The Impact of Derivative Disclosures on Managerial Opportunism: Evidence from Insider Trades and Stock Price Crash Risk

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Abstract: Derivatives are increasingly used by managers not only to hedge risks but also to pursue non-hedging activities for fulfilling opportunistic incentives. Using the mandatory adoption of financial reporting standard (SFAS 161) on derivative disclosures, we examine whether and how derivative disclosures influence managerial opportunistic behavior. We employ insider trades and stock price crash risk to capture managerial opportunism. Applying a difference-in-differences design with hand-collected data on derivative designations, we find that, after the enforcement of SFAS 161, derivative users that strictly comply with SFAS 161 experience a significantly greater decrease in both insider trades and stock price crash risk, compared with a matched control sample of non-derivative users. Our cross-sectional analyses reveal that the effects of SFAS 161 are stronger for firms that have high information opacity, high financial risk, or high business risk. Overall, our results suggest that enhanced disclosures on firms' objectives for, and strategies in using derivatives are effective in curbing managerial opportunism.

Keywords: SFAS 161; derivative disclosures; insider trading; crash risk; hedging; information asymmetry; financial risk; business risk
JEL classification: G14; G32; M48

1. Introduction

The hedging activities of firms have changed dramatically with the development of financial derivatives since 2000. According to the statistics releases from the Bank for International Settlements (BIS), the notional amount of outstanding over-the-counter (OTC) derivatives increased from $94 trillion at the end of June 2000 to $595 trillion at the end of June 2018. Managers use derivatives increasingly not only to hedge risks but also to pursue non-hedging activities for fulfilling opportunistic incentives (Brown, 2001; Chernenko and Faulkender, 2011). For example, Enron once used derivatives excessively to hide losses and inflate the value of its troubled business and continued to pay substantial amounts of bonus to its key executives in subsequent years (Bratton, 2002). The use of derivatives for non-hedging purposes increases with the likelihood of managers' decisions serving their monetary incentives and other self-interests. One way to restrain the excessive use of derivatives for non-hedging purposes is requiring firms to disclose more explicitly about the purposes of their derivative use. Thus our study aims to examine whether the enhanced derivative disclosures, as mandated by FASB Statement No. 161 (SFAS 161),[1] can effectively curb managerial opportunism. This echoes Kanodia and Sapra (2016)'s call for future research on real economic consequences of accounting standards and Campbell et al. (2019)'s call for studies examining how derivative use affects managers.

[1] FASB Statement No. 161, *Disclosures about Derivative Instruments and Hedging Activities – An Amendment of FASB Statement No. 133* was issued in 2008. FASB Statement No. 133, *Accounting for Derivative Instruments and Hedging Activities*, was issued in 1998. SFAS 133 and SFAS 161 are now codified under Accounting Standards Codification Topic 815 (ASC 815) *Derivatives and Hedging*. We use the pre-codification nomenclature in this study to discuss the changes made in disclosure requirement for derivatives over time.

Previous literature documents that derivatives used for hedging reduce cash flow volatility (Froot et al., 1993), heighten earnings predictability (DeMarzo and Duffie, 1995), alleviate financial distress, and lower expected tax liabilities (Smith and Stultz, 1985). However, derivatives also serve non-hedging purposes such as earnings management and speculation (Brown, 2001; Faulkender, 2005; Géczy et al., 2007; Chernenko and Faulkender, 2011; Manchiraju et al., 2016, 2018), giving rise to a source of information uncertainty and asymmetry. Unfortunately, varied managerial incentives for using derivatives cannot be easily distinguished, especially absent the associated disclosures made in an adequate manner.

Before SFAS 161 was issued in March 2008, subject to the SFAS 133, firms were not transparent in disclosure as to their objectives for, and strategies in using derivatives. The inconsistent accounting treatments associated with various purposes and ways of using derivatives leave financial professionals and investors a difficult task of interpreting derivative use for valuation. SFAS 161 regulates the derivative disclosures in a way that enhances the transparency about the purposes of derivative usage by firms. This standard distinguishes between the derivatives used for risk management (defined as derivatives *designated* as hedging instruments) and those used for other purposes (defined as derivatives *not designated* as hedging instruments) by requiring additional tabular disclosures. Under these two broad categories, the tabular discourses must include (i) the location and period-end market value of derivatives in balance sheet and (ii) the location of derivative gains and losses reported in the income statement, by primary risk exposure categories such as interest rate, foreign exchange, commodity, and credit derivatives (FASB, 2008).

We put forward two routes of arguments for the impact of SFAS 161 on managerial opportunism. First, the enhanced derivative disclosures under SFAS 161 reduce the information asymmetry between managers and outside investors so that investors can better assess the impact of derivatives usage on stock price movements and/or volatility. Recent study by Manchiraju et al. (2018) finds that firms tend to use derivatives not designated as hedges to achieve or beat performance benchmarks, leading to higher firm risks. Also, investors react positively to firms that use derivatives for hedging but not to firms that speculate (Koonce et al., 2008). To the extent that SFAS 161 helps investors distinguish between hedging and non-hedging derivatives, the reduced information asymmetry would make it less likely for managers to behave opportunistically in a way that harms outside investors (Hutton et al., 2009). Moreover, greater transparency of the objectives of derivative use helps curb the use of derivatives for non-hedging purposes, which would further reduce the financial opacity of a firm. Taken together, lower information asymmetry in the post-SFAS 161 era is expected to suppress managerial opportunistic behavior.

Second, given that derivatives generally reduce risks if used as hedging instruments and increase risks if used for speculation or other non-hedging purposes (Chernenko and Faulkender, 2005; Manchiraju et al., 2018), more transparent disclosures about derivatives encourage active risk management via hedging. Because the benefits from speculation using derivatives remain unchanged while the potential costs (reputational costs or risk of litigation) arising from increased firm risks are higher, firms are less likely to use derivatives to pursue opportunistic non-hedging activities in the post-SFAS 161 period. Thus, we expect SFAS 161

to induce firms to use derivatives more to hedge, alleviating firms' risk exposures and associated probability that bad news would arise, thereby deterring managerial opportunistic behavior.

In order to examine the impact of SFAS 161 on managerial opportunism, we use two proxies in this study: (i) insider trades, and (ii) stock price crash risk. The lower degree of information asymmetry and more efficient risk management in the post-SFAS 161 era reduce the profitability of insider trades and hence restrain insiders from trading on their advanced information about how derivative use affects stock performance. Also, more transparent derivative disclosures help investors better correct for mispricing, lowering probability of stock price crash. Since derivatives can serve non-hedging purposes such as earnings management, as a means for managers to withhold bad news, more derivatives used for hedging after SFAS 161 would lessen the hoarding behavior and associated crash risk.

The empirical analysis is based on an initial hand-collected sample of 1,208 unique firms in non-financial and non-utility industries in the U.S. from 2006 to 2011. We employ a difference-in-differences regression model and define treatment firms as derivatives-users that strictly comply with and make changes to their derivative disclosures in response to SFAS 161, and control firms as non-users that completely unaffected by SFAS 161 to test the impact of the regulation. We find that after the adoption of SFAS 161, the decrease in insider trades is significantly greater in strict compliers, relative to a matched control sample of non-users. Also, we find that the strict compliers experience a more significant decrease in their stock price crash risk compared with the non-users in the post-SFAS 161 period.

In addition, we carry out three cross-sectional tests to examine how the impact of SFAS 161 differ by firm characteristics with respect to information opacity, financial risk and business risk. Information opacity reflects the transparency of financial statements. Lack of transparency concerning firm performance enables managers to stockpile negative information about the firm and conceal it from outside investors (Jin and Myers, 2006; Hutton et al., 2009; Kothari et al., 2009). If SFAS 161 is effective in reducing the information asymmetry between insiders and outsiders, firms with high information opacity would find it more difficult to engage in opportunistic activities in the post-SFAS 161 period. Nevertheless, SFAS 161 encourages prudent risk management and prompts more derivatives usage for hedging, resulting in lower risks. When firms have financial risk and high business risk, SFAS 161 would be more effective in suppressing the use of non-hedging derivatives, mitigating the risks and associated managerial opportunism. Therefore, we expect that the impact of SFAS 161 is more pronounced for firms with high information opacity, high financial risk and high business risk. Our empirical results are consistent with the expectations.

This study contributes to the extant literature in several ways. First of all, we extend the research on real effects of mandatory disclosure (Kanodia and Sapra, 2016; Jayaraman and Wu, 2018). To the best of our knowledge, our study is the first to examine whether derivative disclosures, as stipulated by SFAS 161, help curb managers' opportunistic behavior while most studies focus on the effect of derivative accounting on corporate investment and hedging decisions (e.g., Zhang, 2009; Panaretou et al., 2013). We echo Kanodia and Sapra's (2016) call for future research on real economic consequences of accounting standards and that "*future*

research should focus on specific disclosure/accounting measurement rules and specific corporate decisions that are predicted to be affected" (p.671). In specific, we find that SFAS 161 suppresses insider trades that fulfill managers' self-interests and restrains the use of derivatives for earnings management that facilitates bad news hoarding and hence lowers future crash risk.

Second, we contribute to the derivative literature where most studies are limited to the use of derivatives by financial institutions. While Guay and Kothari (2003) using data from 1997 claim that the use of derivatives by non-financial firms is minimal, Campbell et al. (2019) argue that this conclusion is likely outdated as the notional amount of derivative contracts has increased over 700% since 1998. We respond to Campbell et al. (2019)'s call for future studies to examine non-financial firms' use of derivatives in this study.

Third, our results call for greater scrutiny on notes to financial statements since SFAS 161 is only effective if firms comply with the standards and make real efforts to improve their derivatives disclosures. Our findings have practical and regulatory implications in that a clear guidance for implementation and an immediate review for compliance of derivatives disclosures are needed to better assess firms' hedging decisions and encourage more efficient use of derivatives. This goal can only be achieved if external authority and regulators take more responsibilities in the public interest, with stronger enforcement actions to be taken in order to improve firms' compliance with disclosure requirements.

The remainder of this study is organized as follows. In Section 2, we establish our main hypotheses. Section 3 provides details of the data resources, sample selection and variables.

Section 4 explains identification strategies and the empirical results are described in Section 5. Section 6 conducts supplemental analyses and Section 7 concludes.

2. Hypothesis Development

Hedge accounting allows companies that exercise derivatives for hedging to secure their income statements from the effect of opposed changes in interest rates, commodity prices, or foreign exchange rates (Drakopoulou, 2014). One common example of cash flow hedges is a derivative contract that protects firms from rising oil prices in the future. Derivatives are recorded at fair value at reporting date and unrealized gains/losses from the derivative contract are reported as a component of other comprehensive income (OCI) in the balance sheet. Subsequently, any gains from buying oil at lower contracted prices are reclassified into earnings after the hedge expires. But when any gains/losses in the fair value of derivatives cannot be completely offset by the losses/gains in the fair value of hedged items, the ineffective portion is reported in earnings immediately (FASB, 2008). Furthermore, if derivatives are not designated as hedges, the changes in fair values of these non-designated hedges are also recognized in earnings immediately. Considering the impact of hedge accounting on earnings, we argue that managers' choice of approach estimating the fair value of derivatives can be influential and that managers may use derivatives to inflate earnings and conceal bad news of the firm, as a way to fulfill their self-interests.

For example, Enron once entered into a series of derivatives transactions with its special purpose entities, the limited partnerships called LJM and Raptors. The so-called "price swap

derivative" hedged Enron's exposure to downside risk on large block positions of equity held, however, the counterparties in such equity swaps – LJM and Raptor, did not hedge their own risk in the event of swaps losing value. Instead, Enron committed to give its common stock to LJM and Raptor to cover any loss on the swaps. It is documented that when the value of Enron portfolio stocks under the swap contracts fell by $1.1 billion, Enron recognized a gain of $500 million in its Annual Report for 2000, which completely offset its loss on stock portfolio and attributed to almost one third of its earnings for 2000 (Bratton, 2002). As a result, stocks are overpriced to the extent that firms use derivatives to inflate earnings. Based on this earnings, over $25 million were paid to the top executives in 2001 according to Enron's bonus scheme. Despite the main argument for and investors' perception of derivatives are that derivatives are used as hedging instruments, corporate scandals such as extensive use of derivatives to boost revenues and managerial pay suggest that it may not be the case.

The introduction of SFAS 161 that aims to enhance disclosures about (i) how and why a firm uses derivative instruments; (ii) how derivative instruments are accounted; and (iii) how derivative instruments affect a firm's financial position, financial performance, and cash flows (FASB, 2008), has brought investors' attention to corporate derivative disclosures. SFAS 161 requires firms to put greater effort in distinguishing derivatives designated as hedges and derivatives not designated as hedges in a tabular format. Manchiraju et al. (2018) argue that the accounting designation of derivatives is informative as to the purposes of derivative use. They find that designated derivatives are negative associated with firm risk while derivatives not designated as hedges are often related to speculation or inefficient hedging. In achieving

its objectives, SFAS 161 is expected to reduce the information asymmetry, facilitating investors to evaluate the effect of derivative use on firm valuation and stock price volatility. This reduces the probability that managers make use of investor uncertainty about stock performance to behave opportunistically.

As SFAS 161 provides useful information for assessing the effectiveness of derivative use for hedging, another argument for SFAS 161 is that it encourages more active risk management by firms. Prior research documents mixed evidence on effects of derivatives on firm value and risk (Guay, 1999; Adam and Fernando, 2006; Bartram et al., 2011; Gilje and Taillard, 2017). In general, derivatives if used effectively as hedges reduce firm risk and increase firm value but may increase risks if used for speculation. Thus, more active risk management via hedging in the post-SFAS 161 period would alleviate firm risk and the likelihood of associated bad news. We expect that the improved derivative disclosures set forth in SFAS 161 would restrain managers from pursuing non-hedging activities and the associated opportunistic behavior.

To investigate our general hypothesis, we use insider trades and stock price crash risk as two specific proxies for managerial opportunism, which is pursued at the cost of external shareholders. Firstly, insiders, as previous literature (e.g., Ke et al., 2003; Huddart and Ke, 2007; Huddart et al., 2007; Skaife et al., 2013) suggests, take informational advantage to generate abnormal gains from trading in securities of their firms, and the profitability from insider-trading activities increases with the degree of information asymmetry between insiders and outsiders. The enhanced derivative disclosures required by SFAS 161 help investors better understand the effect of firms' derivative use on stock price movements, leading to fewer

opportunities for insiders to gain from their privileged information about stock performance.

In addition, more transparent disclosure as to the objectives of derivative usage would likely induce managers to use derivatives more for hedging and less for non-hedging, leading to more efficient risk management. If so, firms' risk exposure would decrease and firm value would increase (Bartram et al., 2011; Gilje and Taillard, 2017). The opportunity costs (i.e., reputational costs and losses of compensation) for managers to engage in insider trades would be higher for well-performing firms. Therefore, we expect that the enhanced disclosures of derivatives after SFAS 161 lead to fewer insider trades, and establish our first hypothesis as follows:

H1: *Firms that provide tabular disclosures of the purposes of derivative usage experience a greater decrease in insider trades following the passage of SFAS 161 than do no-derivative firms.*

Second, more transparent derivative disclosures enable investors to better correct for mispricing. Campbell et al. (2018) find that the documented mispricing of derivative-using firms in the pre-SFAS 161 era does not persist after SFAS 161. According to the crash risk literature (e.g., Chen et al., 2001; Hutton et al., 2009; Kim et al., 2011a, b; He, 2015; Zhu, 2016), probability of stock price crashes is higher due to bad news hoarding behavior. The more bad news withheld, the larger degree of stock overvaluation, and the higher likelihood of a stock price crash for firms. Thus, we predict that the reduced information asymmetry in post-SFAS 161 period leads to lower stock price crash risk.

The complex derivatives disclosures and higher level of information asymmetry also

create agency tension between managers and shareholders. Managers, who possess private information of a firm, tend to hide bad news from outside investors for an extended period (Kothari et al., 2009). Previous research (e.g., Pincus and Rajgopal, 2002; Chernenko and Faulkender, 2011; Manchiraju et al., 2018; He and Ren, 2019) suggests that derivatives can serve as earnings manipulation devices, thereby facilitating managers to withhold bad news. For instance, using interest rate swaps, firms can manage earnings via interest expense, specifically, by modifying their interest rate exposure when there is a large difference in current interest payment between fixed interest rate and floating interest rate (Faulkender, 2005). Firms can inflate earnings and hide losses by lowering the interest expense via the favored (lower) interest rate. By contrast, if derivatives are used for hedging, and downside risks are hedged away (Gilje and Taillard, 2017), bad news and associated hoarding malpractices would be lessened, thereby leading to lower crash risk. Therefore, to the extent that SFAS 161 helps outside investors better understand the purposes of derivative usage and increases (decreases) firms' use of derivatives for hedging (non-hedging), stock price crash risk would decrease following the passage of SFAS 161. This leads to our second hypothesis:

H2: *Firms that provide tabular disclosures of the purposes of derivative usage experience a greater decrease in stock price crash risk following the passage of SFAS 161 than do no-derivative firms.*

3. Sample Construction and Summary Statistics

3.1 Data and Sample Selection

Our empirical analysis is based on a sample of U.S. firms in non-financial and non-utility

industries. According to previous studies on derivatives (e.g., Guay, 1999; Zhang, 2009; Bartram et al., 2011; Chang et al., 2016), firms from financial industries (two-digit SIC codes 60-69) and utility industries (two-digit SIC code 49) use derivatives primarily for trading purposes and the financial reporting requirements for these firms are remarkably different. Since SFAS 161 was issued in 2008 and is effective for annual reporting period starting after 15th of November, 2008, companies generally started applying this standard from the fiscal year of 2009. Accordingly, our sample period spans the years 2006-2011, covering the three-year pre-SFAS-161 period (i.e., 2006-2008) and post-SFAS-161 period (i.e., 2009-2011).

We begin with a sample of non-financial and non-utility firms available on Compustat for fiscal years 2006-2011. Company is included in the sample if it has at least three years of consecutive data including year 2008 and 2009. We exclude the firm-year observations with negative value of total assets and missing data on market value of the firm's equity. We also exclude the observations for which the stock return data are not available on CRSP and those without analyst forecast information on I/B/E/S. The empirical analysis is based on two proxies for managerial opportunism – insider trades and stock price crash risk. The final samples should include at least one insider trading transaction or one value for crash risk measure, respectively. Insider trading data are obtained from Thomson Financial Insider Research Services Historical Files, including transactions by directors and officers only. Other necessary financial statement data and stock information come from Compustat and CRSP databases.

The tabular disclosures of whether derivatives are designated as hedging instruments need to be hand-collected from 10-K filings in SEC's EDGAR database (see tabular disclosures in

the Kadant Inc.'s 2010 annual report in Appendix B for example). Keywords such as "designated", "derivative", "hedge", "risk", "SFAS No. 133", "SFAS No. 161", "ASC 815" are used for our screen-search. One of the most apparent changes made in SFAS 161 is the requirement of providing additional tabular disclosures on derivatives under two broad titles of "derivatives *designated* as hedges" and "derivatives *not designated* as hedges" in notes to firms' financial statements.[2] There are generally three types of derivative instruments reported by companies, namely, cash flow hedges, fair value hedges and net investment hedges (or hedge of foreign currency exposure). Our data collection includes all of the three types of hedges and no differentiation is made for the purpose of this study.

3.2 Define Treatment and Control Groups

Our initial sample contains 1,208 unique firms. From a close look at the derivative disclosures in firms' 10-K reports, we find that not every firm using derivatives provides additional tabular disclosures on derivative instruments segregated by types of risk exposures as required by SFAS 161, although this standard is mandatory and applies to all entities.[3] In line with Drakopoulou (2014)'s finding that "most companies failed with the requirements of SFAS No. 161 to disclose required information", approximately 45% of the derivative-using companies in our hand-collected sample do not provide tabular disclosures distinguishing

[2] The disclosures can also be under similar titles such as "designated hedges" and "non-designated hedges".
[3] Firms may choose not to apply hedging accounting simply to avoid costs associated with documentation and monitoring required for derivatives disclosed, even if the derivatives not designated as hedges provide significant economic hedging (Comiskey and Mulford, 2008). Therefore, the effect of SFAS 161 on managers' hedging decisions remain an open question.

between designated and non-designated hedges in the three-year post-SFAS 161 period (2009-2011). Thus, we categorize the firms into three groups: *strict*-compliers (408 firms), non-compliers (335 firms), and non-users (465 firms).

The treatment firms are defined as those that provide tabular disclosures distinguishing between derivatives *designated* and *not designated* as hedging instruments in the three-year post-SFAS-161 period. We call this type of firms as *strict*-compliers. Designation of derivatives used must be clearly made in tabular disclosures to be identified as a strict complier. By contrast, firms that report no derivatives in any year during the sample period, either before or after SFAS 161, are non-users. Following previous literature (Donohoe, 2015; Chang et al., 2016), non-users are defined as our control firms. To measure the treatment effect of SFAS 161 on managers' opportunistic behavior in a firm, we need to compare firms that use derivatives *and* apply SFAS 161 with firms that are completely unaffected by the regulation, i.e., the non-users who do not use derivatives in any year over the sample period. The non-strict-compliers identified in our sample cannot be used as control group because the comparison between strict compliers and non-strict compliers is about firms' decision of complying or not complying with SFAS 161, which involves self-selection bias. In other words, firms' decision of non-compliance is mechanically correlated with our dependent variables. To tease out this problem, we define derivative-users complying the SFAS 161 and non-users as our treatment and control groups. Although the decision of using or not using derivatives is irresponsive to the changes in disclosure requirements, we further eliminate the potential selection bias by applying the propensity score matching approach in this study.

3.3 Measures for Managerial Opportunism

We examine the impact of SFAS 161 on managerial opportunism using two proxies. Firstly, we use amount of insider trades to capture the extent of insiders' informational advantage over outside investors. We measure insider trades (*INSITRADE*) as the natural logarithm of the total of dollar trading volume of insider sales and insider purchases made by all directors and officers over a fiscal year.[4] Missing values of insider trade are set as zero.

The second measure that we use to study managerial opportunism is stock price crash risk. The crash risk literature (e.g., Jin and Myers, 2006; Hutton et al., 2009) argues that managerial bad news hoarding is the fundamental cause of stock price crashes. Managers have tendency to conceal bad news from outside investors for an extended period and the accumulated bad news will eventually exceed a limit, engendering a sudden crash in stock prices. Following Hutton et al. (2009) and Kim et al. (2011a), we use an indicator variable (*CRASH*) to capture the likelihood of extremely low firm-specific weekly returns in the one-year-ahead forecast window. Firm-specific weekly return is defined as the natural logarithm of one plus the residual return $\varepsilon_{i,\tau}$ from the following expanded regression model, adjusted for market-wide factors:

$$r_{i,t} = a_i + b_{1i} r_{m,t-2} + b_{2i} r_{m,t-1} + b_{3i} r_{m,t} + b_{4i} r_{m,t+1} + b_{5i} r_{m,t+2} + e_{i,t} \quad (1)$$

where $r_{i,\tau}$ is the return on stock i, and $r_{m,\tau}$ is the return on the CRSP value-weighted market index, in week τ. Accordingly, *CRASH* equals to 1 for a firm that experiences one or

[4] Following Skaife et al. (2013), we use an alternative measure of insider trading profitability that is defined as the total of capital gains after insider purchases and the losses avoided by selling shares. Since insiders' trades precede abnormal returns, the gain realized from purchases and loss avoided from sales are calculated by multiplying the one-year buy-and-hold abnormal (size-adjusted) returns by the dollar value of trades. Insider trading profit is calculated as natural logarithm of the total capital gains during the fiscal year. In result that is not reported, the main finding of this study remains valid.

more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over a fiscal year, and 0 otherwise.

4. Research Methodology

4.1 Match Treatment and Control Groups

Our main research specification used is a difference-in-differences (hereafters, DID) regression model. The DID analysis is a common approach to get around time trends or natural changes that may affect all companies. Specifically, we contrast the changes in variables of interest (either insider trades or stock price crash risk) observed in affected (i.e., treatment) firms before and after the SFAS 161 with that observed in unaffected (i.e., control) firms. The treatment and control groups are defined as in Section 3.2.

To mitigate potential selection bias, we use the propensity score matching approach (e.g., Irani and Oesch, 2013, 2016; Hasan et al., 2014; Ke et al., 2018) to match a strict-complier with a non-user in our samples. We estimate the propensity scores from a logistic regression using *TREAT* as the dependent variable and independent variables include factors that explain the variations in derivatives usage, specifically, market value of equity (*SIZE*), book-to-market ratio (*BTM*), leverage (*LEV*), profitability (*ROA*), dedicated investors' ownership (*DEDI*), and idiosyncratic return volatility (*IDIOSYN*). According to previous literature (Stulz, 2003; Zhang, 2009; Donohoe, 2015; Chang et al., 2016), larger, growth-firms with greater profitability and more dedicated institutional investors are more likely to use derivatives. Also, since derivatives can alleviate financial distress costs and insulate firm value from unfavorable changes in risk

exposures, financial leverage and idiosyncratic return volatility are included as general incentives for derivative usage. Table 2 Panel A presents the results from logistic regression of *TREAT* on the chosen covariates before matching. It shows that five out of six covariates have statistically significant coefficients, explaining firms' choice of using derivatives in both insider trades and crash risk samples.

We match each treated firm with a control firm with replacement by using the closest propensity score within a caliper of 10%, based on data before the implementation of SFAS 161 (2006-2008). Because we have a relatively small sample with more treated firms than control firms, we allow replacement in the matching so that a control firm can be matched more than once with a treated firm. Matching with replacement in this case can improve the quality of matching, ensure the statistical power, and reduce bias (Caliendo and Kopeinig, 2008; Shipman et al., 2017). After applying the propensity score matching, we check the balance in covariates between the treated and control groups by conducting standard t-test and calculating standardized bias.

Table 2 Panel B reports the results for covariate balance check. The t-statistics from the two-sample t-test of mean show that the covariates in treated group are in general statistically indifferent from those in control group. Another method to evaluate covariate balance is to examine the standardized bias for each covariate using Rosenbaum and Rubin (1985)'s formula. The last column in Panel B shows that the standardized bias for all the covariates is below 10%, suggesting that the matching procedure sufficiently reduces the imbalance between the treated and control groups in our sample.

4.2 Difference-in-Differences (DID) Identification

In a difference-in-differences design, the research specification can be expressed as follow.

$$INSITRADE_{i,t} = a_0 + a_1 TREAT_i + a_2 POST_t + a_3 TREAT_i \times POST_t + \sum_k a_k CONTROLS_{i,t}^k + \sum_z a_z IND_{i,t}^z + \sum_t a_t YR_{i,t}^t + e_{i,t} \quad (2)$$

$$CRASH_{i,t+1} = b_0 + b_1 TREAT_i + b_2 POST_t + b_3 TREAT_i \times POST_t + \sum_k b_k CONTROLS_{i,t}^k + \sum_z b_z IND_{i,t}^z + \sum_t b_t YR_{i,t}^t + u_{i,t} \quad (3)$$

Model (2) and (3) specify the insider trades and one-year-ahead stock price crash risk as the dependent variable, respectively. The group indicator variable, *TREAT*, equals to 1 for a treated firm and 0 for a control firm. Recall that SFAS 161 was issued in 2008 and is effective for annual reporting period beginning after November 15th, 2008, all of our treatment firms start applying this standard from the fiscal year of 2009. Accordingly, the time indicator variable, *POST*, equals to 1 if a firm is in a fiscal year during the post-SFAS-161 period (i.e., 2009-2011), and 0 if it is in the three-year pre-SFAS-161 period (i.e., 2006-2008). The variable of interest is the interaction term *TREAT*×*POST*, coefficient for which captures the impact of SFAS 161 on insider trades and stock price crash risk for strict-compliers relative to non-users of derivatives. The difference-in-differences estimators (α_3 in model (2) and β_3 in model (3)) indicate the effectiveness of SFAS 161 in mitigating the managerial opportunism. It is expected that SFAS 161 can improve the information transparency and encourage prudent risk management with more derivatives being use for hedging, thereby restraining insider trades and lowering stock price crash risk. Hence, coefficients for the interaction terms are expected to be significantly negative in order to support H1 and H2.

We include separate sets of control variables in model (2) and (3) following previous literature. Firstly, for insider trades, we include firm size (*SIZE*) as a control variable and expect it to be positively related to insider trading because insiders trade more actively in larger firms (Lakonishok and Lee, 2001). Piotroski and Roulstone (2005) find that insider trades are positively associated with firm's future earnings performance and book-to-market (*BTM*) ratio. Thus, we include both return-on-assets (*ROA*) as a proxy for firm performance and *BTM* as controls. Moreover, because insiders have incentives to trade on their superior information and profit against mispricing, insider trades should be increasing with trading volume (*TRADEVOL*) due to the intensity of disagreement among investors (Chen et al., 2001). We also include analyst coverage (*LANACOV*) measured as natural logarithm of one plus the number of analyst following, and dedicated institutional investors' ownership (*DEDI*) as controls for external monitoring on insiders' opportunistic trading behavior. Insiders are expected to trade less in firms with higher analyst following (Frankel and Li, 2004) and higher institutional investors' ownership (Skaife et al., 2013). In addition, variables of idiosyncratic return volatility (*IDIOSYN*) and firm age (*FIRMAGE*) are added to further control for information asymmetry (Skaife et al., 2013), and both are predicted to be positively related to insider trades.

In model (3), we include firm size (*SIZE*), book-to-market ratio (*BTM*), analyst coverage (*LANACOV*), dedicated institutional investors' ownership (*DEDI*), return-on-assets (*ROA*), trading volume (*TRADEVOL*), idiosyncratic return volatility (*IDIOSYN*), corporate tax avoidance (*CETR*), and negative skewness of firm-specific weekly returns (*NCSKEW*) as control variables. Larger firms and growth firms are more likely to experience stock price

crashes (Harvey and Siddique, 2000; Chen et al., 2001; Hutton et al., 2009). Previous studies find that financial analysts pressure managers to conceal bad news in order to beat the forecasts, and that dedicated investors suppress bad news hoarding by monitoring over a firm's management. Therefore, we expect that *LANACOV* (*DEDI*) is positively (negatively) associated with stock price crash risk. We also control for firm's past performance (measured by return-on-assets) and stock liquidity (measured by trading volume). Both are expected to be positively related to crash risk (Hutton et al., 2009; Chang et al., 2017). Kim et al. (2011a) document that corporate tax avoidance facilitates managerial rent extraction and bad news hoarding. The variable *CETR* is the cash effective tax rate calculated as cash taxes paid divided by pretax income net of special items in a firm's financial statement. By construction, a lower value of *CETR* represents a greater extent of tax avoidance, hence *CETR* is expected to be negatively associated with crash risk. In addition, Chen et al. (2001) find that firms with high return skewness in year *t-1* are more likely to have high skewness in year *t*, indicating a higher crash risk. In addition, both models include the industry (*IND*) and year (*YR*) fixed effects to control for aggregate fluctuations and time-varying industry-specific shocks. Detailed definitions of all variables are provided in Appendix A.

The parallel trends assumption behind the DID requires similar trends in the outcome variable for both treatment and control groups prior to the treatment event (Roberts and Whited, 2013). To test the validity of this assumption, we first compare the growth rates in insider trades and crash risk of treatment firms with those of control firms in years prior to 2009. The annual growth rate is computed as the changes in insider trades (crash risk) from previous year divided

by insider trades (crash risk) in the previous year. Results from standard t-tests show that the growth rates in insider trades (crash risk) of treatment firms are statistically indifferent from those of control firms in 2007 and 2008, respectively. In addition, we re-run our DID regression models (2) and (3) by using 2005 and 2006 (as well as 2006 and 2007, and 2007 and 2008) as the pre- and post-treatment periods, respectively. Again, from results (not tabulated), we find no evidence of significant changes in insider trades or crash risk for the treated firms relative to the control firms in any year before SFAS 161 was implemented. These suggest that no violation of parallel trends assumption would bias any substantive results that would be observed in our DID regressions.

5. Empirical Results

5.1 Main Results for Hypotheses

The summary statistics for variables used in the multivariate tests are presented in Table 1. Because of the overlap in control variables, we end up with 2,762 and 2,753 firm-year observations in insider trades (*INSITRADE*) and stock price crash risk (*CRASH*) sample, respectively. We also compute t-statistics for mean tests and Chi-squared for median tests of differences between treated and control groups before matching. In results (not tabulated), firms using derivatives tend to be larger, growth companies with more analyst following, more dedicated investors, higher leverage and idiosyncratic risk, consistent with previous literature (e.g., Stulz, 2003). Regarding the disparity between the treated and control groups, a matching approach is applied to ensure the validity and robustness of the multivariate results.

Table 3 presents the main results in this paper investigating the effect of derivatives disclosure requirement changes in SFAS 161 on managerial opportunism. There are 1,523 firm-year observations for treatment group in the insider trades sample and 1,485 firm-year observations for treatment group in the crash risk sample. By matching each treatment firm with a control firm, with replacement, it ends up with a total of 3,046 and 2,970 observations in the two samples, respectively. Column (1) shows that coefficient on the interaction term *TREAT*×*POST* is significantly negative at 5% level (*p*-value=0.029). This result is consistent with H1, indicating that insider trades in strict-compliers decreases more significantly after SFAS 161 that requires enhanced disclosures on objectives for derivatives usage, relative to the non-users that are not affected by the standard. Column (2) shows a similar result of a considerably significant (*p*-value=0.019) coefficient on *TREAT*×*POST* with a negative sign. This result supports H2, suggesting that strict-compliers experience significantly larger decrease in their one-year-ahead stock price crash risk after SFAS 161 compared to the matched non-users. In addition, we conduct the variance inflation factor (VIF) test to check the potential multicollinearity concern involved in our regression estimations. The un-tabulated results show that the VIF value is less than 5 for all the explanatory variables in Table 3 Column (1) and (2), indicating that multicollinearity is not an issue for our analysis. Overall, our results provide evidence of mitigated managerial opportunism in strictly complied derivative-using firms, which attributes to reduced information asymmetry between managers and outside investors and to managers' self-restraint in using derivatives for non-hedging purposes.

5.2 Check of Robustness of Main Results

5.2.1 Anticipation effects

Before SFAS 161 took effect, it is possible that some derivatives users anticipated the regulatory changes and disclosed the purposes of their derivative usage voluntarily. Managers in these firms might restrict their opportunistic behavior moderately in advance with such an anticipation, which may alleviate our results. To mitigate this concern, we first look through the 10-K reports of all treatment firms and ensure that none of them provides the tabular disclosures pursuant to SFAS 161 before it was enforced for the fiscal year 2009. Second, we re-run the DID regression model (2) and (3) using 2005-2007 and 2008-2010 as pre- and post-"event" periods, respectively, in order to test whether there is an anticipation effect in year before 2009. From the results (not tabulated for simplicity), we find no evidence of significant changes in insider trades and stock price crash risk prior to the implementation of SFAS 161 in the fiscal year of 2009, suggesting that no anticipation effect is likely to weaken our results.

5.2.2 Financial crisis

A potential countervailing force that might also weaken our results is the impact of financial crisis. As documented in Chang (2011) and Boyallian and Ruiz-Verdú (2018), the recent financial crisis lasts from 2007 to 2010. Since the SFAS 161 event stands at the midpoint of the crisis period of 2007-2010 (i.e., the end of 2008), the effect of the crisis would not confound our results. To further address the concern, we conduct a placebo test using 2009-2010 as the crisis period and 2011-2012 as the post-crisis period and re-estimate the treatment

effects. Some might argue that the effect of financial crisis is more evident during 2007-2008 than in 2009-2010. Then same would be true for 2009-2010 relative to 2011-2012. Therefore, if we obtain significant results from our placebo test, financial crisis would play a role in explaining the reduced managerial opportunism after the crisis. However, results (not reported) show that the coefficients on interaction terms in model (2) and (3) are indeed statistically insignificant, suggesting that our finding of reduced managerial opportunism is driven by SFAS 161 instead of financial crisis during the sample period, reinforcing our main results.

5.2.3 Firm-fixed effects

Although we include both determinants of insider trades and stock price crash risk as well as industry-fixed effects in our baseline regression model (2) and (3), it cannot exclude the possibility that some unobserved firm characteristics might still be omitted and affect the outcome variables through other possible channels. To ease this concern, we re-estimate the models by including firm-fixed effects in our regressions. The firm-fixed effects model better deals with any unobserved within-firm variations among treatment and control groups that would lead to potential influence on insider trades and firm-specific crash risk. Table 4 presents the results for this test, which are consistent with the main findings from Table 3.[5] In Table 4 Column (1) and (2), the coefficients for the interaction terms remain highly significant at the 1% level with an expected negative sign, suggesting that the negative impact of SFAS 161 on

[5] When including firm-fixed effects, some observations are omitted due to collinearity issue, especially for model (3), where the dependent variable of crash risk (*CRASH*) is an indicator variable.

managerial opportunism is unlikely to be driven by correlated omitted time-invariant factors.

6. Additional Tests

6.1 Cross-Sectional Analyses of the Effect of Enhanced Derivative Disclosures on Managerial Opportunism

In this section, we conduct three cross-sectional analyses to provide further implications of the effects of SFAS 161. First, we expect that enhanced derivative disclosures reduce information asymmetry between managers and investors, thus it is meaningful to investigate whether SFAS 161 is more effective in reducing managerial opportunism for firms with high information opacity. Second, we examine whether SFAS 161 is more effective for firms with high financial risk and high business risk, respectively, which are motivated by the expectation that SFAS 161 would direct managers to use derivatives more to hedge risks. These analyses can indirectly shed light on the effects of improved derivative disclosures in reducing managerial opportunism.

Opacity refers to the degree of transparency of a firm's financial statements. A lack of information transparency about firms enables managers to conceal bad news or malpractices from the outside investors for an extended period (Jin and Myers, 2006), hence probability of stock price crashes for these firms would be higher. Also, the likelihood and extent of insider trades are greater when information opacity is high (Huddart and Ke, 2007). Our main findings suggest that SFAS 161 alleviates the information asymmetry and facilitates investors to assess the implications of firms' derivatives use for stock valuation. We expect that such impact on

insider trades and crash risk would be greater for firms with higher information opacity.

The risk management theory suggests that firms using derivatives to hedge have an intention to reduce risk rather than increase risk. The main incentives to hedge include reducing financial risk and business risk. The former, financial risk, is associated with credit risk, default risk or liquidity risk of a firm. The higher level of debt a firm has, the higher the financial risk and the more the firm can benefit from hedging that lowers the real costs of bankruptcy to the shareholders (Smith and Stulz, 1985). Since SFAS 161 makes the use of derivatives more transparent, it encourages more active risk management, changing the intention of derivatives usage from non-hedging to hedging. Effective hedging generally mitigates investor uncertainty about stock performance and reduces financial risk and its associated bad news. If SFAS 161 is effective in inducing firms to use derivatives to hedge against financial risk, we expect that the impact of SFAS 161 on insider trades and crash risk should be more pronounced for firms with higher financial risk.

The later, business risk, is the overall risk inherent in the firm and is independent of the way it is financed (Gabriel and Baker, 1980). Firms with high business risk are typically characterized by a high volatility of net operating income and tend to have high financial risk because of the variability in capacity to repay. Similarly, we expect that effective hedges also reduce business risk and the associated probability of firm-specific bad news. Using a sample of U.S. oil and gas companies and earnings volatility as a proxy for business risk, Manchiraju et al. (2018) find that firms use cash flow hedges in a prudent manner to reduce risk whereas firms using non-hedge derivatives (i.e., derivatives not designated as hedges) are associated

with greater risks. Another study by Abdel-khalik and Chen (2015) finds that firms use more non-trading derivatives for hedging purposes when facing with high earnings volatility. Therefore, if SFAS 161 is effective in directing firms to use derivatives to hedge against business risk, the impact of SFAS 161 on insider trades and crash risk is expected to be stronger for firms with higher business risk.

In order to investigate the moderating effects of information opacity, financial risk and business risk, we conduct subsample analyses. First, we follow Hutton et al. (2009) to measure opacity (*OPACITY*) as the three-year moving sum of absolute discretionary accruals in order to capture the multi-year effects of earnings management. Second, we use firm's leverage ratio (*LEV*) as a proxy for financial risk. In specific, *LEV* is measured as the total of short-term and long-term debt divided by total assets of a firm at the end of fiscal year. The more debt a firm has, the higher the probability that the firm would fail to repay its debts. In addition, earnings volatility (*STDEARN*) is used as a proxy for business risk. To conduct the tests, we split the full sample into two subsamples constructed based on the median values of *OPACITY*, *LEV* and *STDEARN* in insider trade and crash risk sample, respectively. We then match each treated firm with a control firm in each subsample using the same propensity score matching approach as in Section 4.1 to alleviate selection bias, and estimate model (2) and model (3) within the matched subsamples separately.

Table 5 reports the results for subsample test examining the moderating effect of information opacity. The estimated coefficients on the interaction term *TREAT*×*POST* are both not significant in the low-opacity-subsamples in Column (1) and (2). The negative impact of

SFAS 161 is only observed in the high-opacity-subsamples and the coefficient on *TREAT*×*POST* is significant at marginal level for *INSITRADE* and 1% level for *CRASH*. This indicates that the decreases in insider trades and stock price crash risk are significantly more pronounced in firms with high information opacity relative to those with low information opacity after SFAS 161.

Table 6 and Table 7 present the results examining the moderating effects of financial risk and business risk. Table 6 shows that coefficients on the variable of interest *TREAT*×*POST* are statistically significant and negative in the high-leverage subsamples in Column (1) and (2), but not significant in the low-leverage subsamples. Similarly, in Table 7, for both *INSITRADE* and *CRASH*, the coefficient on *TREAT*×*POST* is only statistically significant (*p*-value=0.002 and 0.023, respectively) and negative in the high-earnings-volatility subsample. Results are consistent with our expectations that treatment firms realize even greater decrease in insider trades and crash risk after SFAS 161 relative to the control firms, when they have higher leverage ratio and higher earnings volatility. This supports that SFAS 161 is more effective in deterring managerial opportunism for firms with higher financial risk and higher business risk.[6]

6.2 Is Managerial Opportunism Reduced in Non-Compliers?

In this section, we explore the potential reasons for and costs of non-compliance of

[6] Because the propensity score matching is conducted in each subsample separately, the number of observation in the high-opacity subsample (also, high-leverage subsample and high-earnings-volatility subsample) is different from that of the corresponding low-opacity subsample in Table 5 (and low-leverage subsample and low-earnings-volatility subsample in Table 6 and 7, respectively) due to the difference in efficiency of matching.

derivative disclosures and investigate the impact of SFAS 161 on non-strict-compliers as a falsification test to support our arguments. In our initial sample, we identify 335 derivatives-using firms that do not provide disclosures strictly complied with SFAS 161, compared to 408 strict-compliers. The reasons for non-compliance are an empirical question relating to the enforcement of FASB's reporting standards. As an independent and private organization, FASB claims to have no authority over the enforcement of its standards. The responsibility for ensuring that financial statements comply with disclosure requirements rests with the reporting entity, the auditors, and the Securities Exchange Commission (SEC) for public companies. Companies face increased risk of SEC enforcement and litigation and a higher possibility of civil penalties, injunctions, clawback remedies, and sanctions by regulators and firm stakeholders (Pecht et al., 2014), especially after reporting any internal control problems or financial restatements. The risk of restatement would increase due to either intentional or unintentional misapplications of hedge accounting, which involves a shortcut method that requires little or no costs of documentation and ongoing monitoring of hedge effectiveness (Comiskey and Mulford, 2008), typically in derivative disclosures prior to SFAS 161. While the market imposes a heavy penalty on firms for restatement via an average 25% decline in stock price (Richardson et al., 2013), SEC normally requires a restatement only if an incorrect information is considered material that would lead to inaccurate conclusions drawn by the users of financial statements. Thus, in general, there is no substantial penalty for insufficient disclosures of derivative usage and for non-compliance with SFAS 161 which aims to enhance the transparency of derivative disclosures.

To examine how SFAS 161 affects derivatives users that do not make a real change or improvement in their derivative disclosures, we conduct an additional test by re-defining the treatment firms as the derivatives users that do not strictly comply with SFAS 161 and re-estimate the treatment effect as in model (2) and (3), respectively. By falsely assuming that the impact of SFAS 161 is effective on derivatives-using firms that do not comply with the rules, we expect the treatment effect to be zero. Such a placebo test using the alternative treated group can mitigate the concern of correlated omitted variables and provide important regulatory implications. We replace the group indicator variable $TREAT_i$ in model (2) and (3) with $NONCOMPLIER_i$, which equals to 1 for a derivatives-using firm that does not strictly complied with SFAS 161, i.e., it does not provide the tabular disclosures distinguishing between derivatives designated as hedges and those not designated as hedges, and 0 for a non-user of derivatives. Each treated firm is matched with a control firm using the same propensity score matching approach as in section 4.1.

Table 8 reports the results from the placebo test examining the impact of SFAS 161 on non-complied derivatives-users. As expected, the coefficient on interaction term $NONCOMPLIER_i \times POST_t$ is not statistically significant in both Column (1) and Column (2). This suggests that SFAS 161 does not have a significant impact on non-complied derivatives-users relative to the non-users and that our main results in Table 3 are robust and free from potential omitted-variables concerns. More importantly, results call for greater scrutiny over the notes to firms' financial statements as SFAS 161 will only be effective if firms strictly comply with the standards and make an effort to improve their derivatives disclosures. This goal can only be

achieved if external authority and regulators take more responsibilities in the public interest, with stronger enforcement actions to improve the compliance with disclosure requirements.

7. Conclusion

Using the enforcement of SFAS 161 on *Disclosures about Derivatives Instruments and Hedging Activities*, this study examines the effects of derivatives disclosures transparency on insider trades and stock price crash risk. To investigate the impact of SFAS 161, we compare derivative-using firms that comply with SFAS 161 with non-users of derivatives in a difference-in-differences regression model. The DID specification controls for omitted variables that affect both treated and control group in a similar manner, mitigating potential endogeneity concerns related to firms' hedging decisions. We use insider trades and stock price crash risk as two proxies for managerial opportunism. We find that the decrease in insider trades is significantly greater in derivatives users that strictly comply with SFAS 161, relative to a matched control sample of non-users after the enforcement of SFAS 161. Also, the strict compliers experience a larger decrease in stock price crash risk compared with the non-users in the post-SFAS 161 period. We conduct additional cross-sectional analyses to provide further insights into the impact of SFAS 161, our results suggest that the effects of SFAS 161 are more pronounced for firms with high information opacity, high financial risk and high business risk.

This study contributes to the literature on real effects of derivative disclosures, it explores how derivative disclosures influence managers' hedging decisions and opportunistic behavior. The complexity in financial reporting exacerbates the information asymmetry associated with

derivative instruments. It was hardly possible to discern firms' objectives for derivative usage before SFAS 161 took effect. More information on firms' strategy and objectives for derivatives enables market participants to better assess the effectiveness of hedging activities, providing greater attention on managerial opportunism pertaining to derivative usage for non-hedging purposes. While our results suggest that SFAS 161 is effective in suppressing managerial opportunism for firms that strictly comply with the standard and make a real improvement in their derivatives disclosures, 45% of derivatives users in our hand-collected sample are non-strict-compliers, the impact of SFAS 161 on which is insignificant. This calls for greater scrutiny of compliance with SFAS 161 to maximize its impact and benefit in the public interest. Although firm's derivatives disclosure practices improve in the past decade, this study is still limited to the information provided by the firms. We believe that the reasons and managerial incentives for non-compliance and for not applying hedge accounting are worth exploring in future research.

Appendix A: Summary of Variable Definitions

Variables	Definitions
CRASH	1 if a firm experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly return over a fiscal year, and 0 otherwise. The firm-specific weekly returns measure follows Kim et al. (2011a).
INSITRADE	The natural logarithm of 1 plus the total of dollar trading volume of insider sales and the dollar trading volume of insider purchases made by all directors and officers over a fiscal year.
POST	1 if a firm is in the three fiscal years (i.e., 2009-2011) after the enforcement of SFAS 161 in 2008, and 0 if a firm is in the three fiscal years of the pre-SFAS 161 period (i.e., 2006-2008).
TREAT	1 for a treated firm that provides tabular disclosures of derivatives designated and not designated as hedging instruments in the 10-K report in any year after the SFAS 161, and 0 for a control firm that reports no derivatives in any year over the sample period.
NONCOMPLIER	1 for a treated firm that does not strictly complied with SFAS 161, i.e., it does not provide the tabular disclosures distinguishing between derivatives designated as hedges and those not designated as hedges, and 0 for a non-user of derivatives.
SIZE	The natural logarithm of the market value of a firm's equity at the end of a fiscal year.
BTM	The book value of firm equity divided by the market value of firm equity at the end of a fiscal year, winsorized at the 1% and 99% levels, respectively.
DEDI	Dedicated institutional investors' stock ownership as a percentage of a firm's outstanding shares at the end of the fiscal year.
LANACOV	The natural logarithm of 1 plus the number of analysts that make at least one annual EPS forecast for a firm over a fiscal year.
ROA	Return on assets calculated as income before extraordinary items divided by total assets at the beginning of fiscal year.
LEV	The sum of short-term and long-term debt divided by total assets for a firm over a fiscal year. We set missing values of short-term debt equal to zero and drop the observation for which long-term debt is missing.
FIRMAGE	The number of years a firm has been listed.
TRADEVOL	The average of monthly trading volume for a firm over a fiscal year, scaled by shares outstanding at the end of the year.
IDIOSYN	Idiosyncratic return volatility calculated as the standard deviation of the residuals from the following market model regression over the 52-week window before the end of a fiscal year: $r_{i,t} = \alpha_i + \beta_{1i} r_{m,t-1} + \beta_{2i} r_{m,t-2} + \beta_{3i} r_{m,t} + \beta_{4i} r_{m,t+1} + \beta_{5i} r_{m,t+2} + \varepsilon_{i,t}$, where $r_{i,t}$ is the weekly return on firm i and $r_{m,t}$ is the value-weighted CRSP index return (Kim et al., 2011a).
OPACITY	The three-year moving sum of the absolute value of annual discretionary accruals, a measure of financial opacity developed by Hutton et al. (2009).
STDEARN	The standard deviation of income before extraordinary items in the current and previous four fiscal years.
CETR	Cash effective tax rate, calculated as cash taxes paid (TXPD) divided by pretax income (PI) net of special items (SPI). We set missing values of TXPD equal to zero, and set *CETR* to missing if the denominator is 0 or negative.
NCSKEW	The negative of the third moment of firm-specific weekly returns. The firm-specific weekly returns measure follows Kim et al. (2011a).

Appendix B. Derivative Disclosures Before and After the SFAS 161

1. An excerpt from notes to Consolidated Financial Statements of Kadant Inc. for the fiscal year ended December 29, 2007

Derivatives

The Company uses derivative instruments primarily to reduce its exposure to changes in currency exchange rates and interest rates. When the Company enters into a derivative contract, the Company makes a determination as to whether the transaction is deemed to be a hedge for accounting purposes. For contracts deemed to be a hedge, the Company formally documents the relationship between the derivative instrument and the risk being hedged. In this documentation, the Company specifically identifies the asset, liability, forecasted transaction, cash flow, or net investment that has been designated as the hedged item, and evaluates whether the derivative instrument is expected to reduce the risks associated with the hedged item. To the extent these criteria are not met, the Company does not use hedge accounting for the derivative.

SFAS No. 133 (SFAS 133), "Accounting for Derivative Instruments and Hedging Activities," as amended, requires that all derivatives be recognized on the balance sheet at fair value. For derivatives designated as cash flow hedges, the related gains or losses on these contracts are deferred as a component of accumulated other comprehensive items. These deferred gains and losses are recognized in the period in which the underlying anticipated transaction occurs. For derivatives designated as fair value hedges, the unrealized gains and losses resulting from the impact of currency exchange rate movements are recognized in earnings in the period in which the exchange rates change and offset the currency gains and losses on the underlying exposures being hedged. The Company performs an evaluation of the effectiveness of the hedge both at inception and on an ongoing basis. The ineffective portion of a hedge, if any, and changes in the fair value of a derivative not deemed to be a hedge, are recorded in the consolidated statement of income.

The Company entered into interest rate swap agreements in 2007 and 2006 to hedge a portion of its variable rate debt and has designated these agreements as cash flow hedges of the underlying obligations. The fair values of the interest rate swap agreements are included in other assets for unrecognized gains and in other liabilities for unrecognized losses with an offset in accumulated other comprehensive items (net of tax). The Company has structured these interest rate swap agreements to be 100% effective and as a result, there is no current impact to earnings resulting from hedge ineffectiveness.

The Company uses forward currency exchange contracts primarily to hedge certain operational ("cash flow" hedges) and balance sheet ("fair value" hedges) exposures resulting from fluctuations in currency exchange rates. Such exposures primarily result from portions of the Company's operations and assets that are denominated in currencies other than the functional currencies of the businesses conducting the operations or holding the assets. The Company enters into forward currency exchange contracts to hedge anticipated product sales and recorded accounts receivable made in the normal course of business, and accordingly, the hedges are not speculative in nature.

2. An excerpt from notes to Consolidated Financial Statements of Kadant Inc. for the fiscal year ended January 1, 2011

Derivatives

The Company uses derivative instruments primarily to reduce its exposure to changes in currency exchange rates and interest rates. When the Company enters into a derivative contract, the Company makes a determination as to whether the transaction is deemed to be a hedge for accounting purposes. For a contract deemed to be a hedge, the Company formally documents the relationship between the derivative instrument and the risk being hedged. In this documentation, the Company specifically identifies the asset, liability, forecasted transaction, cash flow, or net investment that has been designated as the hedged item, and evaluates whether the derivative instrument is expected to reduce the risks associated with the hedged item. To the extent these criteria are not met, the Company does not use hedge accounting for the derivative. The changes in the fair value of a derivative not deemed to be a hedge are recorded currently in earnings. The Company does not hold or engage in transactions involving derivative instruments for purposes other than risk management.

ASC 815, "Derivatives and Hedging," requires that all derivatives be recognized on the balance sheet at fair value. For derivatives designated as cash flow hedges, the related gains or losses on these contracts are deferred as a component of accumulated other comprehensive items. These deferred gains and losses are recognized in the period in which the underlying anticipated transaction occurs. For derivatives designated as fair value hedges, the unrealized gains and losses resulting from the impact of currency exchange rate movements are recognized in earnings in the period in which the exchange rates change and offset the currency gains and losses on the underlying exposures being hedged. The Company performs an evaluation of the effectiveness of the hedge both at inception and on an ongoing basis. The ineffective portion of a hedge, if any, and changes in the fair value of a derivative not deemed to be a hedge, are recorded in the consolidated statement of operations.

Interest Rate Swaps

The Company entered into interest rate swap agreements in 2008 and 2006 to hedge its exposure to variable-rate debt and has designated these agreements as cash flow hedges. On February 13, 2008, the Company entered into a swap agreement (2008 Swap Agreement) to hedge the exposure to movements in the 3-month LIBOR rate on future outstanding debt. The 2008 Swap Agreement has a five-year term and a $15,000,000 notional value, which decreased to $10,000,000 on December 31, 2010, and will decrease to $5,000,000 on December 30, 2011. Under the 2008 Swap Agreement, on a quarterly basis the Company receives a 3-month LIBOR rate and pays a fixed rate of interest of 3.265% plus the applicable margin. The Company entered into a swap agreement in 2006 (the 2006 Swap Agreement) to convert a portion of the Company's outstanding debt from floating to fixed rates of interest. The swap agreement has the same terms and quarterly payment dates as the corresponding debt, and reduces proportionately in line with the amortization of the debt. Under the 2006 Swap Agreement, the Company receives a three-month LIBOR rate and pays a fixed rate of interest of 5.63%. The fair values for these instruments as of year-end 2010 are included in other liabilities, with an offset to accumulated other comprehensive items (net of tax) in the accompanying consolidated balance sheet. The Company has structured these interest rate swap agreements

to be 100% effective and as a result, there is no current impact to earnings resulting from hedge ineffectiveness. Management believes that any credit risk associated with the swap agreements is remote based on the Company's financial position and the creditworthiness of the financial institution issuing the swap agreements.

The counterparty to the swap agreement could demand an early termination of the swap agreement if the Company is in default under the 2008 Credit Agreement, or any agreement that amends or replaces the 2008 Credit Agreement in which the counterparty is a member, and the Company is unable to cure the default. An event of default under the 2008 Credit Agreement includes customary events of default and failure to comply with financial covenants, including a maximum consolidated leverage ratio of 3.5 and a minimum consolidated fixed charge coverage ratio of 1.2. The unrealized loss of $1,595,000 as of year-end 2010 represents the estimated amount that the Company would pay to the counterparty in the event of an early termination.

Forward Currency-Exchange Contracts

The Company uses forward currency-exchange contracts primarily to hedge exposures resulting from fluctuations in currency exchange rates. Such exposures result primarily from portions of the Company's operations and assets and liabilities that are denominated in currencies other than the functional currencies of the businesses conducting the operations or holding the assets and liabilities. The Company typically manages its level of exposure to the risk of currency-exchange fluctuations by hedging a portion of its currency exposures anticipated over the ensuing 12-month period, using forward currency-exchange contracts that have maturities of 12 months or less.

Forward currency-exchange contracts that hedge forecasted accounts receivable or accounts payable are designated as cash flow hedges. The fair values for these instruments are included in other current assets for unrecognized gains and in other current liabilities for unrecognized losses, with an offset in accumulated other comprehensive items (net of tax). For forward currency-exchange contracts that are designated as fair value hedges, the gain or loss on the derivative, as well as the offsetting loss or gain on the hedged item are recognized currently in earnings. The fair values of forward currency-exchange contracts that are not designated as hedges are recorded currently in earnings. The Company recognized a loss of $34,000 and $699,000 in 2010 and 2009, respectively, and a gain of $896,000 in 2008 included in selling, general, and administrative expenses associated with forward currency-exchange contracts that were not designated as hedges. Management believes that any credit risk associated with forward currency-exchange contracts is remote based on the Company's financial position and the creditworthiness of the financial institutions issuing the contracts.

The following table summarizes the fair value of the Company's derivative instruments designated and not designated as hedging instruments, the notional values of the associated derivative contracts, and the location of these instruments in the consolidated balance sheet:

(In thousands)	Balance Sheet Location	2010 Asset (Liability) (a)	2010 Notional Amount (b)	2009 Asset (Liability) (a)	2009 Notional Amount (b)
Derivatives Designated as Hedging Instruments:					
Derivatives in an Asset Position:					
Forward currency-exchange contracts	Other Current Assets	$ 131	$ 1,794	$ 207	$ 7,856
Derivatives in a Liability Position:					
Forward currency-exchange contracts	Other Current Liabilities	$ (59)	$ 1,056	$ –	$ –
Interest rate swap agreements	Other Long-Term Liabilities	$ (1,595)	$ 17,750	$ (1,517)	$ 23,250
Derivatives Not Designated as Hedging Instruments:					
Derivatives in a Liability Position:					
Forward currency-exchange contracts	Other Current Liabilities	$ (48)	$ 1,816	$ (98)	$ 1,728

(a) See Note 11 for the fair value measurements relating to these financial instruments.
(b) The total notional amount is indicative of the level of the Company's derivative activity during 2010 and 2009.

The following table summarizes the activity in accumulated other comprehensive items (OCI) associated with the Company's derivative instruments designated as cash flow hedges as of and for the period ended January 1, 2011:

(In thousands)	Interest Rate Swap Agreements	Forward Currency-Exchange Contracts	Total
Unrealized loss (gain), net of tax, at January 2, 2010	$ 1,212	$ (138)	$ 1,074
(Loss) gain reclassified to earnings (a)	(710)	138	(572)
Loss (gain) recognized in OCI	788	(50)	738
Unrealized loss (gain), net of tax, at January 1, 2011	$ 1,290	$ (50)	$ 1,240

(a) Included in interest expense for interest rate swap agreements and in revenues for forward currency-exchange contracts in the accompanying consolidated statement of operations.

As of January 1, 2011, $552,000 of the net unrealized loss included in OCI is expected to be reclassified to earnings over the next twelve months.

References:

Adam, T. R., and Fernando, C. S., 2006. Hedging, speculation, and shareholder value. *Journal of Financial Economics* 81 (2): 283-309.

Bartram, S. B., Brown, G. W., and Conrad, J., 2011. The effects of derivatives on firm risk and value. *Journal of Financial and Quantitative Analysis* 46 (4): 967-999.

Bratton, W. W., 2002. Enron and the dark side of shareholder value. *Tulane Law Review* 76: 1275-1361.

Brown, G. W., 2001. Managing foreign exchange risk with derivatives. *Journal of Financial Economics* 60 (2-3): 401-448.

Campbell, J. L., Khan, U., and Pierce, S., 2018. The effect of mandatory disclosure on market inefficiencies: Evidence from Statement of Financial Accounting Standard Number 161. Working paper, University of Georgia.

Campbell, J. L., Mauler, L. M., and Pierce, S. R., 2019. A review of derivatives research in accounting and suggestions for future work. *Journal of Accounting Literature* 42: 44-60.

Caliendo, M., and Kopeinig, S., 2008. Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys* 22 (1): 31-72.

Chang, H. R., Donohoe, M., and Sougiannis, T., 2016. Do analysts understand the economic and reporting complexities of derivatives? *Journal of Accounting and Economics* 61 (2-3): 584-604.

Chang, X., Chen, Y., and Zolotoy, L., 2017. Stock liquidity and stock price crash risk. *Journal of Financial and Quantitative Analysis* 52 (4): 1605-1637.

Chen, J., Hong, H., and Stein, J. C., 2001. Forecasting crashes: Trading volume, past returns, and conditional skewness in stock prices. *Journal of Financial Economics* 61 (3): 345-381.

Chernenko, S., and Faulkender, M., 2011. The two sides of derivatives usage: Hedging and speculating with interest rate swaps. *Journal of Financial and Quantitative Analysis* 46 (6): 1727-1754.

Comiskey, E. E., and Mulford, C. W., 2008. The non-designation of derivatives as hedges for accounting purposes. *Journal of Applied Research in Accounting and Finance* 3 (2): 3-16.

DaDalt, P., Gay, G. D., and Nam, J. 2002. Asymmetric information and corporate derivatives use. *Journal of Futures Markets* 22 (3): 241-267.

DeMarzo, P. M., and Duffie, D., 1995. Corporate incentives for hedging and hedge accounting. *Review of Financial Studies* 8 (3): 743-771.

Donohoe, M., 2015. The economic effects of financial derivatives on corporate tax avoidance. *Journal of Accounting and Economics* 59 (1): 1-24.

Drakopoulou, V., 2014. Accounting for derivative instruments and hedging activities. *Journal of Financial Risk Management* 3 (4): 151-165.

Faulkender, M., 2005. Hedging or market timing? Selecting the interest rate exposure of corporate debt. *Journal of Finance* 60 (2): 931-962.

Financial Accounting Standards Board (FASB), 1998. *Statement of Financial Accounting Standards No.133: Accounting for derivative instruments and hedging activities.* Norwalk, CT: FASB.

Financial Accounting Standards Board (FASB), 2008. *Statement of Financial Accounting Standards No.161: Disclosures about derivative instruments and hedging activities*. Norwalk, CT: FASB.

Frankel, R., and Li, X., 2004. Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders. *Journal of Accounting and Economics* 37 (2): 229-259.

Froot, K., Scharfstein, D., and Stein, J., 1993. Risk management: Coordinating corporate investment and financing policies. *Journal of Finance* 48 (5): 1629-1648.

Gabriel, S. C., and Baker, C. B., 1980. Concepts of business and financial risk. *American Journal of Agricultural Economics* 62 (3): 560-564.

Géczy, C. C., Minton, B. A., and Schrand, C. M., 2007. Taking a view: Corporate speculation, governance, and compensation. *Journal of Finance* 62 (5): 2405-2443.

Gilje, E. P., and Taillard, J. P., 2017. Does hedging affect firm value? Evidence from a natural experiment. *Review of Financial Studies* 30 (12): 4083-4132.

Guay, W. R., 1999. The impact of derivatives on firm risk: An empirical examination of new derivative users. *Journal of Accounting and Economics* 26 (1-3): 319-351.

Harvey, C. R., and Siddique, A., 2000. Conditional skewness in asset pricing tests. *Journal of Finance* 55 (3): 1263-1295.

Hasan, I., Hoi, C. K., Wu, Q., and Zhang, H., 2014. Beauty is in the eye of the beholders: The effect of corporate tax avoidance on the cost of bank loans. *Journal of Financial Economics* 113 (1): 109-130.

He, G., 2015. The effect of CEO inside debt holdings on financial reporting quality. *Review of Accounting Studies* 20 (1): 501-536.

He, G., and Ren, H. M., 2019. Are financially constrained firms more susceptible to a stock price crash? Working paper, Durham University and University of Warwick.

Huddart, S. J., and Ke, B., 2007. Information asymmetry and cross-sectional variation in insider trading. *Contemporary Accounting Research* 24 (1): 195-232.

Huddart, S., Ke, B., and Shi, C., 2007. Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings. *Journal of Accounting and Economics* 43 (1): 3-36.

Hutton, A. P., Marcus, A. J., and Tehranian, H., 2009. Opaque financial reports, R^2, and crash risk. *Journal of Financial Economics* 94 (1): 67-86.

Irani, R. M., and Oesch, D., 2013. Monitoring and corporate disclosures: Evidence from a natural experiment. *Journal of Financial Economics* 109 (2): 398-418.

Irani, R. M., and Oesch, D., 2016. Analyst coverage and real earnings management: Quasi-experimental evidence. *Journal of Financial and Quantitative Analysis* 51 (2): 589-627.

Jayaraman, S., and Wu, J. S., 2018. Is silence golden? Real effects of mandatory disclosure. *Review of Financial Studies* forthcoming.

Jin, L., and Myers, S. C., 2006. R2 around the world: New theory and new tests. *Journal of Financial Economics* 79 (2): 257-292.

Jin, Y., and Jorion, P., 2006. Firm value and hedging: Evidence from U.S. oil and gas producers. *Journal of Finance* 61(2): 893-919.

Kanodia, C., and Sapra, H., 2016. A real effects perspective to accounting measurement and disclosure: Implications and insights for future research. *Journal of Accounting Research* 54 (2): 623-676.

Ke, B., Huddart, S., and Petroni, K., 2003. What insiders know about future earnings and how they use it: Evidence from insider trades. *Journal of Accounting and Economics* 35 (3): 315-346.

Ke, R., Li, M., Ling, Z., and Zhang, Y., 2019. Social connections within executive teams and management forecasts. *Management Science* 65 (1): 439-457.

Kim, J-B., Li, Y., and Zhang, L., 2011a. Corporate tax avoidance and stock price crash risk: Firm-level analysis. *Journal of Financial Economics* 100 (3): 639-662.

Kim, J-B., Li, Y., and Zhang, L., 2011b. CFOs versus CEOs: Equity incentives and crashes. *Journal of Financial Economics* 101 (3): 713-730.

Koonce, L., Lipe, M. G., and McAnally, M. L., 2008. Investor reactions to derivative use and outcomes. *Review of Accounting Studies* 13 (4): 571-597.

Kothari, S. P., Shu, S., and Wysocki, P. D., 2009. Do managers withhold bad news? *Journal of Accounting Research* 47 (1): 241-276.

Lakonishok, J., and Lee, I., 2001. Are insider trades informative? *Review of Financial Studies* 14(1): 79-111.

Manchiraju, H., Hamlen, S., Kross, W., and Suk, I., 2016. Fair value gains and losses in derivatives and CEO compensation. *Journal of Accounting, Auditing & Finance* 31 (3):

311-338.

Manchiraju, H., Pierce, S., and Sridharan, S. S., 2018. Is hedge accounting designation informative about how firms use derivatives? Working paper, Indian School of Business, Florida State University, and Northwestern University.

Panaretou, A., Shackleton, M. B., and Taylor, P. A., 2013. Corporate risk management and hedge accounting. *Contemporary Accounting Research* 30 (1): 116-139.

Pecht, G. G., Oakes, M. T., and Stokes, P. A., 2014. SEC steps up scrutiny of financial reporting and internal controls. Norton Rose Fulbright Publications, available from: http://www.nortonrosefulbright.com/knowledge/publications/123389/sec-steps-up-scrutiny-of-financial-reporting-and-internal-controls.

Pincus, M., and Rajgopal, S., 2002. The interaction between accrual management and hedging: Evidence from oil and gas firms. *Accounting Review* 77 (1): 127-160.

Piotroski, J. D., and Roulstone, D. T., 2005. Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? *Journal of Accounting and Economics* 39 (1): 55-81.

Roberts, M. R., and Whited, T. M., 2013. Endogeneity in empirical corporate finance. *Handbook of the Economics of Finance*. 493-572.

Rosenbaum, P. R., and Rubin, D. B., 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician* 39 (1): 33-38.

Shipman, J. E., Swanquist, Q. T., and Whited, R. L., 2017. Propensity score matching in accounting research. *Accounting Review* 92 (1): 213-244.

Skaife, H. A., Veenman, D., and Wangerin, D., 2013. Internal control over financial reporting and managerial rent extraction: Evidence from the profitability of insider trading. *Journal of Accounting and Economics* 55 (1): 91-110.

Smith, C. W., and Stultz, R. M., 1985. The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis* 20 (4): 391-405.

Stulz, R. M., 2003. *Risk Management & Derivatives*. Southwestern College Publishing.

Zhang, H., 2009. Effect of derivative accounting rules on corporate risk-management behavior. *Journal of Accounting and Economics* 47 (3): 244-264.

Zhu, W., 2016. Accruals and price crashes. *Review of Accounting Studies* 21 (2): 349-399.

Table 1 Descriptive Statistics

Variables	No. of firm-years	No. of unique firms	Mean	Std. dev.	25th	Median	75th
INSITRADE	2,762	712	4.6479	6.3358	0	0	11.9837
CRASH	2,753	756	0.1976	0.3983	0	0	0
SIZE	2,762	712	7.1450	1.7263	6.0880	7.1197	8.1458
BTM	2,762	712	0.5787	0.8088	0.2673	0.4236	0.6727
LANACOV	2,762	712	3.4697	1.2244	2.8904	3.6889	4.3041
DEDI	2,762	712	0.0792	0.0930	0.0113	0.0573	0.1202
ROA	2,762	712	0.1248	1.5040	0.0400	0.0711	0.1122
LEV	2,762	712	0.1489	0.1627	0.0002	0.1018	0.2462
TRADEVOL	2,762	712	2.3167	1.7974	1.1420	1.8795	2.9895
FIRMAGE	2,762	712	20.9066	18.9084	9	15	26
IDIOSYN	2,762	712	0.0525	0.0242	0.0372	0.0488	0.0629
RETR	2,762	712	0.2329	0.6870	0.0943	0.2218	0.3253
NCSKEW	2,753	756	-2.3980	13.5785	-8.6742	-2.2358	4.2824
OPACITY	2,480	700	10.0161	67.4258	0.0401	0.1472	0.9973
STDEARN	2,762	712	127.9514	595.8608	6.0127	17.6636	69.0112

Notes: This table presents descriptive statistics for the variables used in the multivariate tests before matching. The sample contains firm-year observations for the period of 2006-2011. All the variables are defined in Appendix A.

Table 2 Propensity Score Matching Specification

Panel A. Determinants of Variations in Derivatives Usage

Variables	(1) *INSITRADE* Sample Dependent Variable = $TREAT_i$	(2) *CRASH* Sample Dependent Variable = $TREAT_i$
$SIZE_t$	0.5790***	0.5870***
	(<0.001)	(<0.001)
BTM_t	0.3149***	0.2921***
	(<0.001)	(<0.001)
LEV_t	4.8004***	3.8402***
	(<0.001)	(<0.001)
ROA_t	0.0149	-3.0149***
	(0.752)	(<0.001)
$DEDI_t$	1.0231*	0.3278
	(0.052)	(0.524)
$IDIOSYN_t$	-4.7027**	-4.5234**
	(0.028)	(0.036)
Intercept	-4.5457***	-4.0549***
	(<0.001)	(<0.001)
No. of observations	2,762	2,753
Pseudo R-squared	0.2270	0.2047

Panel B. Checking the Balance of Measured Covariates between Treated and Control Groups

Insider trades (*INSITRADE*) sample

Variables	Mean *TREAT*=0 (N=1,523)	Mean *TREAT*=1 (N=1,523)	Mean Difference (t-stat)	Standardized Bias (%)
SIZE	7.7798	7.8541	-0.0743	-4.7
			(-1.18)	
BTM	0.5851	0.6172	-0.0321	-4.0
			(-0.92)	
LEV	0.2023	0.1905	0.0118	7.9
			(1.94)*	
ROA	0.1483	0.0889	0.0594	4.1
			(1.14)	
DEDI	0.0888	0.0958	-0.0071	-7.7
			(-1.87)*	
IDIOSYN	0.0477	0.0478	-0.0001	-0.6
			(-0.18)	

Stock price crash risk (*CRASH*) sample

Variables	Mean *TREAT*=0 (N=1,485)	Mean *TREAT*=1 (N=1,485)	Mean Difference (t-stat)	Standardized Bias (%)
SIZE	7.7173	7.6317	0.0856	5.4
			(1.48)	
BTM	0.5911	0.5956	-0.0045	-0.6
			(-0.13)	
LEV	0.3617	0.1804	0.1813	3.2
			(0.93)	
ROA	0.1453	0.0905	0.0548	4.0
			(1.13)	
DEDI	0.0866	0.0895	-0.0029	-3.3
			(-0.83)	
IDIOSYN	0.0486	0.0512	-0.0026	-10.0
			(-3.11)***	

Notes: Panel A of this table presents the logistic regression results for determinants of the variations in firms' derivatives usage before matching. The regressions estimate the propensity scores for each firm-year observations in the insider trades (*INSITRADE*) and stock price crash risk (*CRASH*) sample, respectively. Each treated firm is then matched with a control firm that has the closest propensity score, with replacement and within the caliper of 10%. The dependent variable is the indicator variable *TREAT*, which equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives in any year over the sample period. Panel B reports the descriptive statistics of strict-complier (*TREAT*=1) group and non-user (*TREAT*=0) group based on propensity score matching. The t-statistic from two-sample test of mean and standardized bias are calculated as a check for balance of measured covariates. The sample period covers the years of 2006-2011. All the variables are defined in Appendix A. The *p*-values in parentheses are based on robust standard errors clustered by firm in Panel A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 3 Difference-in-Differences Tests: The Impact of SFAS 161 on Managerial Opportunism

Variables	Dependent Variable=	
	(1) $INSITRADE_t$	**(2) $CRASH_{t+1}$**
Intercept	-3.1334	0.2308
	(0.328)	(0.663)
$TREAT_i$	1.2299***	0.1033
	(0.001)	(0.504)
$POST_t$	1.0714**	0.4617**
	(0.030)	(0.012)
$TREAT_i \times POST_t$	**-0.9967****	**-0.4498****
	(0.029)	**(0.019)**
$SIZE_t$	0.6550***	-0.0762
	(<0.001)	(0.149)
BTM_t	0.0973	-0.1804
	(0.508)	(0.112)
$LANACOV_t$	0.2126	0.1106
	(0.235)	(0.146)
$DEDI_t$	-1.4474	0.5595
	(0.216)	(0.279)
ROA_t	-0.0997	-0.0354
	(0.204)	(0.624)
$TRADEVOL_t$	0.1554*	0.0473
	(0.058)	(0.167)
$IDIOSYN_t$	1.0558	-15.2104***
	(0.880)	(<0.001)
$FIRMAGE_t$	-0.0199***	
	(0.003)	
$CETR_t$		-0.4268
		(0.460)
$NCSKEW_t$		-0.0035
		(0.344)
Year-fixed effects	included	included
Industry-fixed effects	included	included
No. of observations	3,046	2,970
Adjusted/Pseudo R-squared	0.1154	0.0583

Notes: This table reports the results of difference-in-differences tests for the impact of SFAS 161 on managerial opportunism. The sample period covers the years of 2006-2011. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $TREAT_i$, equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $TREAT_i \times POST_t$, is the variable of interest, coefficient for which measures the effect of SFAS 161 on insider trading and stock price crash risk for strict-complier ($TREAT$=1) relative to non-user ($TREAT$=0) of derivatives. All the variables are defined in Appendix A. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 4 Including Firm-Fixed Effects: The Impact of SFAS 161 on Managerial Opportunism

Variables	Dependent Variable=	
	(3) $INSITRADE_t$	**(4) $CRASH_{t+1}$**
Intercept	21.5024***	7.1380**
	(<0.001)	(0.014)
$TREAT_i$	-57.7320***	-1.7358
	(<0.001)	(0.305)
$POST_t$	6.2207***	1.2543***
	(<0.001)	(<0.001)
$TREAT_i \times POST_t$	**-1.1574*** **	**-0.9387*** **
	(0.009)	**(0.002)**
$SIZE_t$	0.8022*	-0.5422*
	(0.056)	(0.065)
BTM_t	0.1681	-0.8668*
	(0.665)	(0.072)
$LANACOV_t$	-0.1377	0.2187
	(0.685)	(0.361)
$DEDI_t$	-5.6754***	2.9082*
	(0.009)	(0.053)
ROA_t	-0.1129	0.2698
	(0.153)	(0.839)
$TRADEVOL_t$	0.3313**	0.1481
	(0.019)	(0.146)
$IDIOSYN_t$	61.5570***	-58.3732***
	(<0.001)	(<0.001)
$FIRMAGE_t$	-1.9860***	
	(<0.001)	
$CETR_t$		0.4506
		(0.748)
$NCSKEW_t$		-0.0255***
		(<0.001)
Year-fixed effects	included	included
Industry-fixed effects	included	included
Firm-fixed effects	included	included
No. of observations	3,046	1,496
Adjusted/Pseudo R-squared	0.3518	0.1750

Notes: This table reports the results of difference-in-differences tests for the impact of SFAS 161 on managerial opportunism after including firm-fixed effects in the regressions. The sample period covers the years of 2006-2011. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $TREAT_i$, equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $TREAT_i \times POST_t$, is the variable of interest, coefficient for which measures the effect of SFAS 161 on insider trading and stock price crash risk for strict-complier (*TREAT*=1) relative to non-user (*TREAT*=0) of derivatives. All the variables are defined in Appendix A. Firm dummies, industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 5 The Moderating Effect of Information Opacity

Variables	(1) Dependent Variable = $INSITRADE_t$		(2) Dependent Variable = $CRASH_{t+1}$	
Information Opacity (*OPACITY*)	**Low**	**High**	**Low**	**High**
Intercept	0.1357	2.2208	0.7028	-2.4649*
	(0.976)	(0.726)	(0.398)	(0.069)
$TREAT_i$	0.6903	0.9645*	-0.2754	0.3456
	(0.233)	(0.093)	(0.288)	(0.203)
$POST_t$	0.9358	3.4486***	-0.1881	0.7204**
	(0.268)	(<0.001)	(0.538)	(0.027)
$\boldsymbol{TREAT_i \times POST_t}$	**-0.4001**	**-1.2616***	**0.4760**	**-0.8579*****
	(0.554)	**(0.072)**	**(0.133)**	**(0.006)**
$SIZE_t$	0.7048***	0.5565***	-0.0438	0.0509
	(<0.001)	(0.006)	(0.612)	(0.455)
BTM_t	-0.6739**	0.0335	0.2718	-0.4128***
	(0.048)	(0.868)	(0.187)	(0.001)
$LANACOV_t$	-0.4380	1.2670***	0.0372	0.4424***
	(0.134)	(<0.001)	(0.785)	(<0.001)
$DEDI_t$	-1.5084	1.6557	-0.3455	0.3808
	(0.511)	(0.295)	(0.753)	(0.591)
ROA_t	-0.1060	-0.0766	-0.6679	-0.0719
	(0.251)	(0.551)	(0.681)	(0.801)
$TRADEVOL_t$	0.5261***	-0.4305***	0.0698	-0.0211
	(<0.001)	(0.003)	(0.221)	(0.710)
$IDIOSYN_t$	-24.4158**	10.1894	-20.9538***	2.5648
	(0.042)	(0.279)	(0.001)	(0.502)
$FIRMAGE_t$	-0.0550***	-0.0239**		
	(<0.001)	(0.028)		
$CETR_t$			-0.0044	0.0829
			(0.990)	(0.196)
$NCSKEW_t$			-0.0064	0.0017
			(0.293)	(0.739)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
No. of observations	1,364	1,374	1,268	1,324
Adjusted/Pseudo R-squared	0.1522	0.1761	0.1032	0.1382

Notes: This table reports the results for subsample test examining the moderating effect of information opacity. The sample period covers the years of 2006-2011. The moderator variable is information opacity that is measured as the three-year moving sum of the absolute value of annual discretionary accruals. A higher value of *OPACITY* indicates a larger extent of information opacity. Difference-in-differences test is run separately in the low-opacity subsample and high-opacity subsample, which is split based on the sample median of *OPACITY*. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $TREAT_i$, equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $TREAT_i \times POST_t$, is the variable of interest. All the variables are defined in Appendix A. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 6 The Moderating Effect of Financial Risk: Evidence from Leverage

Variables	(1) Dependent Variable = $INSITRADE_t$		(2) Dependent Variable = $CRASH_{t+1}$	
Leverage (*LEV*)	**Low**	**High**	**Low**	**High**
Intercept	0.0136	-8.6170	-0.0949	-0.5116
	(0.997)	(0.150)	(0.905)	(0.727)
$TREAT_i$	0.0200	1.7700***	-0.0832	0.8907***
	(0.965)	(0.001)	(0.730)	(0.001)
$POST_t$	0.9569	-0.6863	-0.0983	0.9327***
	(0.106)	(0.381)	(0.737)	(0.002)
$\boldsymbol{TREAT_i \times POST_t}$	**-0.2753**	**-1.2737***	**0.0987**	**-0.9708*****
	(0.637)	**(0.056)**	**(0.743)**	**(0.002)**
$SIZE_t$	0.8643***	0.8814***	-0.1264	-0.1828**
	(0.000)	(0.000)	(0.147)	(0.023)
BTM_t	0.1953	0.2385	0.0153	-0.1756
	(0.238)	(0.230)	(0.870)	(0.206)
$LANACOV_t$	0.3943*	-0.0147	0.1543	0.3634**
	(0.067)	(0.958)	(0.205)	(0.013)
$DEDI_t$	1.6717	-2.8771	0.1072	0.4557
	(0.326)	(0.138)	(0.900)	(0.595)
ROA_t	-0.3359	-0.1005	1.9055	-3.0814
	(0.857)	(0.180)	(0.122)	(0.102)
$TRADEVOL_t$	-0.0631	0.3970***	0.0874	-0.0068
	(0.521)	(0.001)	(0.101)	(0.909)
$IDIOSYN_t$	4.8100	1.3959	-12.2797**	-6.9521
	(0.643)	(0.888)	(0.025)	(0.190)
$FIRMAGE_t$	-0.0111	-0.0239***		
	(0.242)	(0.005)		
$CETR_t$			-0.7021*	-0.0613
			(0.075)	(0.553)
$NCSKEW_t$			0.0005	0.0083
			(0.921)	(0.135)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
No. of observations	1,818	1,444	1,210	1,675
Adjusted/Pseudo R-squared	0.1459	0.1769	0.0697	0.1228

Notes: This table reports the results for subsample test examining the moderating effect of financial risk. The sample period covers the years of 2006-2011. The moderator variable, financial leverage (*LEV*), as a proxy for a firm's financial risk, is measured as the sum of short-term and long-term debt, divided by the total assets of a firm for a fiscal year. Difference-in-differences test is run separately in the low-leverage subsample and high-leverage subsample, which is split based on the sample median of *LEV*. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $TREAT_i$, equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $TREAT_i \times POST_t$, is the variable of interest. All the variables are defined in Appendix A. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 7 The Moderating Effect of Business Risk: Evidence from Earnings Volatility

Variables	(1) Dependent Variable = $INSITRADE_t$		(2) Dependent Variable = $CRASH_{t+1}$	
Earnings Volatility (*STDEARN*)	**Low**	**High**	**Low**	**High**
Intercept	-8.6994	-9.6207**	-0.9790	-1.4144
	(0.155)	(0.025)	(0.354)	(0.354)
$TREAT_i$	-0.2858	3.3466***	0.2677	0.4248
	(0.564)	(<0.001)	(0.315)	(0.102)
$POST_t$	-0.5797	1.6397**	0.3467	0.6466**
	(0.427)	(0.014)	(0.288)	(0.017)
$TREAT_i \times POST_t$	**-0.7431**	**-1.8890*** **	**-0.4503**	**-0.6647** **
	(0.261)	**(0.002)**	**(0.163)**	**(0.023)**
$SIZE_t$	0.6713***	1.0401***	-0.1564	0.1844**
	(0.004)	(<0.001)	(0.182)	(0.011)
BTM_t	0.1010	0.0509	-0.4775*	-0.0724
	(0.680)	(0.813)	(0.077)	(0.577)
$LANACOV_t$	1.0447***	-0.2677	0.1684	-0.0159
	(<0.001)	(0.289)	(0.185)	(0.908)
$DEDI_t$	-0.2743	-2.8813**	-0.4459	-1.4740*
	(0.874)	(0.044)	(0.671)	(0.074)
ROA_t	-0.1107	-0.0877	-0.0944	-0.0215
	(0.231)	(0.469)	(0.831)	(0.837)
$TRADEVOL_t$	0.1289	0.2040*	0.1110*	-0.0056
	(0.312)	(0.065)	(0.062)	(0.924)
$IDIOSYN_t$	3.7144	8.2269	-5.4792	-9.0595
	(0.754)	(0.347)	(0.346)	(0.105)
$FIRMAGE_t$	0.0030	-0.0081		
	(0.837)	(0.318)		
$CETR_t$			0.0732	0.0121
			(0.883)	(0.887)
$NCSKEW_t$			-0.0045	-0.0126**
			(0.457)	(0.016)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
No. of observations	1,356	1,690	1,091	1,464
Adjusted/Pseudo R-squared	0.2090	0.1753	0.0720	0.1463

Notes: This table reports the results for subsample test examining the moderating effect of business risk. The sample period covers the years of 2006-2011. The moderator variable is earnings volatility (*STDEARN*), measured as the standard deviation of income before extraordinary items in the current and previous four fiscal years. Difference-in-differences test is run separately in the low-earnings-volatility subsample and high- earnings-volatility subsample, which is split based on the sample median of *STDEARN*. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $TREAT_i$, equals to 1 if a firm provides tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $TREAT_i \times POST_t$, is the variable of interest. All the variables are defined in Appendix A. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 8 The Impact of SFAS 161 on Non-Complied Derivatives Users

Variables	Dependent Variable=	
	(1) $INSITRADE_t$	**(2) $CRASH_{t+1}$**
Intercept	-3.1334	0.2308
	(0.328)	(0.663)
$NONCOMPLIER_i$	-0.7588**	-0.0928
	(0.039)	(0.575)
$POST_t$	0.2242	0.0370
	(0.664)	(0.869)
$\boldsymbol{NONCOMPLIER_i \times POST_t}$	**0.1570**	**-0.0046**
	(0.750)	**(0.984)**
$SIZE_t$	0.6767***	-0.1290*
	(0.000)	(0.052)
BTM_t	0.4892***	-0.3548**
	(0.002)	(0.013)
$LANACOV_t$	0.2171	0.2383***
	(0.220)	(0.005)
$DEDI_t$	4.6093***	0.8301
	(0.003)	(0.193)
ROA_t	1.0010	1.2119**
	(0.331)	(0.021)
$TRADEVOL_t$	0.2312***	0.0298
	(0.005)	(0.488)
$IDIOSYN_t$	16.5439**	-6.2220*
	(0.011)	(0.083)
$FIRMAGE_t$	0.0018	
	(0.833)	
$CETR_t$		0.5287
		(0.406)
$NCSKEW_t$		-0.0048
		(0.285)
Year-fixed effects	included	included
Industry-fixed effects	included	included
No. of observations	2,296	2,085
Adjusted/Pseudo R-squared	0.1139	0.0736

Notes: This table reports the results of placebo tests for the impact of SFAS 161 on managerial opportunism. The sample period covers the years of 2006-2011. The dependent variable is insider trading ($INSITRADE_t$) in Column (1) and stock price crash risk ($CRASH_{t+1}$) in Column (2). The group indicator variable, $NONCOMPLIER_i$, equals to 1 if a firm uses derivatives but does not provide tabular disclosures of designated and non-designated hedges, complying with SFAS 161, and 0 if a firm reports no derivatives. The time indicator variable, $POST_t$, equals 1 (0) if a firm is in the post-SFAS 161 (pre-SFAS 161) period (2009-2011 (2006-2008)). The interaction term, $NONCOMPLIER_i \times POST_t$, is the variable of interest, coefficient for which measures the effect of SFAS 161 on insider trading and stock price crash risk for non-complier-user relative to non-user of derivatives. All the variables are defined in Appendix A. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. The *p*-values in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.