Impact of Corporate Diversification and Segment Reporting on Stock Price Crash Risk

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ABSTRACT

We show that diversified firms, compared to focused firms, display lower future stock price crash risk. We also investigate the impact of SFAS No. 131, the accounting standard on disclosure about segment financial data. Using difference-in-differences design, we provide evidence that focused firms, which changed their reporting by disclosing multiple segments post-SFAS No. 131, experienced a significant immediate (within two years) decline in future stock price crash risk. Our results further show that diversified firms, which disclosed more segments and new information post-SFAS No. 131, on average, did not experience a significant immediate (within two years) change in future stock price crash risk. However, diversified firms that changed their disclosures by a higher level or an increase in information disaggregation post-SFAS No. 131 revealed stockpiled bad news immediately upon adopting SFAS No. 131 and experienced an increase in crash risk within two years post-SFAS No. 131. The results collectively show that while the difference in crash risk between diversified and focused firms is significantly reduced due to SFAS No. 131, marginal difference in crash risk remains. Our findings collectively support the information transparency effect of corporate diversification on information asymmetry and that SFAS No. 131 significantly increased information transparency, thereby reduced bad news hoarding as implied in future stock price crash risk.

Keywords: corporate diversification, stock price crash risk, information asymmetry; SFAS No. 131.

JEL Classifications: D82, G10, G34, M41.

Data Availability: Data is available from public sources cited in the text.

I. INTRODUCTION

Considerable debate exists about corporate diversification and information transparency (Thomas 2002). A diversified firm is a business that invests capital in more than one related or unrelated business segments. Several arguments suggest that diversified firms may suffer from reduced transparency, and hence they are subject to greater levels of information asymmetry and agency problems compared to focused firms (Clarke et al. 2004). Greater levels of information asymmetry increase monitoring costs, moral hazard issues (e.g., Lee and Kwok 1988; Geringer et al. 1989; Mitchell et al. 1992; Denis et al. 2002; Doukas and Pantzalis 2003; Bushman et al. 2004; Black et al. 2014), and internal capital market inefficiencies (Cho 2015). Hence, we investigate the research question whether firm structure impacts future stock price crash risk (hereinafter crash risk). Crash risk is defined as the frequency of extreme negative stock returns.

The issue of information asymmetry is of importance to analysts and investors for stock pricing and valuation. Crash risk is an important measure for information asymmetry issues because it is an outcome of sudden release of bad news hoarding (Jin and Myers 2006). We explore the predications of two competing theories that explain the provision of financial information within diversified firms, viz. the information transparency hypothesis where diversified firms have greater opportunities to hoard information, and the diversification hypothesis where diversified firms are able to diversify information resulting in no real final impact on information asymmetry.

We investigate these hypotheses on crash risk for non-financial firms using ordinary least squares (OLS) regressions. We exclude financial firms as mechanisms of financial reporting requirements may have different impact on crash risk. Our analyses are based on a matched sample of diversified and focused firms that have similar firm characteristics. We specifically use the algorithm described in Clarke et al. (2004) to match diversified with focused firms.

Our primary results indicate that, on average, diversified firms are associated with lower crash risk. We obtain this result using four measures of corporate diversification and two measures of crash risk. Our results suggest that diversified firms, on average, engage in lower bad news hoarding than focused firms.

We also examine the impact of SFAS No. 131 using difference-in-differences (DID) method. SFAS No. 131 is a mandatory accounting standard issued in June 1997 in the US to improve segment financial reporting of diversified firms (FASB 1997). It effectively reduces firms' opportunities to aggregate segment data (Berger and Hann 2003). Thus, firms have reduced ability to overlap good news from one segment against bad news from another segment. SFAS No, 131, therefore, increased information transparency but decreased information diversification for diversified firms. For the DID analyses, we focus on the impact of SFAS No. 131 for focused firms and diversified firms that change their reporting of segments after adopting SFAS No. 131. The DID analyses utilize data for two years surrounding the adoption of SFAS No. 131 to minimize the impact of confounding events.

Our DID results indicate that focused firms, which changed their disclosures by reporting multiple business segments post-SFAS No. 131, experienced a significant decrease in crash risk within two years of adoption of SFAS No. 131. On the other hand, diversified firms, which changed their disclosures by reporting more segments and new information post-SFAS No. 131, on average, did not experience a significant change in crash risk within two years of adoption of SFAS No. 131. Using continuous measures of change firms, we further find that SFAS No. 131 caused a significant increase in crash risk of diversified firms that changed their segment disclosures by reporting a larger increase in disaggregated new information post-SFAS No. 131. This result is consistent with Berger and Hann (2003, 2007) and suggests that SFAS No. 131

caused firms, which largely aggregated their segment information under SFAS No. 14, to suddenly disclose hidden information (mostly bad news) that resulted in an immediate increase in crash risk post-SFAS No. 131.

Consistent with recent research (Kausar et al. 2016; Lamoreaux 2016), we empirically show that the parallel trends assumption for our DID estimation is satisfied. We specifically show that the decrease in crash risk of focused firms that changed their reporting post-SFAS No. 131 is absent the year before the adoption of SFAS No. 131 and take effect in the adoption year of SFAS No. 131. In addition, we extract the sample years prior to SFAS No. 131 from our test sample and partition this subsample into two groups. We create a dichotomous variable coded one for the years approaching SFAS No. 131, and zero otherwise. Using this approach, we find no difference in crash risk during pre-SFAS No. 131 period between focused change and focused no change firms. We also find no difference in crash risk during pre-SFAS No. 131 period between diversified firms that changed disclosures by reporting more segments and diversified firms that did not change the number of reported segments. Thus, our analyses that include firm and year fixed effects and are based on matched samples further validate our inferences and mitigate some endogeneity concerns.

In additional analyses, we show that diversified firms are associated with significantly lower crash risk compared to focused firms before the adoption of SFAS No. 131. These results complement the results of Thomas (2002) and Clarke et al. (2004), who find similar results during pre-SFAS No. 131 period using analysts' earnings forecast errors and bid-ask spreads as proxies of information asymmetry. We further examine the pre-SFAS No. 131 sample by classifying firms based on SFAS No. 131. For this alternative classification, we find no difference in crash risk between diversified and focused firms. These results complement our main results and suggest that

SFAS No. 131 significantly reduced the difference in crash risk between diversified and focused firms.

Our study makes several contributions. First, we investigate the impact of firm structure on crash risk. To the best of our knowledge, we are the first to investigate this research question. Given the limited and conflicting empirical evidence on corporate diversification (Thomas 2002; Clarke et al. 2004; Berger and Hann 2003; Cho 2015) from an information transparency perspective, we add further evidence by examining the impact of SFAS No. 131 on crash risk. Earlier studies show that diversified firms do not exhibit higher levels of information asymmetry compared to focused firms (Thomas 2002; Clarke et al. 2004). However, Berger and Hann (2003, 2007) show some evidence that diversified firms are more likely to hoard bad news as opposed to good news. Cho (2015) show that diversified firms that suffered severe agency problems experienced capital market inefficiencies before adopting SFAS No. 131. We consider the issue of information transparency in diversified firms from a crash risk perspective. Crash risk captures negative return skewness (the third moment of stock returns) (Chen et al. 2001), which is distinct from other measures used to capture information asymmetry. In particular, crash risk homes in on bad news hoarding and is a very important component of information asymmetry.[1] We explore these findings more formally by investigating the association between firm structure and crash risk.

Second. most studies predominately consider analysts' earnings forecast errors and bid-ask spreads as measures of information asymmetry (Thomas 2002; Clarke et al. 2004; Berger and Hann 2003; Behn et al. 2002; Botosan and Stanford 2005). While earnings forecast errors and bid-

[1] For instance, Kothari et al. (2009) show that managers withhold bad news up to a threshold but release good news promptly. This suggests that information asymmetry mostly originates from bad news hoarding (Liu and Elayan 2015).

ask spreads are good measures of information asymmetry, they include a wide variety of information in the prediction of earnings and prices, including good and bad news. Earnings forecast errors can also contain noise related to forecasting techniques and therefore may not be purely due to information asymmetry. Analysts also have incentives to meet or beat actual earnings for reward of commission from firms (Ciconte et al. 2014) and therefore using the average/median forecast errors of a group of analysts may not be an appropriate representation of earnings forecast errors. Bid-ask spread as an empirical proxy also includes a wide variety of news aggregated in the final bid or ask price and therefore has limitations (Callahan et al. 1997). In addition to this, Richardson et al. (2004) find that that the walk-down to beatable targets is most pronounced when firms or insiders are net sellers of stock after an earnings announcement, indicating that earnings forecast are a function of analyst's self-interest. Given that earnings forecast errors and bid-ask spreads have many confounding issues, it is difficult to disentangle whether the information asymmetry or information diversification hypothesis dominates. On the other hand, crash risk is a final measure of information asymmetry, that is, it captures the impact of bad news hoarding on share prices (Kothari et al. 2009). Since bad news hoarding is more likely to cause information asymmetry issues, we are more directly testing this hypothesis.

As part of additional analysis, we add further evidence to the financial transparency and firm structure literature. Several studies investigate the issue of information asymmetry within diversified firms (Thomas 2002; Berger and Hann 2003; Clarke et al. 2004). Unlike Thomas (2002) and Clarke et al. (2004), we also consider the impact of SFAS No. 131. Thomas (2002) and Clarke et al. (2004) show that diversified firms display a somewhat lower information asymmetry compared to focused firms. They, however, examine data before the adoption of SFAS No. 131. Berger and Hann (2003) consider the impact of the adoption of SFAS No. 131 on earnings forecast errors. Our analysis primarily differs from the above by investigating the impact of SFAS No. 131 on crash risk, which is an outcome of bad news hoarding, and which no study has so far investigated.

The remainder of the paper is organized as follows. Next, we discuss prior literature and provide our hypotheses. In Section III, we discuss our research design and sample for hypothesis one, and in Section IV, we provide the results. Section V provides the sample description, research design and results for hypothesis two. We discuss our results from additional analyses in Section VI and conclude our paper in Section VII.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Diversified Firms and Crash Risk

It is often argued that management of diversified firms have a greater ability to hoard bad news. Based on the rationale that diversified firms face heightened asymmetric information (Thomas 2002) and agency problems, the information transparency argument conjectures that managers of diversified firms have greater opportunities to engage in bad news hoarding, as well as greater opportunities to engage in self-serving activities (e.g., empire building or excess perk consumption) that incentivize bad news hoarding.

Managers can also possibly utilize the less transparent information environment of diversified firms to hoard bad news. The transparency hypothesis suggests that the requirements for disclosures for diversified firms are limited (Clarke et al. 2004). Also, managers can exercise discretion in allocating assets, costs, and revenues across business segments (Clarke et al. 2004). Inside managers can observe the divisional cash flows but outside investors can only observe a noisy estimate of the divisional cash flows (Thomas 2002). This increases the opacity of financial reporting.

In addition, the complex nature of diversified firms may affect the effectiveness of financial analysts in processing information as they specialize in an industry, but conglomerates operate in multiple industries (Thomas 2002). The lack of transparency within diversified firms can increase the cost of monitoring managers. Due to opaque financial reports and high external monitoring cost, the feasibility for managers to hoard bad news and stockpile the bad news through opaque financial reports is higher for diversified firms than that for focused firms. While managers of focused firms also have similar incentives to hoard bad news and research indicates that they do so, the transparency hypothesis argues that managers of diversified firms have greater opportunity to hoard bad news due to the agency and monitoring problems. The very nature of diversified structure allows diversified firms to hide bad news within business segments.

Bad news hoarding leads to sudden stock price crash when the accumulated bad news is eventually made known to the market in the absence of a corresponding large public news (Hong and Stein 2003). The question whether diversified firms experience higher or lower levels of stock price crash is therefore important. The extant literature provides evidence on various reasons that motivate managers to delay the disclosure of firm-specific price-sensitive information. For example, Kothari et al. (2009) argue that managers are motivated by their personal interest such as career concerns, compensation plans, and litigation risks to conceal and delay bad news but prefer to disclose good news to investors, and find that stock market reactions to bad news are more pronounced compared to its response to good news.

Recent studies use the agency theory framework to explain the sources of a stock price crash. Jin and Myers (2006) argue that opaqueness increases information gap between inside managers and outside investors. It leads to imperfect firm-specific information to outside investors and shifts the firm-specific risks to inside managers, resulting in higher R^2 and stock price variations. They also suggest that opaqueness allows inside managers to hide bad news from investors. Hutton et al. (2009) provide empirical support for Jin and Myers (2006) by suggesting that managers withhold negative information through accrual management, which increases the information gap between managers and outside investors. Kim and Zhang (2014) add to this literature by showing that financial reporting opacity increases expected crash risk.

While majority of the prior studies link their construct with bad news hoarding to explain its effect on crash risk, none attempt to link firm structure as an important factor. Kothari et al. (2009) and Graham et al. (2005) discuss numerous factors that can incentivize managers to delay the release of negative news. In the theory of Jin and Myers (2006), managers withhold and accumulate bad news for extended periods until the cost or difficulty of concealing their negative private information becomes too high, at which point the accumulated bad news tend to come out all at once or very quickly. This causes a crash in the stock price that can be empirically identified as an extreme left-tail outlier in the distribution of weekly or daily firm-specific (idiosyncratic) returns. In general, the literature on crash risk finds a positive (negative) relation to factors that exacerbate (attenuate) information asymmetry and agency conflicts between managers and investors (Hutton et al. 2009; Kim et al. 2011b, 2011a; An and Zhang 2013; Callen and Fang 2013, 2015; Kim and Zhang 2014; Xu et al. 2014).

In summary, the information transparency hypothesis indicates that due to a conducive firm structure creating an environment for lack of information transparency and incentives for hoarding bad news, managers of diversified firms, compared to managers of focused firms, are more likely to hoard and stockpile bad news.

On the contrary, Thomas (2002) explains the information diversification hypothesis in the context of corporate diversification and information asymmetry. The study argues that diversified firms disclose aggregated earnings in consolidated reports. If the errors investors make in forecasting industry segment cash flows are not perfectly positively correlated across segments, then the absolute value of the percentage error in a firm's cash flow forecast may be smaller for a diversified firm than that for a focused firm (Thomas 2002). Thomas (2002) further adds that even if investors make more errors in forecasting segment cash flows than forecasting focused firm cash flows, the consolidated forecast for a diversified firm may be more accurate than a forecast for a focused firm if the segment cash flow forecast errors are imperfectly correlated across segments. As a result, the information gap observed in stock prices between outside investors and inside managers of a diversified firm is reduced.

The information diversification hypothesis argues that diversified firms, compared to focused firms, have lower crash risk. A diversified firm reports aggregated fundamental financial statement information in its consolidated financial reports. It also combines financial information from its multiple operations (i.e., sub-segments, which could be defined as individual segments if managers have less discretion to define segment) into a few business segments, depending on how it defines segment.[2] Hence, the information reported for each segment is also in an aggregate form.

Due to information aggregation, the reported information of a conglomerate is diversified at the segment level and also at the firm level. For example, if information relating to multiple operations (segments) of a reporting segment (conglomerate) are not perfectly positively correlated across the sub-segments (segments), the effect of the reported aggregate information would be

[2] In our next sub-section, we discuss the difference in the definition of segments as per SFAS No. 14 and SFAS No. 131. The change in the definition of segments has some implications for our hypothesis.

diluted. In other words, for conglomerates, good news and bad news are combined and the effect of each is diluted in the consolidated financial reports and the segment reports.

Even if managers hoard bad news, the effect of the bad news hoarding of a conglomerate is likely to be lower than the effect of a similar bad news hoarding of a focused firm. Due to managers' bad news hoarding, investors may make errors in forecasting a firm's future cash flows, if they are unable to obtain all relevant information in making their investment decision. Consequently, the information gap between outside investors and inside managers is likely to be lower for conglomerates than that for focused firms. Hence, investors are likely to more accurately price the shares of a conglomerate than that of a focused firm.[3] In sum, due to the information diversification effect, investors are less likely to overvalue the shares of a diversified firm.[4] Therefore, future stock price crash is likely to be lower for diversified firms compared to focused firms. This hypothesis is referred to as the diversification hypothesis.

The two foregoing hypotheses provide competing outcomes for diversified firms in terms of financial information provision. While the information transparency hypothesis predicts that diversified firms are more likely to engage in bad news hoarding, the information diversification hypothesis predicts otherwise. There are limited studies that explore these two competing hypotheses. Thomas (2002) empirically examines the relationship between corporate diversification and information asymmetry proxies derived from analysts' forecast and abnormal returns associated with increased asymmetric information and find no evidence that diversified

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[3] Prior studies identify information asymmetry as a cause of equity mispricing (Hayek 1945; Healy and Palepu 2001; Hurwicz 1973; Merton 1987), and Thomas (2002) and Clarke et al. (2004) provide some evidence that greater corporate diversification is, on average, not associated with increased information asymmetry.

[4] Prior studies provide evidence that shares of diversified firms, compared to that of focused firms, are traded at a discount – the diversification discount (e.g., Rajan et al. 2000; Campa and Kedia 2002; Mitton and Vorkink 2010; Custódio 2014).

firms exhibit greater levels of asymmetric information. Clarke et al. (2004) further report that diversified firms display somewhat less asymmetric information compared to focused firms. Given the divergent theoretical arguments and limited empirical evidence showing support that diversified firms display somewhat reduced information transparency compared to focused firms, we test the following non-directional hypothesis in its null form:

H1: There is no association between firm structure and crash risk.

Segment Reporting Standards and Diversified Firms

Regulators and investors have long argued that financial disclosure of diversified firms needs greater level of segment reporting. The first financial reporting standard on segment data was issued in December 1976 as SFAS No. 14 and further revised in June 1997 as SFAS No. 131. The objectives of segment reporting standards are to provide stakeholders with segment financial information for better decision making. Much of the criticisms of SFAS No. 14 stems from the poor definition of "industry" which provides for a very flexible application of the standard (Berger and Hann 2003). The motivation for SFAS No. 131 stems from the concerns of financial statement users (Behn et al. 2002). Some evidence indicate that consolidating segment data does not allow users to make informed decisions (Epstein and Palepu 1999). The requirements under SFAS No. 14 were too general thus allowing diversified firms to provide limited segment data. SFAS No. 131 is an attempt to overcome the issues of SFAS No. 14.

For the purpose of general-purpose financial reporting, SFAS No. 131 defines segments based on the way managers organize the segments within their enterprise for assessing performance and making operating decisions (i.e., the management approach) (FASB 1997). The FASB believes that the information provided under the new standard is less subjective because the management approach provides less discretion in defining segments (FASB 1997). Financial analysts had previously criticized that SFAS No. 14 provides inadequate information and they had consistently requested for more disaggregated financial statement data (FASB 1997). The FASB (1997) believes that the SFAS No. 131 induces more segmentation.

SFAS No. 131 provides new guidelines for segment financial reporting based on the "management approach". The FASB argued that this approach allows segment reporting in line with the structure of a firm's internal organization. This approach provides more useful information to stakeholders in assessing a firm's performance and making a better estimate of firm's future cash flows.

However, opponents of segment financial reporting argue that provision of segment financial information creates more confusion and complicates the analysis of firm performance. Several critics indicate that maintaining consistency in segment financial reporting would be difficult, especially when companies reorganize or restructure and where subjective rules are open to interpretation (Springsteel 1998; Reason 2001). Central to SFAS No. 131 is the reporting lines of business segments to chief operation officer as a basis for identifying segments to be reported. There is a possibility that firms would restructure reporting lines, which they dislike, to get around the rules of SFAS No. 131 (Springsteel 1998).

Several studies investigate the impact of SFAS No. 131 on financial transparency. Most studies consider the degree to which firms adopt SFAS No. 131, moderator variables that may explain the impact of SFAS No. 131 and/or whether SFAS No. 131 improves analysts' judgements and decisions. Research finds that the number of reported segments increased after the adoption of SFAS No. 131 (Berger and Hann 2003; Street 2000; Herrmann and Thomas 2000). Studies that consider the impact of SFAS No. 131 on analysts' judgement investigate the accuracy of analysts' forecasts. Venkataraman (2001) reports that average individual analysts' forecast accuracy improves most for firms that adopt SFAS No. 131, but after controlling for change in precision of private information, they find only a weak association. Berger and Hann (2003) investigate data in the year of adoption of SFAS No. 131 and restate the prior year's segment data as if SFAS No. 131 had been in effect. They report that, generally SFAS No. 131 caused an increase in the number of segment reporting. They also report that pre SFAS No. 131, analysts appear to incorporate private access to the types of segment information under SFAS No. 131 and that analysts show improved forecasts, thus suggesting that not all information revealed under SFAS No. 131 were publicly available.

Most interestingly, Berger and Hann (2003) find that a measure of the stock market's discounting of the values of diversified firms increased under SFAS No. 131, thus suggesting that SFAS No. 131 provides the market with some additional information about agency problems associated with diversification. Ettredge et al. (2005) provide price-based evidence that SFAS No. 131 caused disclosure of more information to the market. Ettredge et al. (2006) report that post-SFAS No. 131, firms that have greater ability and competitive incentives to conceal segment data show less variable segment profits compared to firms that heavily rely on external funding. Berger and Hann (2007), exploring the propriety costs and agency costs motives of managers, find support for the agency costs motives. That is, where agency costs dominate, managers tend to withhold the segments with relatively low abnormal profits. They find mixed results for propriety costs motives. Cho (2015) finds that SFAS No. 131 enhances the quality of capital allocations across segments and that these improvements were greater for firms that experienced greater levels of agency problems. These improvements were most pronounced where managers had greater incentives to improve efficiency. More recently Edmonds et al. (2018) empirically show that comparability has deteriorated for firms adopting SFAS No. 131. However, this reduction is marginally constrained for firms which reformulate their segment data based on how they manage their business. They also note that greater segment information disaggregation diminishes overall comparability.

Given the theoretical arguments and empirical evidence, we test the following null hypothesis.

H2: SFAS No. 131 is not associated with crash risk.

III. RESEARCH DESIGN AND SAMPLE FOR HYPOTHESIS ONE

Measuring Firm-specific Crash Risk

Consistent with recent studies (e.g., Khurana et al. 2018), we employ two measures of firm-specific crash risk (*CRASHRISK*), namely (1) down-to-up volatility (*DUVOL*) and (2) negative coefficient of skewness (*NCSKEW*) developed by Chen et al. (2001). To construct each firm-specific measure of crash risk, we follow Kim et al. (2011a) and Kim and Zhang (2016), and compute the firm-specific weekly return, which is defined as the natural logarithm of one plus the residual return from the following expanded market model. The residual return is obtained from estimating the following regression model for each firm and year.

$$r_{j\tau} = \alpha_j + \beta_{1j} r_{m(\tau-2)} + \beta_{2j} r_{m(\tau-1)} + \beta_{3j} r_{m\tau} + \beta_{4j} r_{m(\tau+1)} + \beta_{5j} r_{m(\tau+2)} + \varepsilon_{j\tau} \quad (1)$$

Where $r_{j\tau}$ is the return for stock *j* in week τ, and $r_{m\tau}$ is the return on the Centre for Research in Security Prices (CRSP) value weighted market index in week τ. We include one and two-year lead and lag market index return to allow for nonsynchronous trading (Dimson 1979; Schloles and Williams 1977).

Next, using the firm-specific weekly return (*W*), we estimate each measure of the crash risk. Our first measure of crash risk, *DUVOL*, is computed using the following equation.

$$DUVOL_{jt} = log\left\{\left((n_u - 1)\sum_{DOWN} W_{j\tau}^2\right) / \left((n_d - 1)\sum_{UP} W_{j\tau}^2\right)\right\} \quad (2)$$

For a stock *j* over each fiscal year *t*, the average firm-specific weekly return is calculated, and all the firm-specific weekly returns are categorized into two groups. Specifically, if the firm-specific weekly returns are below the annual mean then it is grouped within the *DOWN* category and if they are above the annual mean then it is grouped within the *UP* category. In the equation (2) above, n_u and n_d represent the number of *UP* and *DOWN* weeks, respectively. Following prior studies (Chen et al. 2001; Kim et al. 2011b, 2011a), *DUVOL* is computed for each firm and year as the natural logarithm of the ratio of the *DOWN* category's standard deviation to the *UP* category's standard deviation. Since *DUVOL* is computed without involving the third moment, it is less likely to be excessively affected by a small number of extreme returns. A higher value of *DUVOL* corresponds to higher crash risk.

Our second measure of crash risk, *NCSKEW*, is calculated as the negative of the third moment of the firm-specific weekly returns divided by the standard deviation of the firm-specific weekly returns raised to the third power. Like *DUVOL*, a higher value for *NCSKEW* represent higher crash risk. Following Chen et al. (2001), Kim et al. (2011a) and Kim et al. (2011b) we compute *NCSKEW* for each firm in each fiscal year using the following equation.

$$NCSKEW_{jt} = -\left(n(n-1)^{\frac{3}{2}} \sum W_{j\tau}^3\right) / \left((n-1)(n-2)(\sum W_{j\tau}^2)^{\frac{3}{2}}\right) \quad (3)$$

Measuring Firm Structure

Our main variable to test hypothesis one is firm structure. Our measures of firm structure include *FS*, *HERF*, *ENTROPY*, and *NBSEG*. *FS* is a dichotomous variable that is coded one if the firm reports two or more business segments in different four-digit SIC codes, and zero otherwise. The definition of *FS* is consistent with Kuppuswamy and Villalonga (2016). *HERF* is the sum of squares of each reported segment's assets as a proportion of the firm's total assets (Thomas 2002), multiplied by negative one. We multiply by negative one so that the lowest value of *HERF* represents focused firms. *ENTROPY* is computed as $\sum_{i=1}^{n} P_i ln(\frac{1}{P_i})$ (Jacquemin and Berry 1979; Custódio 2014). P_i is the percentage of firm sales employed in industry segment *i* and the summation is over the *n* industry segments in which the firm operates. *NBSEG* is the natural logarithm of the number of business segments (Custódio 2014).

Control Variables

Following recent studies on crash risk (Callen and Fang 2015; Chen et al. 2001; Kim et al. 2011a; Kim and Zhang 2016; Kim et al. 2016), we control for other determinants of crash risk. We first control for one-year lag crash risk. That is, for the OLS regression of *DUVOL* and *NCSKEW*, we control for one-year lag *DUVOL* and *NCSKEW*, respectively, to account for serial correlation of our dependent variable in each test. Since Chen et al. (2001) show that the intensity of opinion differences predicts future crash risk, we control for change in trading volume (*DTURN*). *DTURN* is calculated as the average monthly share turnover over the current fiscal year minus the average monthly share turnover over the previous fiscal year, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month. Chen et al. (2001) also show that past returns have predictive power for future crash risk as explained by a bubble build up before a large drop in price to its fundamentals. Hence, we also control for past returns (*RET*), which is the mean of the firm-specific weekly returns over the fiscal year multiplied by 100. For similar reasons and consistent with prior studies, we control for market-to-book ratio (*MB*) and firm size (*SIZE*).

Additionally, since more volatile stocks increase crash likelihood, we next control for stock return volatility (*SIGMA*). *SIGMA* is the standard deviation of the firm-specific weekly returns over the fiscal year. We also control for financial leverage (*LEV*) and return on assets (*ROA*). *LEV* is long term debts scaled by total assets. *ROA* is income before extraordinary items divided by total assets at the beginning of the year. We further control for information opaqueness (*AbsDA*) because Hutton et al. (2009) show that opaque firms are more prone to crash risk. We measure *AbsDA* as the absolute value of discretionary accruals computed using the modified Jones (1991) model of Dechow et al. (1995). Finally, to reduce the influence of outliers on our results, we winsorize all continuous variables at the 1st and 99th percentiles. The definitions and measurements of the dependent, test, and control variables are also provided in Appendix 1.

<<<INSERT APPENDIX 1 ABOUT HERE>>>

Research Methodology and Models

For our research design, we consider potential endogeneity issues. Prior studies suggest that firms self-select to diversify by operating in multiple business segments. It is possible that some factors that are correlated with the decision to diversify into multiple business segments may affect crash risk. Hence, we use matched samples for our empirical tests. We follow the matching algorithm in Clarke et al. (2004) and match each diversified firm with a focused firm based on the stock price, market value, risk and trading volume.

We implement our matching procedure in three steps. First, for each fiscal year, we identify all focused firms which trade on the same stock exchange as diversified firm (conglomerate). Second, from these firms, for each conglomerate-year, we retain those focused firms having a market value of equity (stock price) [standard deviation of daily returns] between 0.5 and 1.5 times the market value of equity (stock price) [standard deviation of daily returns] of the conglomerate. Third, from the remaining focused firms, we choose as a match the firm that is closest in trading volume to the conglomerate (Clarke et al. 2004). We use this matched sample to examine the relation between firm structure and crash risk by employing the following regression model.

$$CRASHRISK = \beta_0 + \beta_1 TV + \beta_n CONTROLS + \varepsilon \quad (4)$$

In model (4), *CRASHRISK* is either *DUVOL* or *NCSKEW*, and *TV* is either *FS*, *HERF*, *ENTROPY* or *NBSEG*. *CONTROLS* include all the control variables described above. We also control for year and industry fixed effects. We estimate model (4) using a two-way clustering at the firm and year level, and report *t*-statistics that are corrected for heteroscedasticity.

Sample Selection Procedure

We obtain our initial sample from the universe of the United States (US) listed firms covered in Compustat and CRSP databases between the fiscal years 1988 to 2018. We initially obtain daily returns for all stocks drawn from the CRSP database. Firms' daily returns are converted into weekly returns[5] and merged with Compustat database for annual financial data. Following Jin and Myers (2006), we adopt the Wednesday-to-Wednesday approach in calculating the weekly returns of each firm, and consistent with prior literature, the data is cleaned up by excluding firms with a year-end closing price of less than $1; firms with fewer than 26 weeks of stock-return data for a full fiscal year; and missing firm-years' research variables. All firms' weekly returns data is winsorized at 1 and 99 percentiles before computing the firm-specific crash risk.

[5] In the extant crash risk literature, both daily returns (Callen and Fang 2013; Chen et al. 2001) and weekly returns (Jin and Myers 2006; An and Zhang 2013; Hutton et al. 2009; Kim et al. 2011b, 2011a) have been used to calculate the measures of firm-specific crash risk. Researchers normally use weekly returns to avoid substantial bias associated with non-synchronous trading and other microstructure effects at the daily level.

The above procedure results in our crash risk data for 180,955 firm-years with non-missing values for each crash risk measure in a future year (t + 1) and current year (t) after excluding firm-years in the financial (SIC codes between 6000 and 6999) and utility (SIC codes between 4900 and 4999) industries. Next, we exclude 72,387 firm-years due to missing data on segment reporting and 10,752 firm-years due to missing data for the control variables.[6] We also exclude 3,139 firm-years due to missing data on variables used in our matching procedure. This selection procedure results in a sample of 94,677 firm-years or 11,465 unique firms.

We apply our matching procedure described above to match 25,908 observations of diversified firms with focused firms from 68,769 observations. We match each diversified firm with a focused firm which trade on the same stock exchange in the same fiscal year, and has similar stock price, market value, risk and trading volume. The matching process results in a final matched sample of 21,800 firm-years or 10,900 diversified firm-years and 10,900 focused firm-years. We report the sample selection procedures in panel A of Table 1.

<<<INSERT TABLE 1 ABOUT HERE>>>

Panel B and C of Table 1 present statistics of the average values on the variables used for matching diversified with focused firms for our sample prior to and after applying the matching procedure. The statistics in Panel B show that diversified firms are, on average, significantly larger, have higher stock price and trading volume, and have lower risk than focused firms. The difference between the average values on these variables are much lower for the matched sample as shown

[6] The observations for diversified firms in our sample is obtained after applying the sample correction techniques employed in Cho (2015). We use business segment data (Compustat code is "BUSSEG") to identify diversified firms. We did not count segments with names starting with "unallocated", "elimination", "intra-group", "reconciliation", "reconciling", "not classified" as a separate segment because they represent adjustments of segment items and are not actual business segments. We also did not count as a separate segment if the segment names start with "corporate", "general corporate", "corp", "other", "all other", and if the segments' SIC codes are missing or any capital expenditure, sale or asset has a negative value.

in Panel C. While the difference for firm size, stock price and trading volume is still significant after applying the matching procedure, the difference is reduced by at least 60 percent. In addition, for the matched sample, the average standard deviation of stock return is not significantly different between diversified and focused firms. The statistics collectively suggest that diversified and focused firms which remain in our matched sample have more similar firm characteristics than those in the unmatched sample. Also, our matching procedure has resulted in a moderately better match compared to Clarke et al. (2004), who report significant differences on the average values of all four variables (see Table 4 on page 118).

IV. RESULTS FOR HYPOTHESIS ONE

Descriptive Statistics

Table 2 reports the descriptive statistics on crash risk, firm structure, and control variables. Table 2 also provides a comparison of the average values of all key variables between diversified and focused firms. The mean (median) value of future *DUVOL* and *NCSKEW* is -0.0099 (-0.0129) and 0.0698 (0.0563), respectively. *DUVOL* (*NCSKEW*) ranges from -0.2209 (-0.2879) in quartile one to 0.1949 (0.4106) in quartile three. The statistics suggest that both crash risk measures have an approximately normal distribution. The difference of average *DUVOL* and *NCSKEW* between diversified and focused firms suggests that diversified firms have, on average, lower crash risk. In addition, the mean (median) value of *FS* is 0.50. This is because our sample consists of each diversified firm-year matched with a focused firm-year that has similar firm characteristics. The average values on the continuous measure of firm structure are -0.7282, 0.3019 and 0.6146 for *HERF*, *ENTROPY* and *NBSEG*, respectively.

<<<INSERT TABLE 2 ABOUT HERE>>>

In terms of the control variables, the mean (median) value of *DTURN* is -0.0032 (-0.0005), which suggests a mild decline in average monthly share turnover. This statistic is consistent with that reported in Bao et al. (2018). The average *MB* ratio of 2.69, which is consistent with that reported in Cho (2015), suggests that our sample firms trade at a value more than twice its book value. The mean (median) value of *SIZE* is 6.4245 (6.5235). Our sample firms have marginally higher market to book ratio and are larger than the sample firms in Kim and Zhang (2016) (2.213; 5.544), and have lower market to book ratio and are smaller than the sample firms in Kim et al. (2011a) (3.121; 7.032) and Kim et al. (2016) (3.822; 7.251). The mean *RET* and *SIGMA* suggests that our sample firms on average experience decline in stock return by 0.1393 percent and have firm-specific weekly returns' standard deviation of 0.0474, which are marginally lower than those reported in Kim et al. (2011a), and Kim and Zhang (2016) (-0.173; 0.053 and -0.177; 0.054, respectively).

Similarly, our sample firms have lower *ROA* (0.0185) than those reported in Kim et al. (2011a), and Kim and Zhang (2016) (0.048 and 0.035, respectively). Our sample firms have lower *LEV* (0.1795) and higher *AbsDA* (0.1250) from those reported in prior studies. For example, Kim et al. (2011a) report mean leverage of 0.325 and absolute value of discretionary accruals equal to 0.052. Generally, the statistics for all control variables are consistent with those reported in prior studies (e.g., Kim et al. 2011a; Kim and Zhang 2016). The marginal difference in the descriptive statistics of some control variables can be attributed to the sample restrictions due to the matching procedure. We also observe that, on average, diversified firms have marginally higher monthly share turnover, stock return, firm size and leverage, and marginally lower market to book ratio, standard deviation of weekly returns and return on assets than those of focused firms.

Main Results: Firm Structure and Crash Risk

The results from our regression of crash risk on firm structure are reported in columns 1 to 4 of Table 3. We find a negative coefficient on all four measures of firm structure that are significant at either five or one percent level. This result suggests that crash risk of diversified firms is significantly lower than that of focused firms. This result is consistent with Thomas (2002) and Clarke et al. (2004), who show that diversified firms are not associated with higher information asymmetry compared to focused firms. Also, the coefficients on the control variables are generally consistent with prior studies (e.g., Callen and Fang 2015; Kim and Zhang 2016).

<<<INSERT TABLE 3 ABOUT HERE>>>

V. SAMPLE, RESEARCH DESIGN AND RESULTS FOR HYPOTHESIS TWO

Sample Selection and Research Design

To investigate the impact of SFAS No. 131 on crash risk, we follow a difference-in-differences (DID) research design. For our DID approach, we identify firms that have changed their reporting structure post-SFAS No. 131 (change firms) and compare the crash risk of this firms with other firms that did not change their reporting structure (no change firms). Following Cho (2015), we define a firm as a change firm if its segments reported in the first year post-SFAS No. 131 are different from those reported in the last year pre-SFAS No. 131, and the segments reported under SFAS No. 131 reveal new information about its operations in industries that were not reported pre-SFAS No. 131. We follow Cho (2015) to implement the classification of change firms by comparing a firm's segment identifiers and segment SIC codes in the first year post-SFAS No. 131 (i.e., the adoption year) with the same firm's segment identifiers and segment SIC codes in the last year pre-SFAS No. 131 (i.e., the lag adoption year).

We use four measures of change firms and specifically define them as follows. *CF* is a dichotomous variable that is coded one if the firm reports a new segment and a new SIC code for its segment in the adoption year of SFAS No. 131 that were not reported in the lag adoption year, and zero otherwise (Cho 2015). To check the sensitivity of our results, we also use three alternative definitions of change firms and define them as follows. *INC* is a dichotomous variable that is coded one if the number of business segments reported under SFAS No. 131 in fiscal years 1998 – 2000 is more than the number of business segments reported under SFAS No. 14 in 1997, and zero otherwise (Ettredge et al. 2005). *DISAGG* is the natural logarithm of the number of business segments divided by the number of SIC codes of a firm (Berger and Hann 2003). *ΔDAGG* is equals to *DAGG* in a given year minus *DAGG* in the lag adoption year of SFAS No. 131 (Ettredge et al. 2005). *DAGG* is the number of business segments reported minus the number of four-digit SIC codes in which a firm operates in a given year. The definition of these variables is also provided in the Appendix. Higher (lower) values on the above variables represent (no) change firms.

To ensure that our final sample, which we use for the DID tests, is less affected by other changes in reporting apart from the changes due to SFAS No. 131 and includes at least one observation of each firm in the pre- and post-SFAS 131 periods, we implement further sample restriction to our pre-matched sample of 94,677 firm-years. First, to ensure that the change firms represent only the reporting changes due to SFAS No. 131 (e.g., Berger and Hann 2003; Ettredge et al. 2005), we eliminate 31,733 firm-years with acquisitions, divestures and change in accounting method. Second, we eliminate 17,887 firm-years with missing data to compute each change firm variable. Third, consistent with Ettredge et al. (2005), we further delete 5,863 observations for firms that do not continue in our sample post-SFAS No. 131 or firms that only start in our sample post-SFAS No. 131. Fourth, we eliminate 5,101 firm-years that reported a different number of segments but did not report a new SIC code in any of its segments post-SFAS No. 131. Such firm-years do not represent change firms as per our definition since we expect change firms to reveal new information about its operations in industries that were not reported pre-SFAS No. 131. However, it is also difficult to classify such firms as no change firm because their number of reported segments has changed from pre- to post-SFAS No. 131. Hence, we delete such observations to arrive at a cleaner sample of change and no change firms. Our sample selection procedure, which is provided in Panel A of Table 4, results in a final sample of 34,093 firm-years between 1988 and 2018 or 9,212 firm-years within two years pre- and post-SFAS No. 131. We use data from two years pre- and post-SFAS No. 131 to minimize confounding effects from other events on our DID tests.

<<<INSERT TABLE 4 ABOUT HERE>>>

Next, we split our sample into two groups: (1) pre-SFAS No. 131 focused firms and (2) pre-SFAS No. 131 diversified firms. We adopt this approach consistent with Ettredge et al. (2005) who argue that SFAS No. 131 may have affected differently firms that were focused (i.e., pre-SFAS No. 131 focused firms) versus diversified (i.e., pre-SFAS No. 131 diversified firms) under SFAS No. 14. Each group has some firms that change their reporting while other firms that did not change their reporting post-SFAS No. 131. We provide the sample distribution for the pre-SFAS No. 131 focused and diversified firms in Panel B of Table 4.

The statistics show that 21 (79) percent of pre-SFAS No. 131 focused firms change (did not change) their segment reporting and is classified as a diversified (focused) firm post-SFAS No. 131.[7] On the other hand, 3 (70) percent of pre-SFAS No. 131 diversified firms change (did not

[7] To enable us to compare the statistics with prior studies, we use the number of firms instead of the number of firm-years to compute the proportion. We calculate 21 (79) percent as 427/1990 (1563/1990) from Panel B of Table 4.

change) their reporting and is classified as a focused (diversified) firm post-SFAS No. 131. In addition, 27 percent of pre-SFAS No. 131 diversified firms change their segment reporting by reporting a new segment and a new SIC code for its segment in the adoption year of SFAS No. 131 (i.e., Diversified changed firms).[8] Our sample distribution of change firms is consistent with the statistics reported in Table 1 (Panel B: Pure Sample) of Berger and Hann (2003) and in Table 2 of Ettredge et al. (2005).[9]

For our formal tests of hypothesis two, we match change firms (*CF* = 1) with no change firms (*CF* = 0) within each group – (1) pre-SFAS No. 131 focused firms and (2) pre-SFAS No. 131 diversified firms.[10] That is, (1) we match 1,021 pre-SFAS No. 131 focused firm-years that change their reporting to a diversified firm with 5,485 pre-SFAS No. 131 focused firm-years that remain focused post-SFAS No. 131. Also, (2) we match 503 pre-SFAS No. 131 diversified changed firm-years with 2,141 diversified firm-years that did not change their segment reporting post-SFAS No. 131. Within each group, for each fiscal year, we first identify all no change firms which trade on the same stock exchange as the change firm. Second, from these firms, for each change firm-year, we retain those no change firms having a market value of equity (stock price) [standard deviation of daily returns] between 0.5 and 1.5 times the market value of equity (stock price) [standard deviation of daily returns] of the change firm. Third, from the remaining no change firms, we choose as a match the firm that is closest in trading volume to the change firm. Using

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[8] In other words, of the 97 percent of pre-SFAS No. 131 diversified firms that remain diversified post-SFAS 131, 28 [=225/(589+225)] percent change their segment reporting by reporting a new segment and SIC code for its segment in the adoption year of SFAS No. 131 and 72 [=589/(589+225)] percent did not change their segment reporting.

[9] Our proportion of pre-SFAS No. 131 diversified sample firms that changed their segment reporting to a focused firm post-SFAS No. 131 is much smaller than that reported in Ettredge et al. (2005) because we adopt a more stricter sample selection to obtain a much cleaner sample of change firms.

[10] The matching of treatment firms to control firms is useful for satisfying the parallel trends assumption in DID regression (Kausar et al. 2016). In our case, the identifying assumption is that focused (diversified) change and no change firms have parallel trends in crash risk. We later show that the parallel trends assumption is satisfied.

this procedure, we have a matched sample for pre-SFAS No. 131 focused firms and a matched sample for pre-SFAS No. 131 diversified firms. We use the matched sample for each group and four years of firm-year observations surrounding SFAS No. 131 to estimate the following DID regression model.[11]

$$CRASHRISK = \beta_0 + \beta_1 POST + \beta_2 \Delta FIRM \times POST + \beta_n CONTROLS + \varepsilon \quad (5)$$

Our dependent variable *CRASHRISK* represents either *DUVOL* or *NCSKEW* at year *t*+1. We use four proxies of firms that change their reporting due to SFAS No. 131 (*ΔFIRM*). *ΔFIRM* represents either *INC*, *CF*, *DISAGG* or *ΔDAGG*. *POST* is a dichotomous variable that is coded one for the post-SFAS No. 131 period and it is coded zero otherwise. *CONTROLS* represent all the control variables discussed and defined for model (4) above. The definition and measurement of all variables are provided in the Appendix. In model (5) we also control for firm and year fixed effects and report *t*-statistics that are corrected for heteroscedasticity.

Our tests using model (5) are important because they isolate the change in crash risk from the pre- to the post-SFAS No. 131 fiscal years for firms that did not change their reporting. Thus, they act as controls for any contemporaneous changes to SFAS No. 131 that may also have affected crash risk. SFAS No. 131 did not affect pre-SFAS No. 131 focused firms and pre-SFAS No. 131 diversified firms that did not change their reporting in the post-SFAS No. 131 period. Hence, the coefficient on *POST* (β_1) in model (5) captures the change in crash risk from pre- to post-SFAS No. 131 period for firms that did not change their reporting due to SFAS No. 131. Therefore, this controls for any macro changes, other than SFAS No. 131, during our sample years that affect crash risk. In addition, Cho (2015) argues that the change versus no change classification is not

[11] We do not include the main effect of $\Delta FIRM$ as it is subsumed by the firm dummies due to the inclusion of firm-fixed effect.

random because the change firms may include more firms with greater incentives to hide segments and they are forced to change their segment definitions upon adopting SFAS No. 131. Hence, consistent with Cho (2015), we estimate model (5) with firm-fixed effects so that we could use the firm as its own control. This approach ensures that our results are not driven by unobservable time-invariant characteristics.

We are particularly interested in the coefficient on the interaction term (β_2) from model (5). A negative (positive) coefficient on β_2 would suggest that firms which change their segment reporting post-SFAS No. 131 experience a decrease (an increase) in crash risk, after accounting for the effect on crash risk due to macro changes and differences in firm characteristics to the extent captured by our matching algorithm, control variables, year and firm fixed effects. While we attempt to control for several observable and unobservable firm characteristics, our models may still suffer from endogeneity issues. We, therefore, exercise caution in interpreting our results as a causation.

Difference-in-differences Results for Hypothesis Two

We provide the DID test results for pre-SFAS No. 131 focused firms in Table 5. Panel A provides a comparison of the average values on the variables that are used to match pre-SFAS No. 131 focused firms that changed their reporting post-SFAS No. 131 with pre-SFAS No. 131 focused firms that did not change their reporting. The statistics show that the difference in the mean values of the matching variables is much lower for the matched sample than that for the unmatched samples. While the difference in the mean values of stock price is still significant after the matching, the difference for these variables after matching is about half of the difference before matching.

Panel B reports the results from the DID regression of crash risk on pre-SFAS No. 131 focused firms that change their reporting post-SFAS No. 131. The results show a negative and significant coefficient on the DID term, using all four alternative measures of change firms. This result suggests that SFAS No. 131 caused a significant decline in crash risk of pre-SFAS No. 131 focused firms that changed their reporting post-SFAS No. 131.

In Panel C, we empirically show that the parallel trends assumption for our DID estimation is satisfied. Following Lamoreaux (2016), we report results after re-estimating our DID regressions for pre-SFAS No. 131 focused firms after including two additional *POST* indicator variables, *POST [-1]* and *POST [+1]*. *POST [-1]* is a dichotomous variable that is coded one for the year preceding the adoption of SFAS No, 131, and zero otherwise. *POST [+1]* is a dichotomous variable that is coded one for the year after the adoption of SFAS No, 131, and zero otherwise. We interact these variables with change firm variables (*ΔFIRM*) and we also interact *ΔFIRM* with *POST*. If SFAS No. 131 caused the decline in crash risk of focused change firms, then we should observe significant negative coefficient on the interaction of *ΔFIRM* with *POST*. Our results show that the coefficient on the interaction of *ΔFIRM* with *POST [-1]* and *ΔFIRM* with *POST [+1]* are insignificant across all DID regressions.[12] Consistent with our expectation, the result shows significant negative coefficient on the interaction between *ΔFIRM* and *POST*. Collectively, this result suggests that pre-SFAS No. 131 focused change firms experienced an immediate decline in crash risk upon the adoption of SFAS No. 131.[13]

[12] We obtain a coefficient of zero when *ΔFIRM* is *ΔDAGG* because the change for the computation of *ΔDAGG* is with respect to the final year in the pre-SFAS No. 131 period. This computation is consistent with Ettredge et al. (2005).
[13] In addition, to supplement the tests of parallel trends assumption (Lamoreaux 2016; Kausar et al. 2016), we extract the two years of pre-SFAS No. 131 sample from our test sample and re-estimate our DID model, where *POST* is coded one for observations in the final year before SFAS No. 131, and zero otherwise. We find no difference in crash risk across focused change and focused no change firms (*t*-statistics on the interaction term range from -0.98 to 0.26). We also obtain a larger pre-SFAS No. 131 sample of four years and re-estimate our DID model, where *POST* is coded one for observations in the final two years before SFAS No. 131, and zero otherwise. We further find no difference in

<<<INSERT TABLE 5 ABOUT HERE>>>

We report the DID test results for pre-SFAS No. 131 diversified firms in Table 6. Panel A provides a comparison of the average values on the variables that are used to match pre-SFAS No. 131 diversified change firms with pre-SFAS No. 131 diversified firms that did not change their reporting. The statistics show that the difference in the mean values of the matching variables between pre-SFAS No. 131 diversified change and no change firms for the matched sample is not statistically significant, except for firm size, which is significant at the 10 percent level.

Panel B reports the results from the DID regression of crash risk on pre-SFAS No. 131 diversified firms that change their reporting post-SFAS No. 131. The results show insignificant coefficients on the DID term, using the two dichotomous measures of change firms (*INC* and *CF*). However, we find a positive and significant DID coefficient when we use the two continuous measures of change firms (*DISAGG* and *ΔDAGG*). Our results suggest that, on average, SFAS No. 131 did not cause a change in the crash risk of pre-SFAS No. 131 diversified firms that changed their segment reporting post-SFAS No. 131. In addition, our results based on the continuous measures of change firms suggest that SFAS No. 131 caused a significant increase in crash risk of pre-SFAS No. 131 diversified firms that changed their segment disclosures by reporting a larger increase in disaggregated new information post-SFAS No. 131. This result is consistent with Berger and Hann (2003, p. 163), who suggest that by increasing information disaggregation, SFAS No. 131 "induced firms to reveal previously "hidden" information about their diversification strategies". Consistent with this view, Berger and Hann (2007) conclude that managers exploited

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crash risk across focused change and focused no change firms (*t*-statistics on the interaction term range from -0.50 to 0.94). We replicate similar supplement tests of parallel trends assumption for the pre-SFAS No. 131 diversified change versus diversified no change firm sample and find no difference in crash risk across diversified change and diversified no change firms. These results suggest that the parallel trends assumption does not appear to be violated.

the discretion available under SFAS No. 14 to opportunistically hide bad news when agency cost motive dominates. Our result is consistent with this contention and suggests that SFAS No. 131 caused firms, which largely aggregated their segment information under SFAS No. 14, to suddenly disclose hidden information (mostly bad news) that resulted in an immediate increase in crash risk post-SFAS No. 131.

In Panel C, we empirically show that the parallel trends assumption for our DID estimation for pre-SFAS No. 131 diversified firms is satisfied. Following Lamoreaux (2016), we re-estimate our DID regressions in Panel B after adding the interactions of *ΔFIRM* with *POST [-1]* and *ΔFIRM* with *POST [+1]*. *POST [-1]* and *POST [+1]* are defined as above. Our results show that the coefficients on the interaction of *ΔFIRM* with *POST [-1]* and *ΔFIRM* with *POST [+1]* are insignificant across all DID regressions. Consistent with our results in Panel B, we find a significant positive coefficient on the interaction between *ΔDAGG* and *POST*. This result suggests that some diversified firms which changed their reporting by increasing disaggregation post-SFAS No. 131 experienced an immediate increase in crash risk upon the adoption of SFAS No. 131.

<<<INSERT TABLE 6 ABOUT HERE>>>

VI. ADDITIONAL ANALYSES

For our test of hypothesis one, we define firm structure based on each fiscal year of reporting. That is, if a firm reports multiple segments within a fiscal year pre-SFAS No. 131, we code the firm-year as one to represent a diversified firm-year and if the same firm reports a single segment within a fiscal year post-SFAS No. 131, we code the firm-year as zero to represent a focused firm. Hence, our measurement of firm structure is affected due to the introduction of the SFAS No. 131 because several firms have changed their reporting from being diversified to focused firms and vice versa. In this section, we consider two alternative definitions of firm structure based on – (1) SFAS No. 14 and (2) SFAS No. 131 for all fiscal years.

Alternative Definitions of Firm Structure – SFAS No. 14

For the first alternative measure, *FS14*, we classify each firm based on their reporting during the SFAS No. 14 reporting requirement. Based on this classification, we code firm structure for all the subsequent fiscal years for the firm. That is, if a firm reports multiple segments during pre-SFAS No. 131 period then we code the firm for the entire sample years as diversified and vice versa. Since our classification of firms significantly change for *FS14* compared to *FS* (our main measure), we re-match diversified firms (*FS14* = 1) with focused firms (*FS14* = 0) using 34,093 pre-matched firm-years obtained after applying sample restriction for change firm data.[14] We apply our matching procedure to match 11,684 observations of pre-SFAS No. 131 diversified firms with 22,409 observations of pre-SFAS No. 131 focused firms. We match each pre-SFAS No. 131 diversified firm with a pre-SFAS No. 131 focused firm which trade on the same stock exchange in the same fiscal year, and has similar stock price, market value, risk and trading volume. The matching process results in a matched sample of 22,936 firm-years. Untabulated statistics show that the difference between the average values on the variables used for matching firms are much lower for the matched sample than that for the pre-matched sample. We report our results using the matched sample in Table 7.

<<<INSERT TABLE 7 ABOUT HERE>>>

[14] We use the pre-matched sample reported in Table 4 to apply the matching procedure based on *FS14* so that our pre-matched sample to apply the matching procedure is consistent for both alternative measures of firm structure.

Panel A provides a comparison of the average values on crash risk for pre-SFAS No. 131 diversified firms and pre-SFAS No. 131 focused firms pre- and post-SFAS No. 131. The statistics using both measures of crash risk show that pre-SFAS No. 131 diversified firms have significantly lower crash risk than that of pre-SFAS No. 131 focused firms before the adoption of SFAS No. 131. However, the difference in crash risk between these two firm structures is insignificant post-SFAS No. 131. We further observe that the average increase in the crash risk of pre-SFAS No. 131 focused firms is significantly lower than the average increase in the crash risk of pre-SFAS No. 131 diversified firms from pre- to post-SFAS No. 131. This result is consistent with our DID results for tests of hypotheses two that shows that some focused firms (i.e., focused change firms) experienced a decline in crash risk post-SFAS No. 131 and some diversified firms (i.e., diversified change firms with larger increase in disaggregation) experienced an increase in crash risk post-SFAS No. 131.

Panel B provides the results from regression of crash risk on firm structure (i.e., *FS14*). The results show a negative coefficient on firm structure that is significant at the one percent level. We also estimate the regression with an interaction between *FS14* and *POST* and we find a significant positive coefficient on the interaction term. The coefficient for the main effect of *FS14* for pre-SFAS No. 131 period is negative and significant at the one percent level but the total effect of *FS14* for post-SFAS No. 131 period is insignificant. These results are consistent with those reported in Panel A. The result suggests that diversified firms as defined by SFAS No. 14 are associated with lower crash risk only during pre-SFAS No. 131 period. The difference between crash risk of diversified and focused firms as defined by SFAS No. 14 disappears in the new reporting regime because the segment reporting of these firms has significantly changed due to SFAS No. 131. This results further support our main results and suggest that while, on average, diversified firms have lower crash risk than that of focused firms, SFAS No. 131 caused a decline in the difference in the crash risk of these two firm structures.

Alternative Definitions of Firm Structure – SFAS No. 131

For our second alternative measure of firm structure, *FS131*, we classify each firm based on their reporting during the SFAS No. 131 reporting regime. Since we have hindsight information on firm structure about all firms after the adoption of SFAS No. 131, we can code all our fiscal year data based on this classification. That is, firms that are reporting as a diversified (focused) firm post-SFAS No. 131 but was reporting as a focused (diversified) firm pre-SFAS No. 131 are reclassified as a diversified (focused) firm for the pre-SFAS No. 131 period. We do this because hindsight information suggests that pre-SFAS No. 131 focused firms that changed their reporting post-SFAS No. 131 are in fact diversified firms and vice versa. Since our classification of firms significantly change for *FS131* compared to *FS* and *FS14*, we re-match diversified firms (*FS131* = 1) with focused firms (*FS131* = 0) using 34,093 pre-matched firm-years. We follow the matching procedure as described in earlier sections, and match each diversified firm (*FS131* = 1) with a focused firm (*FS131* = 0) which trade on the same stock exchange in the same fiscal year, and has similar stock price, market value, risk and trading volume. The matching process results in a matched sample of 12,366 firm-years. Untabulated statistics show that the difference between the average values on the variables used for matching firms are much lower for the matched sample than that for the pre-matched sample. We report our results using the matched sample in Table 8.

<<<INSERT TABLE 8 ABOUT HERE>>>

Panel A provides a comparison of the average values on crash risk for diversified and focused firms defined as per SFAS No. 131. The statistics using both measures of crash risk show that diversified firms have significantly lower crash risk than that of focused firms after the adoption of SFAS No. 131. However, the difference in crash risk between these two firm structures is insignificant in the pre-SFAS No. 131 period. We further observe that the average change in the crash risk between focused and diversified firms from pre- to post-SFAS No. 131 is insignificant. This result is consistent with our DID results for tests of hypotheses two. In this test, the focused firms represent focused firms that did not change their reporting and a very few (3 percent of our sample) pre-SFAS No. 131 diversified firms that have reclassified their reporting to focused firms. Diversified firms represent diversified firms that did not change their reporting and pre-SFAS No. 131 focused firms that have changed their reporting to diversified firms. Hence, the lower crash risk of diversified firms post-SFAS No. 131 is because of pre-SFAS No. 131 focused firms that are reclassified as diversified firms post-SFAS No. 131.

Furthermore, the results for *FS131*, reported in panel B, show a negative coefficient on firm structure that is significant at the five percent level. The results show that the main effect of *FS131* on crash risk for pre-SFAS No. 131 period is insignificant. We also examine the interaction effect of *FS131* and *POST* on the crash risk and observe an insignificant coefficient on the interaction term. The coefficient for the total effect of *FS131* on crash risk for post-SFAS No. 131 period is negative but significant at ten percent level based on only one measure of crash risk (i.e., *DUVOL*). After considering the effect of *POST* on crash risk, our results collectively suggest that diversified firms have moderately lower crash risk than that of focused firms if segments are defined based on the management approach as per SFAS No. 131. On the other hand, in Table 7, we observe a significantly lower level of crash risk for diversified firms if firm structure is defined as per SFAS No. 14. Hence, our results suggest that some firms were wrongly classified in pre-

SFAS No. 131 periods. This result also suggests that SFAS No. 131 has significantly improved the definition of firm structure.

VII. CONCLUSION

Our study extends the early studies that investigate the effect of corporate diversification on information asymmetry. Due to the complex nature of diversified firms, the conventional view is that diversified firms experience higher information asymmetry problems than focused firms. However, Thomas (2002) and Clarke et al. (2004) provide evidence that diversified firms do not have higher information asymmetry than that of focused firms. They provide an alternative argument based on the possibility that investors receive diversified information for diversified firms. Nevertheless, the regulators and mostly analysts have been concerned about asymmetric information problems of diversified firms and therefore, regulators issued SFAS No. 131 to enhance information transparency of conglomerates.

Some prior studies show that diversified firms that changed their reporting post SFAS No. 131 hid bad news prior to the adoption of the standard (Berger and Hann 2003; Berger and Hann 2007). In this study, using a more robust measure for information asymmetry and bad news hoarding, we examine and show that diversified firms display lower crash risk than that of focused firms. We also find that focused firms that changed their reporting post-SFAS No. 131 experienced a significant decline in crash risk post-SFAS No. 131. That is, SFAS No. 131 caused an immediate significant decrease in crash risk for focused firms that adopted SFAS No. 131. However, diversified firms that adopted SFAS No. 131, on average, did not experience an immediate effect on crash risk. Diversified firms that changed their reporting by a higher level or increase in information disaggregation experienced an immediate increase in crash risk with two years upon adopting SFAS No. 131. While we find that diversified firms display lower levels of bad news hoarding and the SFAS No. 131 has to certain extent mitigated these effects, bad news hoarding continues to exist. Our results contribute to the corporate diversification, information asymmetry and crash risk literature.

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APPENDIX 1

Definition and Measurement of Variables

Variables	Definition and Measurement
Dependent Variables	
DUVOL	Is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Down-week (up-week) is when the firm-specific weekly returns are below (above) its annual mean.
NCSKEW	Is the negative skewness of firm-specific weekly returns over the fiscal year.
Test Variables	
FS	Is a dichotomous variable that is coded 1 if the firm reported two or more business segments in different four-digit SIC codes, and 0 otherwise. We code *FS* as 1 to represent diversified firms, and as 0 to represent focused firms.
HERF	Is the sum of the squares of each reported segment's assets as a proportion of the firm's total assets. We multiply the herfindahl index by -1 so that the lower (higher) value represent focused (diversified) firms.
ENTROPY	Is the entropy measure of total diversification computed as $\sum_{i=1}^{n} P_i ln(\frac{1}{P_i})$. P_i is the percentage of firm sales employed in industry segment *i* and the summation is over the *n* industry segments in which the firm operates. Based on the entropy measure, focused (diversified) firms have a lower (higher) values.
NBSEG	Is the natural log of the number of business segments. *NBSEG* has a value of 0 to represent focused firms.
CF	Is coded 1 if the firm reports a new segment and a new SIC code for its segment in the adoption year that were not reported in the lag adoption year, and 0 otherwise.
INC	Is coded 1 if the number of business segments reported under SFAS No. 131 in fiscal years 1998 – 2000 is more than the number of business segments reported under SFAS No. 14 in 1997, and 0 otherwise.
DISAGG	Is the natural logarithm of the number of business segments divided by the number of SIC codes of a firm.
ΔDAGG	Equals *DAGG* for a given year minus *DAGG* for 1997 (the final year in the pre-SFAS No. 131 period). *DAGG* is the number of business segments reported minus the number of four-digit SIC codes in which a firm operates in a given year.
POST	Is a dichotomous variable that is coded 1 for the post-SFAS No. 131 period, and 0 otherwise.
FS14	Firm structure defined as per SFAS No. 14 through the sample. *FS14* is a dichotomous variable that is coded 1 if the firm reported two or more business segments in different four-digit SIC codes, and 0 otherwise, before the adoption of SFAS No. 131. We code *FS14* as 1 to represent pre-SFAS No. 131 diversified firms, and as 0 to represent pre-SFAS No. 131 focused firms. The code for *FS14* remains the same after the adoption of SFAS No. 131.
FS131	Firm structure defined as per SFAS No. 131 through the sample using hindsight information. *FS131* is equals to *FS* (defined above) except for focused firms that change to diversified firms and diversified firms that change to focused firms post-SFAS No. 131. For *FS131*, focused firms that commenced reporting as a diversified firm post-SFAS No. 131 is coded 1 instead of 0 and diversified firms that commenced reporting as a focused firm is coded 0 instead of 1 during pre-SFAS No. 131 period.

This appendix is continued on the next page.

APPENDIX 1 (continued)

Control Variables

DTURN	Is the average monthly share turnover over the current fiscal year minus the average monthly share turnover over the previous fiscal year, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.
RET	Is the mean of firm-specific weekly returns over the fiscal year, times 100.
MB	Is the market value of equity divided by the book value of equity.
SIZE	Is the natural logarithm of the market value of equity.
SIGMA	Is the standard deviation of firm-specific weekly returns over the fiscal year.
LEV	Is long term debts divided by total assets.
ROA	Is income before extraordinary items divided by lagged total assets.
AbsDA	Is the absolute value of discretionary accruals measured using the modified Jones (1991) model of Dechow et al. (1995).

Other Variables

PRICE	Is the average stock price.
VOLUME	Is the average monthly dollar trading volume in millions.
STDRET	Is the standard deviation of daily returns.

TABLE 1

Sample selection procedure and descriptive statistics on the matching variables

Panel A: Sample Selection

Sample Construction Process	**Firm-years**
Initial crash risk data with non-missing values for current year and lagged one year between 1988 and 2018, inclusive after excluding firms in financial and utility industries.	180,955
Less firm-years with missing data on segment reporting	(72,387)
Less firm-years with missing data on control variables	(10,752)
Less firm-years with missing data on variables used for matching firms	(3,139)
Final pre-matched sample (11,465 unique firms)	94,677
Final matched sample (5,215 unique firms)	21,800

Panel B: Comparison of descriptive statistics on variables used for matching diversified and focused firms prior to applying the matching procedure

Variables	**Mean (*FS* = 0)**	**Mean (*FS* = 1)**	**Diff**	***t*-stat**
SIZE	5.1284	6.1198	-0.9914	*-59.43****
PRICE	17.2302	27.0867	-9.8565	*-23.31****
VOLUME	2.4514	4.0896	-1.6382	*-14.79****
STDRET	0.0441	0.0342	0.0099	*44.70****
Sample Size	68,769	25,908		

Panel C: Comparison of descriptive statistics on variables used for matching diversified and focused firms after applying the matching procedure

Variables	**Mean (*FS* = 0)**	**Mean (*FS* = 1)**	**Diff**	***t*-stat**
SIZE	6.2603	6.5886	-0.3283	*-10.49****
PRICE	25.4460	29.3777	-3.9317	*-9.91****
VOLUME	4.1960	4.6650	-0.4690	*-2.36***
STDRET	0.0295	0.0299	-0.0004	*-1.24*
Sample Size	10,900	10,900		

This table reports the sample selection procedure in panel A and the descriptive statistics on the variable used for matching diversified and focused firms in panel B and C. Panel B (C) provides the descriptive statistics on the variables used to match diversified firms with focused firms prior to (after) applying the matching procedure. ** and *** denote significance at the 5 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 2

Descriptive Statistics for the Matched Sample of All Firms, Focused firms, and Diversified Firms

	Full Matched Sample					Focused Firms	Diversified Firms	Comparison of Mean	
Variables	**Mean**	**Median**	**SD**	**Q1**	**Q3**	**Mean**	**Mean**	**Diff**	***t*-stats**
$DUVOL_{t+1}$	-0.0099	-0.0129	0.3220	-0.2209	0.1949	-0.0016	-0.0181	0.0165	*3.79****
$NCSKEW_{t+1}$	0.0698	0.0563	0.6237	-0.2879	0.4106	0.0886	0.0511	0.0375	*4.44****
FS_t	0.5000	0.5000	0.5000	0.0000	1.0000				
$HERF_t$	-0.7282	-0.7863	0.2799	-1.0000	-0.4882				
$ENTROPY_t$	0.3019	0.2218	0.3275	0.0446	0.3953				
$NBSEG_t$	0.6146	0.6931	0.6094	0.0000	1.0986				
$DUVOL_t$	-0.0131	-0.0165	0.3156	-0.2248	0.1929	-0.0068	-0.0193	0.0124	*2.91****
$NCSKEW_t$	0.0662	0.0525	0.6020	-0.2899	0.4029	0.0816	0.0507	0.0309	*3.79****
$DTURN_t$	-0.0032	-0.0005	0.0759	-0.0198	0.0173	-0.0056	-0.0009	-0.0047	*-4.53****
RET_t	-0.1393	-0.0825	0.1569	-0.1681	-0.0431	-0.1448	-0.1338	-0.0109	*-5.14****
MB_t	2.6880	1.9274	3.6417	1.2001	3.1758	3.0246	2.3513	0.6733	*13.71****
$SIZE_t$	6.4245	6.5235	2.3168	4.7541	8.0558	6.2603	6.5886	-0.3283	*-10.49****
$SIGMA_t$	0.0474	0.0410	0.0244	0.0297	0.0586	0.0486	0.0462	0.0024	*7.35****
LEV_t	0.2078	0.1823	0.1801	0.0552	0.3075	0.1986	0.2171	-0.0186	*-7.62****
ROA_t	0.0330	0.0499	0.1333	0.0113	0.0907	0.0345	0.0314	0.0031	*1.73**
$AbsDA_t$	0.1377	0.0570	0.2651	0.0240	0.1284	0.1378	0.1376	0.0002	*0.06*

This table provides the descriptive statistics of all key variables for the full matched sample of 21,800 firm-years. The table also provides the average values on all key variables for focused firms (10,900 firm-years) and diversified firms (10,900 firm-years). * and *** denote significance at the 10 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 3

Regression Results of Crash Risk on Proxies of Firm Structure

Variables	***TV = FS***		***TV = HERF***		***TV = ENTROPY***		***TV = NBSEG***	
	DUVOL	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
Intercept	-0.2323	-0.3993	-0.2666	-0.4635	-0.2363	-0.4070	-0.2317	-0.3986
	*-6.36****	*-5.82****	*-7.10****	*-6.62****	*-6.57****	*-6.03****	*-6.40****	*-5.83****
TV_t	-0.0143	-0.0271	-0.0373	-0.0696	-0.0390	-0.0732	-0.0158	-0.0291
	*-2.27***	*-2.23***	*-3.93****	*-3.58****	*-4.67****	*-4.51****	*-3.62****	*-3.29****
$DUVOL_t$	0.0421		0.0421		0.0423		0.0421	
	*4.65****		*4.62****		*4.61****		*4.64****	
$NCSKEW_t$		0.0386		0.0386		0.0388		0.0386
		*4.06****		*4.04****		*4.05****		*4.06****
$DTURN_t$	-0.0160	-0.0513	-0.0149	-0.0493	-0.0147	-0.0487	-0.0155	-0.0505
	-0.51	*-0.96*	*-0.47*	*-0.93*	*-0.46*	*-0.91*	*-0.49*	*-0.94*
RET_t	0.0580	0.0834	0.0513	0.0711	0.0569	0.0813	0.0537	0.0758
	0.70	*0.58*	*0.62*	*0.49*	*0.69*	*0.57*	*0.65*	*0.53*
MB_t	0.0012	0.0027	0.0010	0.0024	0.0010	0.0023	0.0011	0.0025
	*1.78**	*2.13***	*1.59*	*1.94**	*1.54*	*1.89**	*1.64*	*2.00***
$SIZE_t$	0.0188	0.0339	0.0194	0.0351	0.0209	0.0379	0.0195	0.0352
	*7.02****	*6.73****	*7.26****	*6.97****	*7.97****	*7.71****	*7.18****	*6.90****
$SIGMA_t$	0.7922	2.4107	0.7368	2.3081	0.7761	2.3799	0.7654	2.3623
	1.39	*2.40***	*1.30*	*2.30***	*1.38*	*2.40***	*1.36*	*2.36***
LEV_t	0.0051	-0.0011	0.0054	-0.0004	0.0054	-0.0004	0.0056	-0.0002
	0.34	*-0.0374*	*0.36*	*-0.02*	*0.36*	*-0.01*	*0.37*	*-0.01*
ROA_t	0.0570	0.0602	0.0562	0.0587	0.0558	0.0579	0.0554	0.0573
	*2.71***	*1.43*	*2.69***	*1.41*	*2.67***	*1.39*	*2.66***	*1.38*
$AbsDA_t$	0.0255	0.0437	0.0252	0.0431	0.0248	0.0425	0.0257	0.0441
	*2.51***	*2.23***	*2.48***	*2.19***	*2.48***	*2.19***	*2.54***	*2.24***

This table is continued on the next page.

TABLE 3 (continued)

Variables	*TV = FS*		*TV = HERF*		*TV = ENTROPY*		*TV = NBSEG*	
	DUVOL	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.0390	0.0351	0.0395	0.0355	0.0399	0.0358	0.0394	0.0354
Sample size	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800

This table reports the results from regressions of crash risk (year *t*+1) on firm structure (year *t*). The first row for each independent variable provides the estimated coefficients from the respective regression. The second row in *italics* provides the *t*-statistics, which are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. *, ** and *** denote significance at the 10, 5 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 4

Further Sample Selection Procedure and Distribution for Difference-in-differences Sub-sample

Panel A: Sample Selection

Sample Construction Process	**Firm-years**
Pre-matched sample (11,465 unique firms) of crash risk, firm structure, and control variables between 1988 and 2018, inclusive after excluding firms in financial and utility industries.	94,677
Less firm-years with acquisitions, divestures and change in accounting method	(31,733)
Less firm-years with missing data to compute change firm variable	(17,887)
Less firm-years that do not continue in the sample after the standard or only start in the sample after the standard	(5,863)
Less firm-years that changed based on the number of business segments but did not report a new SIC code in any of its segments	(5,101)
Pre-matched sample (2,998 unique firms) between 1988 and 2018	34,093
Final pre-matched sample (2,832 unique firms) within two years pre- and post- SFAS No. 131 used to construct pre-SFAS No. 131 focused firms' and pre-SFAS No. 131 diversified firms' sub-samples	9,212

Panel B: Sample Distribution Based on Pre-SFAS No. 131 Focused and Diversified Firms

Pre-SFAS No. 131 Firm-years (Firms):	**Post-SFAS No. 131 Firm-years (Firms):**			
	Focused	**Diversified**	**Diversified changed**	**Total**
Focused	5,485	1,021		6,506
	(1,563)	(427)		(1,990)
Diversified	62	2,141	503	2,706
	(28)	(589)	(225)	(842)
Total	5,547	3,162	503	9,212
	(1,591)	(1,016)	(225)	(2,832)

This table reports a further sample selection procedure to restrict our sample firms to pure changes in segment reporting due to SFAS No. 131. Panel A provides the sample construction process. We further eliminate firms from our sample reported in Table 1 because we are interested in pure changes in segment reporting due to SFAS No. 131, consistent with Berger and Hann (2003). We also eliminate firms from our sample that do not continue in the post-SFAS No. 131 period and that only starts in the sample in the post-SFAS No. 131 period. We adopt this sample restriction to ensure that we observe the incremental change in crash risk of firms that are in our sample in both pre- and post-SFAS No. 131 period. Panel B provides the sample distribution for pre-SFAS No. 131 firms based on whether they continued the same reporting or changed their reporting post-SFAS No. 131.

TABLE 5

Difference-in-differences Test Results for Pre-SFAS No. 131 Focused Firms

Panel A: Comparison of Matching Variables between Pre-SFAS No. 131 Focused Firms that Changed and That Did Not Change Post-SFAS No. 131

	Descriptive Statistics Before Matching				**Descriptive Statistics After Matching**			
Variables	**Mean (*CF* = 0)**	**Mean (*CF* = 1)**	**ΔMean**	***t*-stats**	**Mean (*CF* = 0)**	**Mean (*CF* = 1)**	**ΔMean**	***t*-stats**
SIZE	4.6016	5.0922	-0.4906	*-6.78****	4.9316	5.0832	-0.1516	*-1.59*
PRICE	14.5741	19.2776	-4.7035	*-6.62****	16.2864	18.7906	-2.5042	*-3.10****
VOLUME	0.7382	1.8513	-1.1131	*-3.66****	1.3374	1.7449	-0.4075	*-1.32*
STDRET	0.0491	0.0455	0.0036	*3.52****	0.0436	0.0451	-0.0016	*-1.30*
Sample size	5,485	1,021			1,086	1,070		

Panel B: Difference-in-differences Regression Results of Crash Risk for Pre-SFAS No. 131 Focused Firms

Measures for Change Firm:	***ΔFIRM = INC***		***ΔFIRM = CF***		***ΔFIRM = DISAGG***		***ΔFIRM = ΔDAGG***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
POST	0.0692	0.0958	0.0739	0.1039	0.0136	0.0001	0.0061	-0.01156
	1.40	*1.08*	*1.50*	*1.17*	*0.31*	*0.00*	*0.14*	*-0.15*
ΔFIRM × POST	-0.1057	-0.1826	-0.1137	-0.1963	-0.1112	-0.1943	-0.0316	-0.0587
	*-3.07****	*-2.95****	*-3.31****	*-3.18****	*-2.41***	*-2.34***	*-1.83**	*-1.88**
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.6121	0.6119	0.6127	0.6125	0.6106	0.6107	0.6097	0.6099
Sample size	2,156	2,156	2,156	2,156	2,156	2,156	2,156	2,156

This table is continued on the next page.

TABLE 5 (continued)

Panel C: Results from Tests of Parallel Trends Assumption of Difference-in-differences Regression for Pre-SFAS No. 131 Focused Firms

Measures for Change Firm:	***ΔFIRM = INC***		***ΔFIRM = CF***		***ΔFIRM = DISAGG***		***ΔFIRM = ΔDAGG***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
ΔFIRM × POST	-0.0617	-0.1203	-0.0795	-0.1306	-0.2674	-0.4104	-0.0366	-0.0717
	*-1.96***	*-2.13***	*-1.76**	*-2.31***	*-2.22***	*-1.90**	*-1.94**	*-2.11***
ΔFIRM × POST [-1]	-0.0473	-0.0711	-0.0500	-0.0917	0.1532	0.1973	0.0000	0.0000
	-1.41	*-1.18*	*-1.25*	*-1.52*	*1.36*	*0.97*	.	.
ΔFIRM × POST [+1]	-0.0445	-0.0625	-0.0254	-0.0446	0.0360	0.0868	0.0207	0.0468
	-1.23	*-0.96*	*-0.60*	*-0.69*	*0.47*	*0.64*	*0.67*	*0.84*
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.6127	0.6124	0.6133	0.6130	0.6114	0.61112	0.6098	0.6102
Sample size	2,156	2,156	2,156	2,156	2,156	2,156	2,156	2,156

This table reports the results from difference-in-differences test for pre-SFAS No. 131 focused firms. For this test, we match each pre-SFAS No. 131 focused firms that change their reporting with similar pre-SFAS No. 131 focused firms that did not change their reporting post-SFAS No. 131. Also, we use data for two years pre- and post-SFAS No. 131 for this test. Panel A provides a comparison of the average values on the variables that are used to match pre-SFAS No. 131 focused firms that change their reporting post-SFAS No. 131 with pre-SFAS No. 131 focused firms that did not change. Panel B provides the results from the regression of crash risk on proxies of pre-SFAS No. 131 focused firms that change their reporting post-SFAS No. 131. Panel C provides results from tests of parallel trends assumption of difference-in-differences regression for pre-SFAS No. 131 focused firms. For the test in Panel C, we add two more *POST* indicator variables, one before and one after the adoption year of SFAS No. 131. *POST [-1]* is a dichotomous variable that is coded one for the year preceding the adoption of SFAS No, 131, and zero otherwise. *POST [+1]* is a dichotomous variable that is coded one for a year after the adoption of SFAS No, 131, and zero otherwise. The estimates of control variables are omitted in panel B and C to conserve space. Year and firm fixed effects are included in the regressions. *, ** and *** denote significance at the 10, 5 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 6

Difference-in-differences Test Results for Pre-SFAS No. 131 Diversified Firms

Panel A: Comparison of Matching Variables between Pre-SFAS No. 131 Diversified Firms that Changed and That Did Not Change Post-SFAS No. 131

	Descriptive Statistics Before Matching				**Descriptive Statistics After Matching**			
Variables	**Mean (*CF* = 0)**	**Mean (*CF* = 1)**	**ΔMean**	***t*-stats**	**Mean (*CF* = 0)**	**Mean (*CF* = 1)**	**ΔMean**	***t*-stats**
SIZE	5.3227	6.1844	-0.8617	*-6.96****	6.0330	6.3170	-0.2841	*-1.71**
PRICE	21.5572	24.8776	-3.3204	*-2.91****	23.4878	25.2904	-1.8026	*-1.15*
VOLUME	1.0398	1.8348	-0.7950	*-3.75****	1.4278	1.8186	-0.3908	*-1.43*
STDRET	0.0391	0.0345	0.0046	*3.60****	0.0312	0.0328	-0.0016	*-1.15*
Sample size	2,141	503			408	406		

Panel B: Difference-in-differences Regression Results of Crash Risk for Pre-SFAS No. 131 Diversified Firms

Measures for Change Firm:	***ΔFIRM = INC***		***ΔFIRM = CF***		***ΔFIRM = DISAGG***		***ΔFIRM = ΔDAGG***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
POST	-0.0369	-0.0678	-0.0505	-0.1167	-0.0375	-0.0998	-0.0133	-0.0556
	-0.51	*-0.50*	*-0.67*	*-0.83*	*-0.54*	*-0.76*	*-0.20*	*-0.45*
ΔFIRM × POST	0.0662	0.0740	0.0814	0.1467	0.1252	0.2487	0.0409	0.0939
	1.29	*0.77*	*1.45*	*1.40*	*1.69**	*1.80**	*2.11***	*2.60***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.6908	0.6808	0.6912	0.6820	0.6919	0.6831	0.6932	0.6862
Sample size	814	814	814	814	814	814	814	814

This table is continued on the next page.

TABLE 6 (continued)

Panel C: Results from Tests of Parallel Trends Assumption of Difference-in-differences Regression for Pre-SFAS No. 131 Diversified Firms

Measures for Change Firm:	***ΔFIRM = INC***		***ΔFIRM = CF***		***ΔFIRM = DISAGG***		***ΔFIRM = ΔDAGG***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
ΔFIRM × POST	0.0228	-0.0189	0.0488	0.0677	-0.0087	-0.1247	0.0372	0.0778
	0.43	*-0.19*	*0.92*	*0.68*	*-0.07*	*-0.53*	*1.68**	*1.88**
ΔFIRM × POST [-1]	0.0618	0.1137	0.0561	0.0964	0.1190	0.3616	0.0000	0.0000
	1.04	*1.03*	*0.97*	*0.89*	*0.92*	*1.49*	.	.
ΔFIRM × POST [+1]	0.0523	0.1520	0.0076	0.0787	0.1075	0.2533	0.0087	0.0383
	0.92	*1.42*	*0.13*	*0.74*	*0.96*	*1.16*	*0.30*	*0.71*
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.6923	0.6834	0.6917	0.6826	0.6937	0.6890	0.6933	0.6865
Sample size	814	814	814	814	814	814	814	814

This table reports the results from difference-in-differences test for pre-SFAS No. 131 diversified firms. For this test, we match each pre-SFAS No. 131 diversified firms that change their reporting with similar pre-SFAS No. 131 diversified firms that did not change their reporting post-SFAS No. 131. Also, we use data for two years pre- and post-SFAS No. 131 for this test. Panel A provides a comparison of the average values on the variables that are used to match pre-SFAS No. 131 diversified firms that change their reporting post-SFAS No. 131 with pre-SFAS No. 131 diversified firms that did not change. Panel B provides the results from the regression of crash risk on proxies of pre-SFAS No. 131 diversified firms that change their reporting post-SFAS No. 131. Panel C provides results from tests of parallel trends assumption of difference-in-differences regression for pre-SFAS No. 131 diversified firms. For the test in Panel C, we add two more *POST* indicator variables, one before and one after the adoption year of SFAS No. 131. *POST [-1]* is a dichotomous variable that is coded one for the year preceding the adoption of SFAS No, 131, and zero otherwise. *POST [+1]* is a dichotomous variable that is coded one for a year after the adoption of SFAS No, 131, and zero otherwise. The estimates of control variables are omitted in panel B and C to conserve space. Year and firm fixed effects are included in the regressions. *, ** and *** denote significance at the 10, 5 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 7

Results Based on Alternative Definitions of Firm Structure – SFAS No. 14

Panel A: Comparison of Average Crash Risk between Focused and Diversified Firms Defined Following SFAS No. 14

	DUVOL				
	Full Sample Mean	**Pre-SFAS131 (A) Mean**	**Post-SFAS131 (B) Mean**	**ΔMean (A – B)**	***t*-stats (A – B)**
Full Sample		-0.0496	-0.0062	-0.0434	*-10.66****
FS14 = 0 (C)	-0.0206	-0.0366	-0.0062	-0.0304	*-5.32****
FS14 = 1 (D)	-0.0330	-0.0624	-0.0062	-0.0562	*-9.74****
ΔMean (C – D)	0.0124	0.0258	0.0000	0.0258	*3.16****
t-stats (C – D)	*3.04****	*4.44****	*0.00*	*3.16****	

	NCSKEW				
	Full Sample Mean	**Pre-SFAS131 (A) Mean**	**Post-SFAS131 (B) Mean**	**ΔMean (A – B)**	***t*-stats (A – B)**
Full Sample		0.0071	0.0917	-0.0846	*-11.10****
FS14 = 0 (C)	0.0653	0.0346	0.0931	-0.0585	*-5.42****
FS14 = 1 (D)	0.0377	-0.0202	0.0904	-0.1105	*-10.27****
ΔMean (C – D)	0.0277	0.0547	0.0027	0.0520	*3.40****
t-stats (C – D)	*3.62****	*5.11****	*0.25*	*3.40****	

Panel B: Regression Results of Crash Risk on Firm Structure Defined Following SFAS No. 14

	Without Interaction with *POST*		**Interaction with *POST***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
Intercept	-0.1885	-0.2862	-0.1881	-0.2854
	*-7.49****	*-5.56****	*-7.41****	*-5.53****
FS14	-0.0155	-0.0301	-0.0271	-0.0545
	*-2.73***	*-2.81****	*-4.60****	*-5.14****
POST			0.0334	0.0719
			*1.92**	*1.79**
FS14×POST			0.0226	0.0474
			*2.98****	*3.26****
FS14 + FS14×POST			-0.0046	-0.0071
			-0.70	*-0.57*
Controls	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
Adjusted R^2	0.0402	0.0343	0.0410	0.0353
Sample Size	22,936	22,936	22,936	22,936

This table reports results from univariate and multi-variate tests by employing an alternative definition of firm structure, whereby we define firm structure (*FS14*) consistent with SFAS No. 14 throughout our sample, both pre- and post-SFAS No. 131. Panel A compares the average values on crash risk of pre-SFAS No. 131 diversified firms with pre-SFAS No. 131 focused firms, both before and after SFAS No. 131. Panel B provides results from regressions of crash risk on firm structure defined as per SFAS No. 14 (*FS14*) and its interaction with post-SFAS No. 131 period (*POST*). In Panel B, the first row for each independent variable provides the estimated coefficients from the respective regression and the second row in *italics* provides the *t*-statistics, which are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. *, ** and *** denote significance at the 10, 5 and 1 percent level. The definition of all variables is provided in the Appendix.

TABLE 8

Results Based on Alternative Definitions of Firm Structure – SFAS No. 131

Panel A: Comparison of Average Crash Risk between Focused and Diversified Firms Defined Following SFAS No. 131

	DUVOL				
	Full Sample Mean	**Pre-SFAS131 (A) Mean**	**Post-SFAS131 (B) Mean**	**ΔMean (A – B)**	***t*-stats (A – B)**
Full Sample		-0.0429	-0.0035	-0.0395	*-7.05****
FS131 = 0 (C)	-0.0193	-0.0398	0.0052	-0.0451	*-5.64****
FS131 = 1 (D)	-0.0306	-0.0460	-0.0121	-0.0339	*-4.32****
ΔMean (C – D)	0.0113	0.0062	0.0174	-0.0112	*-1.00*
t-stats (C – D)	*2.03***	*0.82*	*2.08***	*-1.00*	

	NCSKEW				
	Full Sample Mean	**Pre-SFAS131 (A) Mean**	**Post-SFAS131 (B) Mean**	**ΔMean (A – B)**	***t*-stats (A – B)**
Full Sample		0.0147	0.0919	-0.0772	*-7.34****
FS131 = 0 (C)	0.0625	0.0241	0.1084	-0.0843	*-5.61****
FS131 = 1 (D)	0.0372	0.0054	0.0753	-0.0700	*-4.76****
ΔMean (C – D)	0.0253	0.0187	0.0330	-0.0143	*-0.68*
t-stats (C – D)	*2.42***	*1.36*	*2.08***	*-0.68*	

Panel B: Regression Results of Crash Risk on Firm Structure Defined Following SFAS No. 131

	Without Interaction with *POST*		**Interaction with *POST***	
Variables	***DUVOL***	***NCSKEW***	***DUVOL***	***NCSKEW***
Intercept	-0.1282	-0.3784	-0.2458	-0.3913
	*-7.00****	*-5.58****	*-7.93****	*-6.22****
FS131	-0.0139	-0.0267	-0.0089	-0.0211
	*-2.02***	*-1.88**	*-1.02*	*-1.12*
POST			0.0505	0.0972
			*2.24***	*1.82**
FS131×POST			-0.0109	-0.0122
			-0.81	*-0.43*
FS131 + FS131×POST			-0.0198	-0.0334
			*-1.86**	*-1.56*
Controls	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
Adjusted R^2	0.0372	0.0338	0.0377	0.0344
Sample Size	12,366	12,366	12,366	12,366

This table reports results from univariate and multi-variate tests by employing an alternative definition of firm structure, whereby we define firm structure (*FS131*) consistent with SFAS No. 131 throughout our sample, both pre- and post-SFAS No. 131 using hindsight information. Panel A compares the average values on crash risk of diversified firms with focused firms, both before and after SFAS No. 131. Panel B provides results from regressions of crash risk on firm structure defined as per SFAS No. 131 (*FS131*) and its interaction with post-SFAS No. 131 period (*POST*). In Panel B, the first row for each independent variable provides the estimated coefficients from the respective regression and the second row in *italics* provides the *t*-statistics, which are corrected for heteroskedasticity, and cross-sectional and time-series correlation using a two-way cluster at the firm and year level. *, ** and *** denote significance at the 10, 5 and 1 percent level. The definition of all variables is provided in the Appendix.