score*) and its interaction with the non-compliance indicator or the predicted change in board independence to Equations (1) and (1'):

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance + \alpha_2 Non\_Compliance \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (2)$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Board\_Ind + \alpha_2 \Delta Board\_Ind \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (2')$$

As explained in Section 3.3, *I_Score* is constructed to have a higher value for firms with better information access or lower information acquisition cost. For ease of interpretation, in the regressions, we standardize *I_Score* by subtracting the sample mean and then dividing the difference by the sample standard deviation, such that the variable has a mean of zero and a standard deviation of 1. The coefficient on the non-compliance indicator in Equation (2), α_1, captures the incremental change in |DA| for non-compliance firms that have average information access. Similarly, the coefficient on the predicted change in board independence in Equation (2'), α_1, captures the effect of board independence increases on the change in |DA| for such firms. For both Equations (2) and (2'), the coefficient on the interaction term, α_2, captures the impact of information access on the effect of increases in board independence on earnings management. H2 predicts α_2 to be negative. Note that we control for the level of information score, since the information environment may be associated with the firm's abilities to attract independent directors and thus the extent of earnings management.

Table 4 reports the regression results. Column (1) is based on the non-compliance indicator. Consistent with H2, the coefficient on *Non_Compliance* × *I_Score* is significantly negative (t=-3.11). This indicates that the decrease in earnings management for non-compliance firms is greater for those with better information access, or lower information acquisition cost. The effect is also economically significant. A one standard deviation increase in *I_Score* leads to a reduction in |*DA*| of 0.009, i.e., 0.9% of total assets. It is about 12.5% (15.8 %) of the sample mean of |*DA*|

in the pre- (post-) regulation period for the non-compliance firms. Similarly, in Column (2) which is based on the predicted change in board independence, the coefficient on $\Delta Board\_Ind \times I\_Score$ is significantly negative (t=-3.51), suggesting that board independence improvement is more effective in reducing earnings management for firms with a higher information score.

We conduct sensitivity tests to ensure that our results in Table 4 are robust. For simplicity, we present the coefficients on the key variables in Appendix C. As reported, the inferences remain similar. First, we run robustness regressions to ensure that our results are not driven by outliers. Second, we redefine the pre-regulation period as year 2000 and the post-regulation period as year 2005 when measuring $\Delta|DA|$. Third, as shown in Table 1, about 5.7 percent of the non-compliance firms still did not have a majority independent board by 2005 based on the BoardEx's definition of independent directors. To ensure that the results are not driven by these firms, we redefine the non-compliance indicator based on board information in both 2000 and 2005: *Non_Compliance* is set as 1 if the firm did not have a majority independent board in 2000 but had one in 2005, and 0 otherwise. Fourth, to address the concern that some firms may be in compliance with the majority board independence requirement through window dressing, we exclude the non-compliance firms that only marginally satisfied the requirement in 2005 (defined as firms that would not have satisfied the requirement if one independent director were re-classified as affiliated) as well as the non-compliance firms that did not satisfy the requirement in 2005.[20] Lastly, we conduct the following sensitivity tests with respect to control variables. We control for change in R&D expenditures to address the concern that information acquisition cost may be correlated with R&D expenditures. We control for the change in *I_Score* to address the

[20] One would expect the results to be stronger after excluding such firms. We find that the magnitude of the coefficient on the interaction term (*Non_Compliance* × *I_Score* / Δ*Board_Ind* × *I_Score*) indeed becomes larger; however, the difference is too small to be statistically significant. Specifically, the coefficient on *Non_Compliance* × *I_Score* is -0.010 (Appendix C, Panel A, Column (6)) vs. -0.009 (Table 4, Column (1)), and the coefficient on $\Delta Board\_Ind \times I\_Score$ is -0.045 (Appendix C, Panel A, Column (7)) vs. -0.041 (Table 4, Column (2)).

concern that the change in information acquisition cost may confound the analyses. We include the lagged change in |*DA*|, measured as the difference in |DA| between 1999 and 2000, to control for potential mean reversion of |DA|. We control for the change in the volatility of earnings and returns. We replace *ROA* with cash flows from operations. See Appendix C for details.

In summary, our analyses indicate that consistent with H2, firms with improved board independence are associated with a reduction in earnings management when independent directors have easy access to information and are presumably more informed.

5. Additional analyses

5.1 Latent class regression analysis

The assumption of a pooled regression is that the same model is appropriate for the entire sample. Including the interaction term, $\Delta Board\_Ind \times I\_Score$, in the regressions allows the relationship between the change in board independence and the change in earnings management to vary with information acquisition cost. An alternative approach is the latent class analysis. Under this approach, the sample is grouped into clusters so that observations within each cluster follow a similar model. Once the clusters are identified, one can examine the factors that differentiate the clusters. Please see Larcker and Richardson (2004) for detailed discussions of this approach.

Table 5, Panel A reports the results. For the regression of $\Delta|DA|$ on $\Delta Board\_Ind$, the number of clusters is determined to be two based on the consistent Akaike information criterion. In cluster I (48% of the sample), the coefficient on $\Delta Board\_Ind$ is significantly negative, indicating that within this cluster, an increase in board independence is associated with a decrease in earnings management. In cluster II (52% of the sample), the coefficient on $\Delta Board\_Ind$ is insignificant. We then compare the information score (*I_Score*) between these two clusters. We

find that cluster I has significantly higher *I_Score* than cluster II (0.538 vs. 0.480); the difference is about 20% of the standard deviation of *I_Score*. This is consistent with our inference that information access is an important determinant of the relation between increases in board independence and decreases in earnings management.

Meanwhile, as reported in Panel A of Table 5, we find that compared to cluster II, cluster I has higher market-to-book ratio, larger size, lower financing, lower leverage, and higher cash flow volatility. We also compare the characteristics of the newly appointed directors for non-compliance firms between the two clusters, including age, employment background, expertise, and number of board meetings, and report the results in Panel B of Table 5. We find that the newly appointed directors are generally similar between these two clusters except that those for cluster I are somewhat more experienced (in terms of the number of firms the directors worked for in the past and the number of senior executive positions the directors held in the past). To ensure that our results are not confounded by firm and director characteristics that differ between the clusters, we include in the regressions the interaction terms between Δ*Board_Ind* and such characteristics (untabulated). The coefficient on Δ*Board_Ind* × *I_Score* remains qualitatively similar and the newly added interaction terms are generally not significant. The results are available upon request.

5.2 Alternative proxies for information access

To ensure the robustness of the results, we replicate the analyses in Table 4 using three alternative proxies for information access. First, we use the measure developed in Duchin et al. (2010), which is based on the average ranking of analyst coverage, forecast error, and forecast dispersion (reverse ranks for forecast error and forecast dispersion). Second, we use analyst coverage, defined as the natural logarithm of the number of analysts who issue forecasts for the firm. Third, we use industry homogeneity. For firms in more homogeneous industries, it is

relatively easy for independent directors to be informed. We measure industry homogeneity using the approach in Parrino (1997).

Table 6 reports the results. Similar to *I_Score*, these alternative measures are calculated in 2000 and standardized for regression analyses. As reported, the interaction term between the non-compliance indicator or the predicted change in board independence and the information access variable has a significantly negative coefficient in all the specifications. This provides further support for H2; non-compliance firms with more transparent information environment experience a larger decrease in earnings management compared to those with less transparent information environment.

Lastly, we conduct two sensitivity tests using alternative approaches of measuring information access; the results are not tabulated to save space. First, instead of defining *I_Score* as average ranking of the underlying variables, we apply the principal component analysis (PCA). The PCA is based on turnover, bid-ask spread, and analyst coverage, as forecast error is missing for firms without analysts' forecasts. Only the first factor from the PCA has an eigenvalue greater than 1. We redefine *I_Score* as the first factor from the PCA. The results are similar to those reported in Table 4. The coefficient on *Non_Compliance* × *I_Score* is -0.011 (t=-3.61) and that on Δ*Board_Ind* × *I_Score* is -0.052 (t=-4.37). Second, to ensure that the results are not driven by analyst coverage, we regress *I_Score* on analyst coverage and use the residual *I_Score* in the analyses. The inferences are similar to those in Table 4. The coefficient on *Non_Compliance* × *I_Score* is -0.007 (t=-2.33) and that on Δ*Board_Ind* × *I_Score* is -0.028 (t=-2.48).

5.3 Alternative proxies for earnings management

In this section, we investigate whether the results hold for alternative proxies for earnings management: the earnings quality measure in Dechow and Dichev (2002) (|*DD*|) and the real

earnings management proxy in Roychowdbury (2006) (*Real_EM*).[21] Following prior research, we first estimate *DD* as the residual from the cross-sectional estimation of the Dechow and Dichev (2002) model by industry and year and then take the absolute value (industries defined as in Fama and French (1997)). Following Roychowdhury (2006) and Zang (2012), we measure real earnings management using abnormal production costs and abnormal discretionary expenditures. We then combine them to capture the overall extent of real earnings management (abnormal production costs minus abnormal discretionary expenditures, both scaled by lagged assets).[22] We use the same research design as in Section 4.

Table 7 reports the results. The coefficients on *Non_Compliance* × *I_Score* and Δ*Board_Ind* × *I_Score* are significantly negative. These results indicate that improving board independence can reduce the extent of working capital management and real earnings management when the information acquisition cost is low.

5.4 Audit committee independence and earnings management

As discussed above, we do not examine the audit committee independence reform in the main analysis because it spans a longer period. However, we acknowledge that compared to the board as a whole, the audit committee potentially has a more direct impact on financial reporting and thus earnings management. As such, in this section, we test the effect of the change in audit committee independence on earnings management.

[21] Another commonly used proxy is restatements. However, this proxy is inappropriate in our setting for the following reasons. First, the nature of restatements is different between the post-SOX and pre-SOX period. Recent studies (Plumlee and Yohn 2008; Scholz 2008; DeFond 2010) argue that post-SOX restatements often result from confusion over the interpretation of new accounting standards and have little impact on firm value. Second, we find that firms with restatements in the pre-SOX period, particularly those with accounting irregularities as classified in Hennes et al. (2008), are unlikely to have restatements in the post-SOX period. Thus, practically one cannot use the change specification to study the impact of the change in board independence on the change in restatements. Lastly, prior research (e.g., Dyck et al. 2010) finds that analyst coverage can increase the likelihood of accounting frauds being *detected*. One can make similar arguments for board independence. Thus, an analysis of the impact of increased board independence on restatements can be confounded by its impact on the detection of misstatements.

[22] We do not use the abnormal level of operating cash flows because both Roychowdhury (2006) and Zang (2012) argue that real earnings management activities have an ambiguous effect on operating cash flows.

The research design is similar to that for board independence. Specifically, firms without a 100% independent audit committee in 2000, a total of 759 sample firms, are classified as non-compliance firms. We use a dummy variable, *Non_Compliance_Audit*, to indicate these firms. As reported in Panel B of Appendix B, this indicator explains the increase in audit committee independence; the coefficient on *Non_Compliance_Audit* is significantly positive (t=52.70, Column (1)). We find that the non-compliance indicator based on overall board independence (*Non_Compliance*) also helps explain the increase in audit committee independence (Column (2)). As such, we use the full model to generate the predicted change in audit committee independence from 2000 to 2005, Δ*Audit_Ind*.

We replicate the analyses in Table 4 and report the results in Table 8.[23] The results are consistent with those based on overall board independence. The coefficients on *Non_Compliance_Audit* × *I_Score* and Δ*Audit_Ind* × *I_Score* are significantly negative (t=-2.93 and -3.42, respectively).

In sum, we find similar results when examining the change in audit committee independence. These findings suggest that among firms with increases in audit committee independence, those with better information access experience a larger decrease in earnings management.

5.5 Linking our findings to Duchin et al. (2010): the reduction in earnings management and improvement in firm performance

Duchin et al.'s (2010) finding that the non-compliance firms with low information acquisition cost experience an improvement in firm performance may be explained by the

[23] We also replicate the analyses in Table 3 using *Non_Compliance_Audit* and Δ*Audit_Ind*. We find that both variables are insignificant in explaining the change in |*DA*|; we do not tabulate the results to save space.

reduction in earnings management for such firms.[24]

To validate this conjecture, we examine the association between future firm performance and the change in |DA| that is explained by the increase in board independence and information access. Specifically, we measure the predicted change in |DA| as the sum of the product of *ΔBoard_Ind*, *I_Score*, *ΔBoard_Ind* × *I_Score* and their corresponding coefficient estimates as reported in Column (2) of Table 4. Following Bowen et al. (2008), we measure future firm performance using the average cash flow from operations (*CFO*) and return on assets (*ROA*) in the post-regulation period (i.e., 2005-2006) and we use similar control variables.

We report the regression results in Table 9. Consistent with the conjecture that the reduction in earnings management leads to improved firm performance, we find that the predicted change in |DA| is negatively correlated with future *CFO* and *ROA* (t=-2.61 and -2.65, respectively). That is, the greater the reduction in earnings management, the better the future performance is. The results are similar when we further control for the level of |DA| in the post-regulation period, indicating that the results are not driven by the mechanical association between discretionary accruals and firm performance.

In sum, these results are consistent with the notion that a reduction in earnings management is one of the mechanisms through which an improvement in board monitoring can lead to better firm performance.

5.6 Alternative explanation: market pressure

An alternative explanation for our results is that the information environment may proxy for the market pressure. Firms with a richer information environment are typically bigger and more

[24] Opportunistic earnings management can lead to poor future performance for two reasons. First, it can disguise managers' rent extraction and waste of firm resources. Second, it can lead to less informative earnings, reducing contracting efficiency and investment efficiency. For example, Beyer et al. (2014) show analytically that when the cost of earnings management is higher (and the extent of earnings management is lower), the board can better motivate executives to work for the interest of shareholders, leading to better firm performance.

visible and have higher institutional ownership. For these firms, the market pressure to adhere to the spirit of the regulatory requirements can therefore be stronger. It thus follows that non-compliance firms with richer information environment may pick directors who have more expertise and are thus more effective monitors, compared to non-compliance firms with poorer information environment.

To address this alternative explanation, we collect information on the characteristics of the newly appointed directors for non-compliance firms. We find that the newly appointed directors in non-compliance firms with information score above the sample median are similar to those in non-compliance firms with information score below the median in terms of age, employment background, and financial expertise.[25] We also find that these two groups of firms have a similar number of board meetings, a proxy for directors' efforts. Therefore, we conclude that our results are not driven by the differences in the attributes of newly appointed independent directors in non-compliance firms with low and high information acquisition cost.

5.7 Alternative explanation: other contemporaneous regulatory changes

Another possible explanation for our results is that they capture the effect of other contemporaneous regulatory changes. However, this explanation only holds if the regulatory changes are correlated with the information score for the group of non-compliance firms because our variable of interest is the interaction term *Non_Compliance* ×*I_Score*. We control for the level of *I_Score* throughout the analyses, thus alleviating this concern. See Duchin et al. (2010) for similar discussions.

Among the regulatory changes, the internal control disclosure requirement (Section 404 of SOX) is related to firm size and hence the information environment. Small firms (i.e., those with

[25] Note that this result appears to contrast with the latent analysis (Section 5.1). For the latent analysis, we find that while the newly appointed directors are generally similar between the two clusters, they are more experienced for cluster I where we find a negative association between increases in board independence and decreases in earnings management (Table 5, Panel B). This inconsistency is likely due to the different research methods used.

public float below $75 million) are exempt from Section 404. We conduct additional tests to ensure that our results are not confounded by Section 404. First, we exclude from our sample the firms that are exempt from Section 404 (164 firms). Second, for the sample firms subject to Section 404, we control for firm size, an indicator for internal control weakness, and their interactions with the non-compliance indicator. The inferences remain similar. In addition, we perform the following tests to address the general concern that the regulatory changes may be correlated with firm size. First, we replicate the analyses using the subset of large firms (firms with market value above the sample median in 2003). Second, we use the residual information score (the residual from the regression of *I_Score* on firm size) in the analyses. The results for the variables of interest remain similar and are available upon request.

While these additional tests increase our confidence in the inferences, we would like to point out that because of the many regulatory changes over the sample period, it is still possible that our results may be attributed to the other contemporaneous regulatory changes.

6. Conclusion

In this paper, we examine the effectiveness of the recent regulatory requirement of majority board independence in reducing earnings management. Firms that did not have a majority independent board in the pre-regulation period have to increase their board independence. This provides a natural experiment to examine whether increases in board independence lead to decreases in earnings management.

Our sample consists of 1,587 firms that have board structure information over 2000-2005 from BoardEx and available financial data. Among these firms, 722 did not have a majority independent board in 2000 (referred to as non-compliance firms), while the rest already had a majority independent board in 2000 (referred to as compliance firms). We compare the change in

the absolute value of performance-matched discretionary accruals (|DA|) from the pre-regulation period (2000-2001) to the post-regulation period (2005-2006) between non-compliance and compliance firms. We find that (1) on average non-compliance firms do not experience an incremental reduction in |DA| compared to compliance firms; (2) non-compliance firms with low information acquisition cost experience a significant reduction in |DA| compared to non-compliance firms with high information acquisition cost. These results remain similar when we use the predicted change in board independence to explain the change in |DA|, when we examine the change in audit committee independence, and when we use alternative measures of earnings management and information acquisition cost. We also find that the reduction in |DA|, as explained by the change in board independence and information acquisition cost, is associated with better future firm performance.

Our paper contributes to the literature by providing direct evidence on the effectiveness of the recent board structure reforms in reducing earnings management and by linking the reduction in earnings management to improvement in future firm performance. The setting of mandated increases in board independence is less likely to be subject to endogeneity than other settings. In addition, we demonstrate that increases in board independence are more effective in reducing earnings management when independent directors have easier access to information.

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Appendix A
Measurement and description of control variables

Panel A: Variable Measurement

|*DA*| = the absolute value of performance-matched discretionary accruals; the accruals model is the modified Jones model as described in prior studies (e.g., Kothari et al. 2005; Yu 2008; Cohen et al. 2008) and is estimated every year in the Compustat population for each industry that has at least fifteen observations (industries defined as in Fama and French (1997)); we then partition the firms in each industry into deciles based on the prior year's return on assets (ROA deciles); performance-matched discretionary accruals are measured as the difference between the firm's discretionary accruals and the median discretionary accruals for the ROA decile the firm belongs to; to reduce the influence of outliers, we winsorize |*DA*| at the 1st and 99th percentiles;

I_Score = information access score; the score is calculated based on four firm characteristics in year 2000: (1) turnover – average daily trading volume over the year scaled by the total number of shares outstanding; (2) average bid-ask spread; for each trade, the bid-ask spread is measured as the difference between bid and ask price scaled by the average of the two; following Anderson et al. (2009), we use all the trades for the firm from the third Wednesday of each month to calculate monthly average bid-ask spread; we then take the average across the 12 months to get the average bid-ask spread over the year; (3) analyst coverage – the number of analysts issuing earnings forecasts in the year, and (4) forecast error – the absolute value of the difference between actual EPS and the consensus analyst forecast before earnings announcements, scaled by stock price at the beginning of the year; we take the average of the quintile ranks of these four variables (the ranks denoted as 0, 0.25, 0.5, 0.75, and 1) (reverse ranks for bid-ask spread and forecast error) so that the range is [0, 1]; in the regression analyses, *I_Score* is standardized (subtracting the sample mean and then dividing by the sample standard deviation) so that it has a mean of zero and a standard deviation of 1;

INST = percentage of shares owned by institutional investors as reported in the CDA/Spectrum database;

ROA = return on assets, calculated as the ratio of income before extraordinary items to total assets;

M/B = the market-to-book ratio, calculated as the ratio of the market value of equity to the book value of equity;

Size = natural logarithm of the market value of equity;

Financing = an indicator variable for debt or equity financing; it equals 1 if the firm reports cash flows from either issuance of debts or sales of common stocks in the year, and 0 otherwise;

LEV = leverage, measured as total long-term debt scaled by total assets;

AC = analyst coverage, measured as the number of unique analysts who issue at least one earnings forecast in the year; in the regression analyses, we take the natural logarithm of AC (i.e., ln(1+AC));

Std_CFO = standard deviation of cash flows from operations (scaled by total assets); we use the period 1998-2001 for pre-regulation estimation and the period 2003-2006 for post-regulation estimation.

Appendix A (Cont'd)

Panel B: Description of control variables

The choice of the control variables follows prior research. Institutional investors can serve a monitoring role and alleviate managers' opportunistic self-serving behavior (e.g., Shleifer and Vishny 1986; McConnell and Servaes 1990). Several studies find that higher institutional ownership is associated with lower extent of earnings management (e.g., Chung, Firth, and Kim 2002). We thus expect a negative coefficient on $\Delta INST$. We include return-on-asset (ROA) because firm performance potentially affects managers' incentive to engage in earnings management (Chung et al. 2002). We expect that firms with poor performance are more likely to engage in earnings management, and thus a negative coefficient on ΔROA. The market-to-book ratio (M/B) captures firms' growth opportunities. Skinner and Sloan (2002) show that the consequences of missing earnings forecasts are more severe for growth firms, and thus firms with high market-to-book ratio are *a priori* more likely to engage in earnings management (Chung and Kallapur 2003). Therefore, $\Delta M/B$ is expected to be positively correlated with $\Delta|DA|$. Previous research suggests that firm size is positively associated with discretionary accruals (Becker et al. 1998; DeFond and Park 1997; Chung et al. 2002). We thus expect a positive coefficient on $\Delta Size$. Following prior research (DeFond and Subramanyam 1998; Frankel, Johnson, and Nelson 2002; Chung and Kallapur 2003), we control for firms' external financing activities because managers might engage in earnings management before debt or stock issuance. We use an indicator variable (*Financing*) to capture debt or equity issuance. Prior studies provide mixed results regarding the association between financing activities and the magnitude of discretionary accruals. For example, Frankel et al. (2002) find an insignificant coefficient on the indicator variable for securities issuance, while Chung and Kallapur (2003) find a positive coefficient. Hence we have no directional prediction for $\Delta Financing$. Prior research argues that firms have incentives to engage in earnings management to relax debt covenant and to avoid debt covenant violation (e.g., Sweeney 1994). We use leverage (LEV) to proxy for the closeness of debt covenant violation. Yu (2008) finds that analyst coverage reduces the extent of earnings management. Lastly, as suggested in Hribar and Nichols (2007), we control for the impact of operating volatility on the unsigned abnormal accruals by including the standard deviation of cash flows from operations (Std_CFO). We expect the coefficient on ΔLEV, ΔAC, and ΔStd_CFO to be positive, negative, and positive, respectively.

Appendix B
Predicting the change in board independence and audit committee independence

This table reports the results from the prediction model that explains the change in board independence and audit committee independence between 2000 and 2005. The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals and other variables. Board (audit committee) independence is the percentage of independent directors on the board (audit committee). *Non_Compliance* equals one for firms that did not have a majority independent board in 2000 (722 firms), and zero otherwise. *Non_Compliance_Audit* equals one for firms that did not have a 100% independent audit committee in 2000 (759 firms), and zero otherwise. Following Duchin et al. (2010), we include firm characteristics in 2000 as explanatory variables: board size (*Board_Size*), leverage (*LEV*), firm age (*Firm_Age*), firm size (*Size*), and industry fixed affects. *Board_Size* is the number of directors on the board, *LEV* is long-term debt scaled by total assets, *Firm_Age* is the natural logarithm of the number of years since the firm's first appearance in the Compustat database, *Size* is the natural logarithm of year-end market value. For brevity, the coefficients on industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

Panel A: Predicting the change in board independence

	(1) Coefficient (t-statistic)	(2) Coefficient (t-statistic)
Non_Compliance	0.223*** (32.31)	0.189*** (26.73)
Non_Compliance_Audit		0.090*** (12.65)
Board_Size	0.083*** (5.75)	0.069*** (4.96)
LEV	0.033 (1.62)	0.030 (1.55)
Firm_Age	-0.015*** (-2.79)	-0.015*** (-2.93)
Size	0.018*** (9.78)	0.014*** (7.81)
Industry Fixed Effects	YES	YES
N	1,587	1,587
Adj. R^2	0.456	0.507

Appendix B (Cont'd)

Panel B: Predicting the change in audit committee independence

	(1) Coefficient (t-statistic)	(2) Coefficient (t-statistic)
Non_Compliance		0.067***
		(8.50)
Non_Compliance_Audit	0.395***	0.370***
	(52.70)	(46.80)
Board_Size	-0.000	0.001
	(-0.01)	(0.08)
LEV	0.035	0.035
	(1.59)	(1.64)
Firm_Age	-0.020***	-0.014**
	(-3.43)	(-2.47)
Size	0.000	0.001
	(0.13)	(0.74)
Industry Fixed Effects	YES	YES
N	1,587	1,587
Adj. R^2	0.655	0.670

Appendix C
Increases in board independence, information access, and changes in earnings management – Robustness checks of the results in Table 4

This table reports the robustness checks of the results in Table 4. The model specification and variable measurements are the same as in Table 4 unless otherwise noted. For brevity, only the coefficients on the key variables are reported. T-statistics are presented in parentheses, except for robustness regressions where Chi-square statistics are reported. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

Panel A: Robustness regressions, alternative definitions of dependent and independent variables, and alternative sample

In columns (1) and (2), we use a commonly used robustness regression, the M-estimation in SAS. In columns (3) and (4), $\Delta|DA|$ is measured as the difference in $|DA|$ between 2000 and 2005. In column (5), the *Non_Compliance* indicator is redefined based on board structure in both 2000 and 2005; it is one for firms that did not have a majority independent board in 2000 but had a majority independent board in 2005, and zero otherwise. In columns (6) and (7), we exclude the non-compliance firms that only marginally satisfied the requirement in 2005 (defined as firms that would not have satisfied the requirement if one independent director were re-classified as affiliated) as well as the non-compliance firms that did not satisfy the requirement in 2005.

	Robustness regressions ‡		$\Delta\|DA\|$ measured as the difference in $\|DA\|$ between 2000 and 2005		*Non_Compliance* indicator based on 2000 and 2005	Excluding non-compliance firms that do not comply in 2005 or marginally comply in 2005	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non_Compliance	0.002		-0.001		0.001	-0.001	
	(0.46)		(-0.35)		(0.39)	(-0.17)	
Non_Compliance* × *I_Score	**-0.008*** (8.14)**		**-0.009** (-2.14)**		**-0.011*** (-3.68)**	**-0.010*** (-2.91)**	
Δ Board_Ind		0.015		0.008			0.006
		(2.04)		(0.48)			(0.50)
Δ Board_Ind* × *I_Score		**-0.033*** (10.17)**		**-0.045*** (-2.71)**			**-0.045*** (-3.63)**
I_Score	0.000	0.002	-0.001	0.002	0.000	0.000	0.004
	(0.00)	(0.59)	(-0.35)	(0.66)	(0.09)	(0.07)	(1.34)
Control Variables	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES
N	1,587	1,587	1,587	1,587	1,587	1,375	1,375
Adj. R^2	0.117	0.118	0.070	0.072	0.113	0.114	0.117

‡ Chi-square statistics are reported in the parentheses.

Appendix C (Cont'd)

Panel B: Robustness checks with respect to control variables
In columns (1) and (2), we further control for the change in R&D expenditures from 2000 to 2005. In columns (3) and (4), we further control for the change in *I_Score* from 2000 to 2005. In columns (5) and (6), we include the lagged change in |*DA*|, measured as the difference in |*DA*| between 1999 and 2000. In columns (7) and (8), we control for the change in the volatility of earnings and returns in place of the change in the standard deviation of cash flows from operations. In columns (9) and (10), we replace *ROA* with cash flows from operations.

	Controlling for change in *R&D*		Controlling for change in *I_Score*		Controlling for change in |*DA*| between 1999 and 2000		Controlling for change in the volatility of earnings and returns		Replacing *ROA* with cash flows from operations	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Non_Compliance	0.001		0.001		0.004		-0.000		0.000	
	(0.30)		(0.32)		(1.55)		(-0.10)		(0.15)	
Non_Compliance	**-0.009*** **		**-0.009*** **		**-0.005***		**-0.007****		**-0.010*** **	
× *I_Score*	**(-3.14)**		**(-3.14)**		**(-1.82)**		**(-2.49)**		**(-3.19)**	
Δ Board_Ind		0.012		0.013		0.023**		0.008		0.009
		(0.97)		(1.08)		(2.01)		(0.65)		(0.76)
Δ Board_Ind		**-0.041*** **		**-0.041*** **		**-0.026****		**-0.033*** **		**-0.043*** **
× *I_Score*		**(-3.52)**		**(-3.52)**		**(-2.38)**		**(-2.80)**		**(-3.67)**
I_Score	-0.000	0.003	-0.000	0.002	-0.001	0.000	-0.000	0.002	-0.000	0.003
	(-0.05)	(0.95)	(-0.21)	(0.78)	(-0.64)	(0.09)	(-0.23)	(0.63)	(-0.08)	(1.05)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	1,587	1,587	1,587	1,587	1,428	1,428	1,586	1,586	1,587	1,587
Adj. R^2	0.111	0.112	0.111	0.112	0.248	0.249	0.110	0.111	0.107	0.109

Table 1
Over-time change in board independence for compliance and non-compliance firms

The sample includes 1,587 firms from the BoardEx with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals and other variables. This table presents the average board independence and the percentage of firms with a majority independent board, that is, a board where more than 50 percent of the directors are independent, for compliance and non-compliance firms. Compliance firms refer to those with a majority independent board in 2000 and the rest are non-compliance firms.

	Compliance firms (N=865)		Non-compliance firms (N=722)	
Year	Mean board independence	% of firms with a majority independent board	Mean board independence	% of firms with a majority independent board
2000	67.99%	100.00%	38.82%	0.00%
2001	70.11%	96.41%	45.56%	25.07%
2002	72.79%	97.10%	52.92%	49.17%
2003	74.74%	96.18%	61.53%	72.16%
2004	76.49%	97.45%	67.19%	88.37%
2005	76.81%	98.15%*	69.93%	94.32%*

* The primary reason why some firms did not comply with the majority independent board requirement by 2005 (according to the BoardEx) is that there are differences in the definition of independent directors between the firm and the BoardEx; the BoardEx's definition tends to be stricter.

Table 2
Descriptive statistics

This table reports the descriptive statistics on our earnings management proxy, information score, and control variables. The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. The firm characteristics are reported for pre-regulation (2000) and post-regulation (2005), except for |*DA*|, for which we report the two-year average over the periods 2000-2001 and 2005-2006. Compliance firms refer to those with a majority independent board in 2000 and the rest are non-compliance firms. Panel A reports the statistics for the full sample, Panel B for compliance firms, and Panel C for non-compliance firms. See Appendix A for variable definitions.

Panel A: Descriptive statistics for all firms (N=1,587)

	Pre-regulation (2000)		Post-regulation (2005)		p-value based on t-test for	p-value based on z-test for
	mean	median	mean	median	diff. in mean	diff. in median
|DA|	0.069	0.052	0.054	0.040	0.001	0.001
I_Score	0.508	0.500	0.519	0.563	0.264	0.300
INST	0.328	0.348	0.450	0.488	0.001	0.001
ROA	0.024	0.051	0.031	0.053	0.176	0.379
M/B	3.517	2.410	3.024	2.145	0.001	0.001
Size	6.307	6.317	6.828	6.866	0.001	0.001
Financing	0.552	1.000	0.485	0.000	0.001	0.001
LEV	0.173	0.126	0.161	0.112	0.059	0.010
AC	8.961	6.000	10.156	8.000	0.001	0.001
Std_CFO	0.068	0.049	0.052	0.037	0.001	0.001

Table 2 (Cont'd)

Panel B: Descriptive statistics for compliance firms (N=865)

	Pre-regulation (2000)		Post-regulation (2005)		p-value based on t-test for diff. in mean	p-value based on z-test for diff. in median
	mean	median	mean	median		
|DA|	0.066	0.051	0.053	0.039	0.001	0.001
I_Score	0.508	0.563	0.512	0.563	0.781	0.908
INST	0.343	0.374	0.452	0.487	0.001	0.001
ROA	0.028	0.053	0.029	0.053	0.872	0.922
M/B	3.434	2.431	3.040	2.150	0.038	0.003
Size	6.332	6.352	6.851	6.876	0.001	0.001
Financing	0.542	1.000	0.482	0.000	0.012	0.013
LEV	0.173	0.126	0.158	0.114	0.093	0.063
AC	9.079	6.000	10.097	8.000	0.031	0.001
Std_CFO	0.065	0.049	0.051	0.037	0.001	0.001

Panel C: Descriptive statistics for non-compliance firms (N=722)

	Pre-regulation (2000)		Post-regulation (2005)		p-value based on t-test for diff. in mean	p-value based on z-test for diff. in median
	mean	median	mean	median		
|DA|	0.072	0.052	0.057	0.042	0.001	0.001
I_Score	0.507	0.500	0.527	0.563	0.173	0.163
INST	0.309	0.316	0.448	0.492	0.001	0.001
ROA	0.018	0.046	0.032	0.052	0.070	0.240
M/B	3.617	2.360	3.004	2.138	0.007	0.003
Size	6.278	6.271	6.800	6.857	0.001	0.001
Financing	0.564	1.000	0.489	0.000	0.004	0.004
LEV	0.173	0.126	0.164	0.110	0.331	0.075
AC	8.819	6.000	10.227	8.000	0.007	0.001
Std_CFO	0.071	0.049	0.052	0.037	0.001	0.001

Note that the change in the firm characteristics (mean or median) is insignificantly different between compliance and non-compliance firms except for *INST*. The increase in *INST* is significantly larger for non-compliance firms than for compliance firms.

Table 3
Increases in board independence and changes in earnings management

This table reports the regression results of the following models:

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance + \boldsymbol{\beta}\,\mathbf{Controls} + \varepsilon \quad (1)$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Board\_Ind + \boldsymbol{\beta}\,\mathbf{Controls} + \varepsilon \quad (1')$$

The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. Δ|*DA*| is measured as the difference in average |*DA*| between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006). *Non_Compliance* is one for firms that did not have a majority independent board in 2000 (non-compliance firms), and zero otherwise. *ΔBoard_Ind* is the predicted change in board independence as estimated in Panel A, Column (2) of Appendix B. The control variables include changes from 2000 to 2005 in the following variables: *INST*, *ROA, M/B, Size, Financing, LEV, AC,* and *Std_CFO*. See Appendix A for variable definitions. For brevity, the coefficients on industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

	Non_Compliance indicator	Predicted change in board independence
	(1)	(2)
Intercept	-0.018*	-0.018*
	(-1.81)	(-1.73)
Non_Compliance	**0.001**	
	(0.17)	
Δ Board_Ind		**-0.001**
		(-0.08)
ΔINST	-0.018**	-0.018**
	(-2.08)	(-2.06)
ΔROA	-0.029***	-0.029***
	(-2.79)	(-2.78)
ΔM/B	0.000	0.000
	(0.46)	(0.46)
ΔSize	0.007***	0.007***
	(4.02)	(3.97)
ΔFinancing	0.003	0.003
	(1.07)	(1.07)
ΔLEV	-0.003	-0.003
	(-0.30)	(-0.30)
ΔAC	0.000	0.000
	(0.06)	(0.06)
ΔStd_CFO	0.256***	0.255***
	(10.18)	(10.18)
Industry Fixed Effects	YES	YES
N	1,587	1,587
Adj. R^2	0.102	0.102

Table 4
Increases in board independence, information access, and changes in earnings management

This table reports the regression results of the following models:

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance + \alpha_2 Non\_Compliance \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (2)$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Board\_Ind + \alpha_2 \Delta Board\_Ind \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\mathbf{Controls} + \varepsilon \quad (2')$$

The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. $\Delta|DA|$ is measured as the difference in average $|DA|$ between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006). *Non_Compliance* is one for firms that did not have a majority independent board in 2000 (non-compliance firms), and zero otherwise. *ΔBoard_Ind* is the predicted change in board independence as estimated in Panel A, Column (2) of Appendix B. Information access score (*I_Score*) is used as the proxy for the ease of information access or the inverse proxy for the information acquisition cost. The control variables include changes from 2000 to 2005 in the following variables: *INST, ROA, M/B, Size, Financing, LEV, AC,* and *Std_CFO*. See Appendix A for variable definitions. For brevity, the coefficients on industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

Table 4 (Cont'd)

	Non_Compliance indicator (1)	Predicted change in board independence (2)
Intercept	-0.018*	-0.018*
	(-1.76)	(-1.76)
Non_Compliance	0.001	
	(0.28)	
Non_Compliance* × *I_Score	**-0.009*** **	
	(-3.11)	
Δ Board_Ind		0.011
		(0.95)
Δ Board_Ind* × *I_Score		**-0.041*** **
		(-3.51)
I_Score	-0.000	0.002
	(-0.08)	(0.93)
ΔINST	-0.020**	-0.023***
	(-2.24)	(-2.59)
ΔROA	-0.027***	-0.026***
	(-2.64)	(-2.58)
ΔM/B	0.000	0.000
	(0.35)	(0.32)
ΔSize	0.006***	0.006***
	(3.10)	(3.20)
ΔFinancing	0.003	0.003
	(1.14)	(1.16)
ΔLEV	-0.005	-0.004
	(-0.50)	(-0.48)
ΔAC	0.000	0.000
	(0.17)	(0.16)
ΔStd_CFO	0.254***	0.254***
	(10.15)	(10.19)
Industry Fixed Effects	YES	YES
N	1,587	1,587
Adj. R^2	0.111	0.112

Table 5
Latent class regression analysis for the relation between the change in board independence and the change in earnings management

This table reports the latent class regression of the change in the extent of earnings management (Δ|*DA*|) on the predicted change in board independence (Δ*Board_Ind*). The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. Δ|*DA*| is measured as the difference in average |*DA*| between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006). *ΔBoard_Ind* is the predicted change in board independence as estimated in Panel A, Column (2) of Appendix B. The number of clusters is determined to be two based on the consistent Akaike information criterion. Panel A reports the means of firm characteristics by cluster. See Appendix A for variable definitions. Panel B reports the means of director characteristics by cluster. T-statistics are presented in parentheses.*, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided t-tests.

Panel A: Regression results and firm characteristics

Cluster	Intercept	Δ*Board_Ind*	# firms (% of sample)	*I_Score*	*INST*	*ROA*	*M/B*	*Size*	*Financing*	*LEV*	*Std_CFO*
I	-0.043***	-0.039***	762	0.538	0.334	0.025	4.057	6.407	0.524	0.155	0.076
	(-12.30)	(-2.52)	(48.02%)								
II	0.018***	0.003	825	0.480	0.322	0.022	3.018	6.215	0.577	0.190	0.060
	(6.07)	(0.24)	(51.98%)								
T-statistics for the differences in mean firm characteristics:				4.12***	1.10	0.42	4.34***	1.81*	-2.08**	-3.77***	4.88***

Table 5 (Cont'd)

Panel B: Characteristics of the newly appointed directors for non-compliance firms by cluster
The characteristics of the newly appointed directors for non-compliance firms are measured in 2005. For cluster I and II, there are 1,106 and 1,275 newly appointed directors, respectively.

			Employment background			Expertise			
Cluster	# firms (% of sample)	Age	Number of firms directors worked for in the past	Number of senior executive positions directors held in the past	Currently retired or not	Accounting	Currently CEO of another firm or not	Investment banking	Number of board meetings
I	762 (48.02%)	57.7	1.96	2.13	0.165	0.074	0.168	0.161	7.478
II	825 (51.98%)	57.6	1.79	1.98	0.173	0.082	0.185	0.151	7.391
T-statistics for the differences in mean director characteristics:		0.33	3.05***	2.64***	-0.46	-0.67	-1.07	0.70	0.40

Table 6
Increases in board independence, information access, and changes in earnings management: Using alternative proxies for information acquisition costs

This table reports the regression results based on alternative proxies for information acquisition costs:

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance + \alpha_2 Non\_Compliance \times Information\_Access + \alpha_3 Information\_Access + \boldsymbol{\beta} Controls + \varepsilon$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Board\_Ind + \alpha_2 \Delta Board\_Ind \times Information\_Access + \alpha_3 Information\_Access + \boldsymbol{\beta} Controls + \varepsilon$$

The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. Δ|*DA*| is measured as the difference in average |*DA*| between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006). *Non_Compliance* is one for firms that did not have a majority independent board in 2000 (non-compliance firms), and zero otherwise. *ΔBoard_Ind* is the predicted change in board independence as estimated in Panel A, Column (2) of Appendix B. We use three alternative proxies for information access (*Information_Access*). The first is the measure in Duchin et al. (2010), based on the average quintile ranking of analyst coverage, forecast error, and forecast dispersion (reverse ranks for forecast error and forecast dispersion). The second is analyst coverage (natural logarithm of the number of analysts following the firm). The third one is industry homogeneity. Following Parrino (1997), for each firm in the industry (industries defined by two-digit SICs), we first calculate the percentage of the variation in monthly stock returns that is explained by an equal-weighted industry index over the previous ten years. We then measure industry homogeneity as the median across all firms in the industry. The assumption is that the more the stock prices of firms in the industry move together, the more homogeneous the industry is. All three proxies are measured in 2000 and standardized for regression analyses (i.e., subtracting the sample mean and dividing by the sample standard deviation). The control variables include changes from 2000 to 2005 in the following variables: *INST, ROA, M/B, Size, Financing, LEV, AC,* and *Std_CFO*. See Appendix A for variable definitions. For brevity, the coefficients on control variables and industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

Table 6 (Cont'd)

	Information Access = Duchin_Score		*Information Access* = Analyst coverage		*Information Access* = Industry homogeneity	
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.019*	-0.019*	-0.019*	-0.018*	-0.018*	-0.018*
	(-1.88)	(-1.84)	(-1.87)	(-1.80)	(-1.82)	(-1.78)
Non_Compliance	0.001		0.000		0.000	
	(0.21)		(0.06)		(0.16)	
Non_Compliance* × *Information _Access	**-0.007****		**-0.006****		**-0.007*****	
	(-2.28)		**(-2.11)**		**(-2.40)**	
Δ Board_Ind		0.006		0.004		0.001
		(0.49)		(0.34)		(0.07)
Δ Board_Ind* × *Information _Access		**-0.026****		**-0.025****		**-0.024****
		(-2.22)		**(-2.17)**		**(-2.12)**
Information _Access	0.000	0.002	0.001	0.002	0.005	0.006
	(0.22)	(0.68)	(0.28)	(0.84)	(1.40)	(1.57)
Control Variables	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
N	1,587	1,587	1,587	1,587	1,587	1,587
Adj. R^2	0.105	0.105	0.104	0.104	0.104	0.104

Table 7
Increases in board independence, information access, and changes in earnings management: Using alternative proxies for earnings management

This table reports the regression results based on alternative proxies for earnings management:

$$\Delta EM = \alpha_0 + \alpha_1 Non\_Compliance + \alpha_2 Non\_Compliance \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\,\mathbf{Controls} + \varepsilon$$

$$\Delta EM = \alpha_0 + \alpha_1 \Delta Board\_Ind + \alpha_2 \Delta Board\_Ind \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta}\,\mathbf{Controls} + \varepsilon$$

The sample is from the 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate earnings management proxies and other variables. The sample for the regressions varies depending on the availability of the specific earnings management proxy. Δ*EM* is measured as the difference in average *EM* between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006*)*. *EM* is one of the following two proxies: |*DD*| and *Real_EM*. |*DD*| is the absolute value of the residual from the cross-sectional regressions of the Dechow and Dichev (2002) model, estimated by industry-year. *Real_EM* is the extent of real earnings management; it is measured as abnormal production costs minus abnormal discretionary expenditures, both scaled by lagged assets. See Roychowdhury (2006) for the measurement of abnormal production costs and abnormal discretionary expenditures. *Non_Compliance* is one for firms that did not have a majority independent board in 2000 (non-compliance firms), and zero otherwise. *ΔBoard_Ind* is the predicted change in board independence as estimated in Panel A, Column (2) of Appendix B. Information access score (*I_Score*) is used as the proxy for the ease of information access or the inverse proxy for the information acquisition cost. The control variables include changes from 2000 to 2005 in the following variables: *INST, ROA, M/B, Size, Financing, LEV, AC,* and *Std_CFO*. See Appendix A for variable definitions. For brevity, the coefficients on control variables and industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

	Δ*EM*= Δ|*DD*|		Δ*EM*= Δ*Real_EM*	
	(1)	(2)	(3)	(4)
Intercept	0.019	0.020	-0.011	-0.012
	(1.19)	(1.23)	(-0.24)	(-0.26)
Non_Compliance	0.000		0.004	
	(0.07)		(0.27)	
Non_Compliance* × *I_Score	**-0.006****		**-0.036*****	
	(-1.96)		**(-2.63)**	
Δ Board_Ind		-0.002		0.047
		(-0.14)		(0.86)
Δ Board_Ind* × *I_Score		**-0.035*****		**-0.165*****
		(-2.89)		**(-3.09)**
I_Score	0.000	0.004	0.039***	0.050***
	(0.15)	(1.37)	(3.98)	(4.15)
Control Variables	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES
N	1,296	1,296	1,451	1,451
Adj. R^2	0.141	0.144	0.051	0.053

Table 8
Increases in audit committee independence, information access, and changes in earnings management

This table reports the regression results based on increases in audit committee independence:

$$\Delta|DA| = \alpha_0 + \alpha_1 Non\_Compliance\_Audit + \alpha_2 Non\_Compliance\_Audit \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta} Controls + \varepsilon$$

$$\Delta|DA| = \alpha_0 + \alpha_1 \Delta Audit\_Ind + \alpha_2 \Delta Audit\_Ind \times I\_Score + \alpha_3 I\_Score + \boldsymbol{\beta} Controls + \varepsilon$$

The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. Δ|*DA*| is measured as the difference in average |*DA*| between the pre-regulation period (2000-2001) and the post-regulation period (2005-2006). *Non_Compliance_Audit* is one for firms that did not have a 100% independent audit committee in 2000 (759 firms), and zero otherwise. *ΔAudit_Ind* is the predicted change in audit committee independence as estimated in Panel B, Column (2) of Appendix B. Information access score (*I_Score*) is used as the proxy for the ease of information access or the inverse proxy for the information acquisition cost. The control variables include changes from 2000 to 2005 in the following variables: *INST, ROA, M/B, Size, Financing, LEV, AC,* and *Std_CFO*. See Appendix A for variable definitions. For brevity, the coefficients on control variables and industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

	Non_Compliance_Audit indicator	Predicted change in audit committee independence
	(1)	(2)
Intercept	-0.017*	-0.017*
	(-1.73)	(-1.75)
Non_Compliance_Audit	0.000	
	(0.13)	
Non_Compliance_Audit* × *I_Score	**-0.009*** **	
	(-2.93)	
Δ Audit _Ind		0.001
		(0.15)
Δ Audit _Ind* × *I_Score		**-0.026*** **
		(-3.42)
I_Score	-0.000	-0.000
	(-0.22)	(-0.16)
Control Variables	YES	YES
Industry Fixed Effects	YES	YES
N	1,587	1,587
Adj. R^2	0.110	0.112

Table 9
Association between the predicted change in earnings management and future performance

This table reports the results of the following regressions:

$$\text{CFO} = \alpha_0 + \alpha_1 Predicted\ \Delta|DA| + \alpha_2 \sigma_{\text{CFO}} + \alpha_3 Lag(CFO) + \alpha_4 Ln(Assets) + \varepsilon$$
$$\text{ROA} = \alpha_0 + \alpha_1 Predicted\ \Delta|DA| + \alpha_2 \sigma_{\text{ROA}} + \alpha_3 Lag(CFO) + \alpha_4 Lag(Accruals) + \alpha_5 Ln(Assets) + \varepsilon$$

The sample includes 1,587 firms with data on board structure over 2000-2005 and available financial information to calculate discretionary accruals (*DA*) and other variables. *CFO* and *ROA* are measured as the average of *CFO* and *ROA* in the post-regulation period 2005-2006. *CFO* is cash flows from operating activities scaled by lagged total assets and *ROA* is income before extraordinary items scaled by lagged total assets. *Predicted* Δ|*DA*| is the sum of the product of the following three variables and their corresponding coefficients in Column (2) of Table 4: *ΔBoard_Ind*, *I_Score*, and *ΔBoard_Ind* × *I_Score*. σ_{CFO} (σ_{ROA}) is the standard deviation of *ROA* (*CFO*) for the five-year window of 1999-2003. *Lag(CFO)* (*Lag(Accruals)*) is the average *CFO* (total accruals scaled by total assets) over the pre-regulation period 2000-2001. *Ln(Assets)* is the natural logarithm of average total assets over 2000-2001. |*DA*| *(Post-regulation)* is |*DA*| in the post-regulation period 2005-2006. For brevity, the coefficients on industry fixed effects are not reported. T-statistics are presented in parentheses. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on two-sided tests.

	CFO	*ROA*	*CFO*	*ROA*
Intercept	0.078***	0.048*	0.100***	0.100***
	(3.24)	(1.87)	(4.04)	(3.81)
Predicted Δ|DA|	**-1.194*** **	**-1.335*** **	**-1.162*** **	**-1.248*** **
	(-2.61)	**(-2.65)**	**(-2.55)**	**-(2.51)**
σ_{CFO}	-0.137***		-0.120***	
	(-3.70)		(-3.25)	
σ_{ROA}		-0.166***		-0.147***
		(-5.61)		(-5.03)
Lag(CFO)	0.366***	0.324***	0.359***	0.308***
	(17.90)	(14.24)	(17.55)	(13.70)
Lag(Accruals)		-0.005		-0.007
		(-0.31)		(-0.45)
Ln(Assets)	0.000	0.003	-0.001	-0.000
	(0.13)	(1.37)	(-0.59)	(0.21)
|*DA*| *(Post-regulation)*			-0.229***	-0.502***
			(-3.47)	(-7.02)
Industry Fixed Effects	YES	YES	YES	YES
N	1,587	1,587	1,587	1,587
Adj. R^2	0.344	0.336	0.349	0.356