The Impact of Increased Segment Disclosure on Insider Trading Profits: Evidence from SFAS No. 131

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Abstract

This paper examines the impact of segment disclosure on the trading profits of corporate insiders. We focus specifically on the firms that increased their number of reported segments after the adoption of a new segment disclosure standard – SFAS No. 131 (CHG firms). Using a difference-in-differences method, we show that the insider profits of CHG firms are significantly greater than those of NOCHG firms in the pre-131 era. Additionally, we show that CHG firms exhibit a significant decline in insider profits relative to NOCHG firms in the post-131 era, which is consistent with Baiman and Verrecchia's (1996) finding that the enhanced disclosure mitigates insiders' ability to earn abnormal profits. This decrease is particularly pronounced in large firms whose segment information is more complex and difficult to disentangle, in firms not covered by analysts, and in pre-131 single-segment firms. Our results are robust to an alternative definition of insider trading activities and to alternative disaggregation measures. Overall, the results of this paper suggest that insiders use private segment information to obtain abnormal trading profits and that these profits are reduced when firms provide more segment data.

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1. Introduction

The theoretical research on insider trading suggests that the profits gained by such trading are positively associated with the degree of information asymmetry between insiders and outsiders. As formulated by Kyle (1985), insiders make positive profits by exploiting their private information before it is fully incorporated into stock prices. Baiman and Verrecchia (1996) extend Kyle's study by incorporating financial disclosure, and they show that these insider gains decrease with the disclosure of more precise information. Although this theory is compelling, empirical evidence that relates increased levels of disclosure to insider gains has to date been scant. This is partly because insiders often strategically choose disclosure policies and the timing of trades jointly to maximize trading profits, which makes it difficult to test the impact of increased disclosure on insider profits.

In this paper, we exploit a unique setting in which multi-segment firms increased their segment disclosure after the adoption of a new segment disclosure standard.[1] More specifically, we empirically test how insiders' trading profits are affected by such increased segment disclosure by comparing the trading profits of insiders around the adoption of SFAS No. 131 and address two primary questions: (1) Did multi-segment firm insiders who withheld segment data under SFAS No. 14 earn excess trading profits by exploiting the information asymmetry induced by the nondisclosure of segment information? (2) Did these excess profits decline as the firms increased their level of segment disclosure under SFAS No. 131? To answer these questions, we first identify 742 firms that changed their segment disclosure by increasing their

[1] SFAS No. 131, "Disclosures about Segments of an Enterprise and Related Information," was promulgated by the U.S. Financial Accounting Standards Board (FASB) and is effective for fiscal years starting after December 15, 1997. SFAS No. 131 superseded the previous standard, SFAS No. 14. Details are explained in section 2.

number of reported business segments (denoted hereafter as '*CHG* firms') and 1141 firms that did not change this disclosure (denoted hereafter as '*NOCHG* firms').[2] We conjecture that, in the pre-131 period, the nondisclosure of segment data contributed to the information asymmetry of *CHG* firms. Therefore, the insider profits of these firms are expected to be greater than those of the *NOCHG* firms in the pre-131 period. However, in the post-131 period, the insiders in *CHG* firms were no longer able to exploit their informational advantage to the previous extent; therefore, we expect that insiders' trading profits subsequently decreased significantly relative to those of *NOCHG* firms.

To test our hypotheses, we measure insider profits as the predictability of insider trades in the pre- and post-131 periods. We specifically examine the extent to which future abnormal returns are predicted by current insider trades. Consistent with our conjecture, we find that the trading profits of *CHG* firms are significantly greater than those of *NOCHG* firms in the pre-131 era, thus indicating that the nondisclosure of segment data is conducive to profitable insider trades. Next, we examine whether the abnormal profits realized from insider trades in *CHG* firms were reduced when these firms released segment data in the post-131 period. Relative to the change in trading profits in *NOCHG* firms, *CHG* firms did exhibit a significant decline in these profits, which is consistent with our conjecture that the enhanced disclosure of segment data mitigates insiders' ability to earn abnormal profits. This decrease is particularly pronounced in large firms whose segment information is more complex and difficult to disentangle. We also find that *CHG* firms not covered by analysts experienced a larger drop in insider profits. The information asymmetry induced by the nondisclosure of segment data in firms covered by financial analysts may be mitigated by these analysts' information searches.

[2] For example, the *CHG* firms in the sample include Abbott Laboratories, which disclosed only two segments (Pharmaceutical and Nutritional Products and Hospital and Laboratory Products) in the pre-131 era, but then began to provide financial information for six segments (Pharmaceutical products, Diagnostic products, Hospital products, Ross products, International, and Chemical and agricultural products) after the adoption of SFAS No. 131.

Therefore, insider gains in the pre-131 period may be relatively greater in firms not covered by analysts. This finding is also consistent with Ettredge et al. (2005) who find that firms not followed by analysts also experienced an increase in their future earnings response coefficient (FERC) after SFAS No. 131 went into effect. Additionally, among *CHG* firms, the decline in insider profits is more significant in the pre-131 single-segment firms than it is in the pre-131 multiple-segment firms. Overall, the findings presented in this paper suggest that managers capitalize on their private information about segment performance when they make insider transactions, but that their excess amount of insider profits declined as more disaggregated information was released after SFAS No. 131 was put in place. Our results are also consistent with prior studies on SFAS No. 131, which document a significant improvement in the disclosure of segment information and the information environment (Hermann and Thomas 2000, Street et al. 2000, Berger and Hann 2003, Botosan and Stanford 2005, Venkataraman 2001, Ettredge et al. 2005). Insiders' informational advantage is limited by a better information environment, which is evidenced by the reduced insider gains found in our results.

This paper contributes to the existing literature in several ways. First, it provides evidence that segment disclosure is a specific source of information that leads to insider gains. Aboody and Lev (2000) argue that "the specific sources of information leading to insider gains in particular and to information asymmetry in general have not been comprehensively investigated." They show that R&D information is a major contributor to information asymmetry by investigating investors' reactions to the public disclosure of insider trades and finding that they are stronger for R&D firms than they are for non-R&D firms. We extend this line of research by proposing that disaggregated business segment information is another major contributor to information asymmetry. Second, although theoretical studies on insider trading suggest a negative relationship between insiders' trading profits and information asymmetry, only a limited number of empirical studies test this fundamental hypothesis, and most of them suffer from an endogeneity problem.[3] We test this hypothesis in the natural experimental setting provided by the SFAS No.131. By using the difference-in-differences method, we avoid the endogeneity problem to a large extent and demonstrate a clear causal relationship between enhanced segment disclosure and managers' trading profits. Third, this paper also adds to the literature on SFAS No. 131. Extant studies conclude that the information environment has been significantly improved under this disclosure standard, as they find an increased number of reported segments, more line items for business segments, improved analyst forecasts, and improved stock market ability to anticipate future earnings since it was implemented. The study reported herein provides direct evidence of reduced information asymmetry under SFAS No. 131 by showing a decrease in insiders' abnormal profits. Our evidence also provides a new perspective on the role of disclosure regulation. Our identification of segment data as a source of insider information suggests a means (e.g., the enhanced disclosure of specific information) of mitigating the harmful consequences of insider trades (Aboody and Lev 2000).

The remainder of the paper is structured as follows: In Section 2, we provide the background to SFAS No. 131 and review the relevant prior research. Section 3 presents our hypotheses and empirical model. In Section 4, we describe our sample selection and present descriptive statistics and a univariate comparison. Section 5 provides the results of our multivariate tests, and Section 6 provides a series of robustness checks. The final section outlines our conclusions.

2. Background and Literature Review

[3] A number of studies investigate the relationship between managerial disclosure and trading incentives. Overall, these studies show that management's discretion allows voluntary disclosure and thus personal trading profits. Our research is different from these studies in that disclosure is an exogenous shock in our model, which allows us to successfully relate the change in disclosure to insider gains.

2.1. SFAS 131 and Its Impact on the Information Environment

SFAS No. 131, "Disclosures about Segments of an Enterprise and Related Information," was promulgated by the FASB and is effective from the fiscal year beginning after December 15, 1997. It was not the first segment disclosure standard, but superseded the previous standard, SFAS No. 14, which required firms to disclose their business segments based on the *industry approach* under which firms were required to disclose their line-of-business information classified by industry segments defined by individual products and services or groups of products or services. However, the definition of business segments in SFAS No. 14 was too broad, thus allowing firms that did not want to disclose segment information to aggregate the operating results of dissimilar segments. Financial analyst groups had criticized SFAS No. 14 for many years before it was replaced by the revised standard. For example, the Association for Investment Management and Research (AIMR) criticized the vagueness of its definition of business segments, claiming that the industry approach allowed the management of diversified companies to lump dissimilar businesses together and report all of their operations as one single, very broadly defined segment (AIMR 1993).

The new standard, in contrast, adopts the *management approach* to define an enterprise's operating segments. In this approach, segmentation is based on how management organizes the segments within an enterprise for the purposes of decision making and performance assessment. Segment information that is based on a firm's internal organizational structure allows financial reporting users to see the firm through the eyes of management, thus enhancing their ability to predict that firm's future cash flows. Moreover, segment information reported using the management approach specified by the new standard is less subject to manipulation, as firms have less discretion about segment definition. As this segment reporting is based on the internal units used by the chief decision maker to make operating decisions and evaluate enterprise performance, the information provided is more consistent with the disclosures made in the other parts of the enterprise's annual report.

Prior SFAS 131 studies report a significant improvement in the disclosure of segment information after the standard was implemented. More specifically, these studies document increases in the number of reported segments (Hermann and Thomas 2000, Street et al. 2000, Berger and Hann 2003), more line items for business segments (Street et al. 2000), improved analyst forecasts (Berger and Hann 2003, Botosan and Stanford 2005, Venkataraman 2001), and improved market ability to anticipate future earnings (Ettredge et al. 2005). For example, Berger and Hann (2003) find that newly disclosed segment data provide additional information that improves analyst forecasts of multi-segment firm earnings. Botosan and Stanford (2005) conclude that analysts are more dependent upon public information by considering changes in the weight of the public and private information included in analyst forecasts. This finding implies that more segment information became publicly available after the new standard was put in place and that analysts seem to use that information to predict firm earnings. Using the FERC, Ettredge et al. (2005) find that the stock market was able to predict the future earnings of *CHG* firms early on in the post-131 era. They conjecture that if the newly disclosed segment data are useful in predicting future earnings, then current stock prices impound more information about those earnings, and thus the association between current stock prices and the FERC should improve. Their empirical results confirm their conjecture and demonstrate that the speed with which future earnings information is incorporated into current stock prices was accelerated in the three years after the adoption of SFAS No. 131.

In summary, the findings of prior studies suggest that analysts and investors now have access to more segment data, which has led to a better information environment and reduced information asymmetry between insiders and outsiders. Although these studies have demonstrated an improved information environment, none has provided direct evidence of reduced information asymmetry between corporate insiders and outside investors. This study therefore contributes to the SFAS No. 131 literature by showing that, prior to the implementation of the new standard, corporate insiders did earn trading profits by taking advantage of the information asymmetry induced by withholding segment data and that these profits were significantly reduced after its implementation.

2.2 Information Asymmetry and Insider Trading

Insider trading generally refers to transactions made by members of top management, directors, and large shareholders with 10% or more of corporate shares. There is substantial demand for insider trading information, and information about routinely executed insider trades are regularly tracked and reported by the popular business press. Although the prior literature has shown that insiders are contrarian investors (e.g., Rozeff and Zaman 1998), it is widely accepted that they are not only contrarian investors, but rather that they possess and trade on information that is not available to outside investors. Substantial evidence has been compiled to show that one component of insider trading is motivated by informational advantage and that, in general, insider trades are followed by significant abnormal returns (e.g., see Jaffe 1974, Seyhun 1986, Damodaran and Liu 1993, Lakonishok and Lee 2001, Ke et al. 2003, Frankel and Li 2004, Piotroski and Roulstone 2005). More specifically, numerous studies show that insiders profit from their foreknowledge of various corporate events, such as earnings announcements (Copeland and Lee 1991, John and Lang 1991, Ke et al. 2003), new issue announcements (Karpoff and Lee 1991), stock repurchases (Lee et al. 1992), bankruptcy (Seyhun and Bradley 1997), and dividend announcements (John and Lang 1991).

Although numerous studies have been conducted on the insider gains obtained from such foreknowledge, the question of the information environment that is most conducive to profitable insider trades has not been well-explored.[4] Aboody and Lev's (2000) study is the only one to identify the specific *source* of information that contributes to information asymmetry and insider profits. They argue that a firm's R&D information contributes to the former, thus resulting in the latter. Insiders in firms with greater amounts of R&D activity enjoy a higher level of profits by exploiting the information asymmetry induced by that activity before stock prices are able to incorporate the implications of the R&D information fully. Our paper is closely related to Aboody and Lev's (2000) in that we introduce segment information as an alternative source of information asymmetry.[5] We argue that public information about different segments is scarce when firms do not publicly disclose disaggregated information. If firms have an incentive to withhold segment data, then important pieces of segment information, such as the capital expenditure, revenue, earnings, and R&D activity of dissimilar segments, will be aggregated, and only such aggregated information will be available to outside investors.[6] We thus hypothesize that corporate insiders in multiple-segment firms that do not provide segment data realize trading gains. We provide supporting evidence by showing that the predictive power of insider trades, which we use as a proxy for insider gains, is significantly stronger for these firms. In sum, we investigate the insider gains issue from the perspective of a specific source of information asymmetry – segment information. Our study contributes to the literature by indentifying segment data as an additional source of such asymmetry.

[4] To the best of our knowledge, only three papers link the information environment to cross-sectional differences in insider trading profits: Aboody and Lev (2000), Frankel and Li (2004), and Huddart and Ke (2007).

[5] Segment disclosure often involves the disclosure of segment R&D activity. Many firms still do not disclose R&D information at the segment level, even in the current SFAS No. 131 environment.

[6] There are competing explanations for why some multi-segment firms failed to provide segment data before the adoption of SFAS No. 131. Botosan and Stanford (2005), for example, argue that these firms aggregated their segment data to preserve a competitive edge over existing and potential competitors, whereas Berger and Hann (2003) and Hope and Thomas (2008) argue that the nondisclosure of geographic segment data is related to the agency problem, specifically, the incentive to conceal poor performance by aggregating the outcomes of poorly performing segments with those of well-performing segments.

Our paper is also related to that of Frankel and Li (2004) who investigate how insider trades are affected by financial statement informativeness, analyst following, and news coverage as specific sources of information available to outside investors. They use the R-square of a return-earnings regression as a metric of financial statement informativeness and provide evidence that firms with a high degree of disclosure quality limit insiders' ability to earn abnormal returns from insider trading. However, they find that the R-square measure becomes insignificant when they add a stock return volatility measure that interacts with net insider purchases. Our use of difference-in-differences methodology, which has much less noise, provides strong and robust evidence to show that increased financial statement informativeness reduces information asymmetry and thereby limits the ability of corporate insiders to obtain abnormal trading profits.

3. Hypothesis Development and Empirical Model

Our main research question asks whether corporate insiders capitalize on their private information about segment performance when they make insider transactions. Testing this hypothesis requires that we measure the trading profits from a given insider trade within a proper event window. Previous studies demonstrate that gains from insider trades are substantial for holding periods up to three years following such trades (e.g., Lorie and Niederhoffer 1968, Jaffe 1974, Finnerty 1976, Seyhun 1986, Lakonishok and Lee 2001, Ke et al. 2003, Frankel and Li 2004). However, Seyhun (1986) shows that most of these abnormal returns occur during the 100 trading-day period after the trades. Therefore, we use a six-month window to calculate the abnormal returns (*RET*) that follow insider trades as our measure of trading profits.[7] We obtain this measure by cumulating the buy-and-hold returns from the date of the last transaction in the event month, adjusted by subtracting the Center for Research in Security Prices (CRSP) value-weighted buy-and-hold returns.[8] [9] To measure the direction of insider trading, we use the net purchase ratio (*NPR*) in a given firm-month. *NPR* is defined as follows.

$$NPR_{it} = \frac{Purchase_{it} - Sales_{it}}{Purchase_{it} + Sales_{it}}, \tag{1}$$

where $Purchase_{it}$ ($Sales_{it}$) equals the number of purchase (sales) transactions made by firm *i* insiders during trading month *t*. This measure was first introduced by Lakonishok and Lee (2001) and subsequently used by a number of insider trading researchers (e.g., Beneish and Vargus 2002, Frankel and Li 2004, Piotroski and Roulstone 2005).[10]

To analyze the effect of segment disclosure on insider trading profits, we estimate the following regression model.

$$\begin{aligned} RET = \alpha &+ \beta_1 CHG + \beta_2 NPR + \beta_3 NPR \times CHG + \beta_4 SIZE + \beta_5 NPR \times SIZE \\ &+ \beta_6 INSHOLD + \beta_7 NPR \times INSHOLD + \beta_8 RDDUM + \beta_9 NPR \times RDDUM \\ &+ \beta_{10} MB + \beta_{11} NPR \times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR \times NUM\_SEG \\ &+ \beta_{14} ANALYST + \beta_{15} NPR \times ANALYST + \beta_{16} VOL + \beta_{17} NPR \times VOL + \varepsilon, \end{aligned} \tag{2}$$

where

RET = six-month cumulative buy-and-hold returns from the date of the last transaction in the event month, adjusted by subtracting CRSP value-weighted buy-and-hold returns;

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[7] The same window is used in a number of others studies, including those of Lakonishok and Lee (2001) and Frankel and Li (2004). We also perform robustness tests using different windows and find our main results to be robust to the length of the window.

[8] We follow Frankel and Li (2004) in choosing the last trade in the event month as the start day to measure the six-month window. Our results are very similar when we cumulate returns from the end of the event month.

[9] Lakonishok and Lee (2001) use equally weighted returns to calculate abnormal returns. Our main results remain unaffected when we use equally weighted returns as an alternative to value-weighted returns.

[10] Some of these researchers use the number of shares traded instead of the number of transactions (e.g., Beneish and Vargus 2002, Piotroski and Roulstone 2005), and we also use this alternative definition in our robustness tests (see Table 7). The results are very similar when we use the number of transactions to calculate *NPR*.

CHG	=	a dummy variable for firms that increased their number of reported segments after implementation of SFAS No. 131;
NPR	=	the net purchase ratio, defined as (1);
INSHOLD	=	the natural logarithm of the average value of the shares held by the insiders who trade in each month;
RDDUM	=	a dummy variable for R&D expenditure that takes a value of one if the firm reports R&D expenses and zero if no R&D expenses are reported or if this information is missing;
MB	=	the market-to-book ratio calculated as the market value of equity divided by the book value of equity, with both measured at the beginning of the fiscal year;
SIZE	=	the natural logarithm of the firm's market capitalization;
ANALYST	=	the number of analysts following the firm, as retrieved from the I/B/E/S summary tape;
NUM_SEG	=	the number of business segments in the firm, with all of the change and no-change firms having more than one business segment; and
VOL	=	stock return volatility, measured as the standard deviation of the daily stock returns in year t-1.

Each observation corresponds to one firm-month. *RET*, *NPR*, and *INSHOLD* are measured by firm-month, and *ANALYST*, *MB*, *RDDUM*, and *VOL* are measured by firm-fiscal year. *CHG* is included in equation (2) because it isolates the change in trading profits from the pre- and post-131 periods for firms that were unaffected by SFAS No. 131, and this acts as our control for any changes contemporaneous to SFAS No. 131 that may also have affected insider profits. We include interaction terms for all control variables with *NPR* to see how the predictive ability of insider trades is affected by each variable.

The *INSHOLD* variable is inserted to control for the potential effects of insiders' stock holdings that are not related to information asymmetry. Aboody and Lev (2000) provide evidence that R&D activities induce information asymmetry, thereby increasing insider trading profits. We thus include *RDDUM*, a dummy variable that takes a value of one for firms with R&D expenditure and of zero for those without. Prior studies have also found that insider trading is more active in growing firms in terms of trading frequency and amount. We control for this effect by adding *MB* to our model. Lakonishok and Lee (2001) show that insiders' predictive ability is more pronounced in small firms, and thus to control for this potential size effect, we add *SIZE* as a natural logarithm of the firm's market capitalization. *ANALYST*, *NUM_SEG*, and *VOL* are added to control for an information environment that is not associated with a change in segment disclosure. Frankel and Li (2004) find that insiders' ability to exploit information asymmetry is limited by the number of analysts following the firm. As the information asymmetry of complex firms may be greater, we control for this effect by using the number of a firm's business segments (*NUM_SEG*). We measure the *NUM_SEG* of *CHG* firms by using the number of business segments disclosed in the first year of the SFAS No. 131 regime and then also use this number as the number of segments in the pre-131 era. Stock return volatility (*VOL*) is added to control for the effect of uncertainty.

The goal of this paper is to determine whether insider trading profits are associated with segment disclosure. We specifically examine (1) whether the insiders in firms that withheld segment data had a higher degree of abnormal profits than those that did not and (2) whether these abnormal trading profits subsequently declined with the disclosure of segment data in the post-131 period. We thus estimate equation (2) separately using a pooled dataset before (pre) and after (post) the enactment of SFAS No. 131. The coefficient of *NPR* (β_2) measures the predictive ability of the insider trades of *NOCHG* firms, whereas $\beta_2+\beta_3$ measures the predictive ability of *CHG* firms. If the trading profits of the latter are greater than those of the former, then we should observe a positive and significant β_3. To test for the decline of the predictive power of insider trades, we compare the β_2 of the pre- and post-131 periods. β_2|post-β_2|pre < 0 would suggest the decreased predictive power of insider trades in firms affected by SFAS No. 131[11].

[11] In testing the significance of a β_2|post-β_2|pre change < 0, we employ a dichotomous variable, *POST*, which is defined as 1 in the post-131 period and as 0 in the pre-131 period. We interact *POST* with all of the variables in equation (2) and run a pooled regression using this expanded model. We then check the coefficient of *POST*×*NPR*×*CHG* to test whether the β_2|post-β_2|pre change < 0 for *CHG* firms.

4. Data and Descriptive Statistics

4.1. Sample Selection

To obtain our primary sample, we begin by identifying the firms that increased their number of business segments and those whose number of reported segments remained unchanged after the adoption of SFAS No. 131. As this standard is effective from the fiscal year beginning after December 15, 1997, new segment data are available no later than 1999. We classify the firm-years after the adoption year as post-131 years and those before the adoption year as pre-131 years. We delete the adoption year in our analysis to mitigate any potential bias resulting from insiders' opportunistic trades in the adoption year. We also deleted early adopters as they might have different incentives to do so. As our primary tests are based on monthly insider transactions, we choose the first 24 firm-months in the post-131 period and the last 24 firm-months in the pre-131 period as our main test windows.[12] Figure 1 presents the time line and the pre- and post-131 periods.

We initially obtain segment data from Compustat and then calculate the segment increases by comparing the number of business segments in the post-131 period with that in 1997. We define *CHG* firms as those firms that increased their number of reported segments and *NOCHG* firms as those that did not.[13] Our initial sample consists of 1,883 firms, of which 816 are *CHG* Firms and 1067 are *NOCHG* firms. One of the major changes that accompanied SFAS No. 131 was an increase in the number of reported segments. The results shown in Table 1 are consistent with the change documented in the existing literature. Panel A shows that less than 30% of the sample firms disclosed segment data in the pre-131 period and that the

[12] The reporting requirements for insider trading were changed after the Sarbanes-Oxley Act of 2002, which is effective for most of fiscal year 2002. Thus, our test results may be confounded by this change in reporting requirements if we use a three-year or longer period to define the pre- and post-131 periods. A long-window test could also introduce potential noise that is unrelated to either insider trades or segment disclosure. Therefore, different from Ettredge et al. (2005), we use a two-year (24-month) time period.

[13] Some pre-131 multiple-segment firms actually reduced the number of segments they reported after SFAS No. 131 was implemented. We drop these firms to avoid any confounding effects. However, very similar results are obtained if we include these samples in the *NOCHG* firm sample.

proportion of multiple-segment firms almost doubled in the post-131 period. This change is even more pronounced in the pre-131 single-segment firms. Of the 1,330 pre-131 single-segment firms, 588 (44.2%) began to report business segment data. Almost the same proportion of pre-131 multiple-segment firms (about 41%) increased their number of reported segments. Panel B reports the change in the number of reported segments. Consistent with the prior literature, more than 80% of the change firms increased this number by one or two.

We gather insider trading data for 1,883 sample firms (1,067 *NOCHG* and 816 *CHG* firms), identified as *CHG* and *NOCHG* firms for the pre- and post-131 periods. All of the insider trading data are retrieved from the Thomson Financial Insiders Database, which is the most comprehensive source of such data. Prior insider trading research argues that the insider trades made by top management are more likely to be based on valuable information and that the market response to announcements of such transactions is thus greater than that to those of other types of insider trades (Beneish and Vargus 2002, Seyhun 1986, 1998, Lin and Howe 1990). As disclosure decisions are made by management, we limit insider trades to those transactions made by the top five executives (CEO, CFO, COO, president, and chairman of the board) and consider only open-market transactions.

Panel A of Table 2 presents the aggregate insider trading data for our sample. For both the *CHG* and *NOCHG* firms, we gather 42,702 insider trades, of which 12,243 are purchase trades and 30,459 are sales trades, thus demonstrating that the latter are approximately 2.5 times more frequent than the former, which is consistent with prior research that has shown the frequency and volume of insider selling to be greater than those of insider buying (e.g., Finnerty 1976, Givoly and Palmon 1985, Seyhun 1986, Rozeff and Zaman 1998, Lakonishok and Lee 2001). The greater frequency of insider sales is partly driven by insiders' motives to diversify the large percentage of their wealth that is held in their companies' securities, which is a result of the prevalence of option- and stock-based compensation during the sample period.

Due to the greater size of the *NOCHG* firm sample, the number of insider trades made by these firms is greater than that made by the *CHG* firms. However, the average number of insider trades per firm is greater in the latter than in the former, which indicates that there was more active insider trading in the *CHG* firms in both the pre- and post-131 eras.

4.2. Insider Trading Intensity

Frankel and Li (2004) use trading frequency to measure insider trading intensity because, given the fixed transaction costs incurred in each transaction, more frequent transactions are more likely to be based on insiders' private information. However, the use of trading frequency may place too much weight on transactions that are small in size, and such transactions may not be based on any information advantage. Seyhun (1998) argues in his first chapter that there are no perfect summary statistics by which to measure insider trading intensity and suggests using volume as an alternative measure. We thus use trading volume, measured as the number of shares traded as a percentage of total shares outstanding. We also add trading value as our alternative measure of trading intensity by multiplying the number of shares traded by the closing market price on the trading date divided by the value of common stocks outstanding. Prior studies show that larger firms tend to have more insider trading activity. We therefore use size-adjusted values for both trading volume and our value measures to make our comparisons among different firm sizes more meaningful. More specifically, for each insider trade, we divide trading volume by the total number of shares outstanding on the same trading day and trading value by the market value of the firm calculated as the number of shares outstanding multiplied by the share price. We then separately aggregate all insider trades made in the pre- and post-131 periods.

In panel B of table 2, a comparison of total trading intensity between the two groups reveals that the *CHG* firms traded more in the pre-131 era than did the *NOCHG* firms. Insider sales in terms of both measures appear to have decreased for both groups of firms, although this decrease is more pronounced in the *CHG* firms. The mean sales volume of these firms is 0.721% of the number of shares outstanding in the pre-131 period and 0.404% in the post-131 period, a 0.318% decline in contrast to the 0.074% decline seen in their *NOCHG* counterparts. In the case of insider purchases, there was a slight increase after the implementation of SFAS No. 131, but the magnitude of that increase was much lower in the *CHG* firms than in the *NOCHG* firms. Overall, the results presented in panel B of table 2 indicate that enhanced segment disclosure mitigates insider trading intensity in terms of both trading volume and value.

Table 3 provides summary statistics of our study variables for *CHG* firms and *NOCHG* firms. Note that on average *CHG* firms are more R&D intensive, less growing, larger, and more analysts following than *NOCHG* firms. There is no significant difference between *CHG* firms and *NOCHG* firms for the other variables, *RET*, *NPR*, *INSHOLD*, *NUM_SEG*, and *VOL*.

5. Correlation Analysis and Multivariate Regression Results

5.1. Correlation Analysis

Table 4 presents the Pearson correlation matrix for the study variables. Panel A shows the correlations among market returns and the control variables, which are generally comparable to those documented in prior studies (e.g., Lakonishok and Lee 2001, Aboody and Lev 2000, Frankel and Li 2004). *RET* is positively associated with *NPR*, thus suggesting that insider purchases (sales) are positively (negatively) associated with trading returns of insiders.

Panel B provides the correlations between *RET* and *NPR* in more detail. These correlations in the *CHG* firms are significantly stronger in the pre-131 period, which indicates that insider trades had greater predictive power in these firms when they withheld segment information. However, the magnitude of these correlations becomes significantly weaker as the firms begin to disclose segment data in the post-131 period. The correlations between the *RET* and *NPR* of the *CHG* and *NOCHG* firms was reversed in the post-131 period. Overall, the results presented in panel B are consistent with our conjecture that management's trading profits are closely related to the public disclosure of segment information. In the next section, we conduct multivariate analysis to test this conjecture more formally.

5.2 The Effects of SFAS No. 131 on Insider Trading Profits

Table 5 provides the results of the ordinary least squares (OLS) regressions based on equation (2). While testing the main hypothesis, we are primarily interested in the coefficients on *NPR* (β_2) and *NPR×CHG* (β_3). The shift in the disclosure regime may possibly affect the other control variables and their relationship to insider trades. For example, prior research on SFAS No. 131 has identified increased forecast accuracy after its implementation (Berger and Hann 2003). In addition to the direct impact of increased segment disclosure on insider trading, there may also be an *indirect* impact through enhanced analyst activities. We thus estimate equation (2) in the pre- and post-131 periods separately to allow all of the coefficients to vary by period. To see how the relationship between segment disclosure and insider trades changes as we include various control variables, we estimate three different specification models. The first column in each model provides the estimation results for the pre-131 period. The coefficients on *NPR* (β_2) are significantly positive in this pre-131 period in the models (1) and (2). However in the model (3), it is not significant in the pre-131 period and it becomes significantly negative in the post-131 period. The positive NPR in the models (1) and (2) is consistent with prior findings that insider trades are informative in predicting cross-sectional stock returns (Lakonishok and Lee 2001). The coefficients on *NPR×CHG* (β_3) are all significantly positive for pre-131, which indicates that the insider trades of *CHG* firms have substantially greater predictive power than do those of *NOCHG* firms in the pre-131 era. This result implies that the mangers of *CHG* firms initially created a higher degree of information asymmetry through their nondisclosure of business segment data and then subsequently traded based on their superior knowledge of these segments. Note that the insider trading intensity of the *CHG* firms, in terms of trading share amount and trading value, was greater than that of the *NOCHG* firms in the pre-131 period. Taken together, the regression results for the pre-131 period suggest that the insiders in *CHG* firms earned significantly better returns by withholding segment information.

The superior predictive power of insider trades in the *CHG* firms disappears almost entirely in the post-131 era. The coefficients on $NPR \times CHG$ (β_3) are all negative and insignificant, which is consistent with our prediction that insiders' ability to earn abnormal returns is mitigated by enhanced segment disclosure. This finding is also consistent with prior studies that demonstrate that the implementation of SFAS No. 131 resulted in an improved information environment (Ettredge et al. 2005, Botosan and Stanford 2005, Berger and Hann 2003) in which analyst forecasts became more accurate and stock price informativeness measured by the *FERC* increased significantly. Baiman and Verrecchia (1996) provide a model in which insider profits decrease as public information becomes more precise. The results presented in Table 5 provide direct empirical evidence to support their model. The profitability of insider trades decreases significantly as *CHG* firms release more precise segment information in the post-131 period.

5.3 Differential Effects of SFAS No. 131 on Insider Trading Profits

Previous research has found that insider trades are generally profitable. Jaffe (1974), Finnerty (1976), Seyhun (1986, 1992), Rozeff and Zaman (1998), and Jeng et al. (2003) find that insiders outperform the stock market. More recently, Lakonishok and Lee (2001) reported that insider purchases in smaller firms are able to predict future returns, but that this predictive power fails to hold in larger firms. Similarly, Finnerty (1976) and Seyhun (1986) find that insider profits are greater for smaller firms. Numerous other papers also suggest that size proxies for the amount of public information available about a firm in the equity market (e.g., Grant 1980, Atiase 1985, Collins et al. 1987, Freeman 1987, Bhushan 1989). Given these findings, it is worthwhile to examine whether our primary results are affected by firm size. We do so by estimating our regression model separately for small and large firms classified by median firm size.

Table 6 presents the estimation results for the two different groups partitioned by median firm size. For brevity, only the coefficients on *NPR* (β_2) and *NPR×CHG* (β_3) are provided. Consistent with Lakonishok and Lee (2001), Finnerty (1976), and Seyhun (1986), we find that the insider profits of relatively small firms, measured as ($\beta_2+\beta_3$), are significantly greater than those of relatively large firms. Additionally, we find that, in the pre-131 period, the β_3 of small firms is slightly higher than that of large firms, which implies that the insider gains of small *CHG* firms are slightly greater than those of large *CHG* firms. This finding is also consistent with the prior literature reporting that the information asymmetry of small firms is generally greater than that of larger firms. Elliott, Morse, and Richardson (1984) hypothesize that because fewer analysts follow small firms, the stock prices of these firms do not completely reflect information about intrinsic firm value; thus, insiders in these firms are more successful in realizing gains using their private information on intrinsic firm value. Although the insider gains in the pre-131 era disappear in the post-131 era, that disappearance is primarily driven by the relatively large firms. The change in the magnitude of the coefficient on *NPR×CHG* ($\Delta\beta_3$) is significantly negative (-0.105), which suggests that the nondisclosure of segment information creates more information asymmetry in the case of large firms. Such firms tend to have more segments in dissimilar industries, and thus the disclosure of segment information may reduce that asymmetry more significantly in these firms.

Table 6 also presents the estimation results for different groups classified using analyst coverage (data for which are obtained from I/B/E/S) and the pre-131 status of the *CHG* firms. These results show that the predictability of insider trades of *CHG* firms compared with *NOCHG* firms before the enforcement of SFAS No. 131 was greater among firms with no analyst coverage and among pre-131 single-segment firms. The coefficient on *NPR* (β_2) for the firms without analyst coverage in the pre-131 era is positive and significant, whereas that on the same variable (β_2) for firms with such coverage is smaller and insignificant. The information asymmetry induced by the nondisclosure of segment data may thus be mitigated by analyst information searches in those firms covered by financial analysts. Frankel and Li (2004) document the limitations on insider profits that result from analyst activities. Berger and Hann (2003) also show that part of the new segment information produced under the SFAS No. 131 regime was available to analysts in the pre-131 era. Therefore, insider gains in the pre-131 period may be relatively greater among firms not covered by analysts. This finding is also consistent with that of Ettredge et al. (2005), who find that firms without an analyst following also experienced an increase in their FERC in the SFAS No. 131 environment. Additionally, among the *CHG* firms, the decline in insider profits is more significant in the pre-131 single-segment firms than it is in the pre-131 multiple-segment firms, which suggests that segment data contribute more to information asymmetry among firms that changed from single- to multiple-segment status than among those that changed by altering the number of their multiple segments.

6. Robustness tests

6.1 Alternative Measure of Net Purchase Ratio (NPR)

We earlier defined *NPR* by using the *frequency* of purchases and sales and measured insiders' share purchases relative to their share sales. Whereas an *NPR* measure constructed using the frequency of trades is used by Lakonishok and Lee (2001) and Frankel and Li (2005), other studies construct this measure using the trading volume (the number of shares sold or purchased) in a given trading period (Beneish and Vargus 2002, Core et al. 2006, Rozeff and Zaman 1998, Piotroski and Roulstone 2005). We therefore use this alternative *NPR* measure, defined as follows, and re-estimate equation (2).

$$NPR_{it} = \frac{Number\ of\ Shares\ Purchased_{it} - Number\ of\ Shares\ Sold_{it}}{Number\ of\ Shares\ Purchased_{it} + Number\ of\ Shares\ Sold_{it}}. \quad (3)$$

The results are presented in Table 7. The coefficient on *CHG×NPR* is significantly positive in the pre-131 regression and subsequently becomes insignificant in the post-131 period in both specifications. This decrease in the magnitude of the coefficient on *CHG×NPR* is significant. Overall, the results shown in this table indicate that our main findings are robust to the alternative *NPR* measure.

6.2 Alternative Measures of Disaggregation (CHG)

Thus far, we have focused on *CHG* as a dichotomous variable to identify firms affected and not affected by the new disclosure rule. Although *CHG* serves as a good measure of disaggregation, it may be a crude proxy for the change in the *level* of segment reporting. We therefore use three alternative disaggregation measures – *DISAGG*, *HERF*, and *NSEG* – following Berger and Hann (2003). The definition of each of these variables is as follows.

DISAGG	=	number of segments/number of different two-digit SIC codes the firm operates in during the reporting year
HERF	=	the revenue-based Herfindahl index calculated as $\sum_{i=1}^{n}(Sales_i)^2 / \left(\sum_{i=1}^{n} Sales_i\right)^2$, where $Sales_i$ is segment *i*'s sales revenue
NSEG	=	number of reported segments

DISAGG was first introduced by Piotroski (2002) as a measure of disaggregation and subsequently used in a number of other studies (e.g., Berger and Hann 2003, Bens and Monahan 2004, Ettredge et al. 2005). The greater *DISAGG* is, the greater the number of reported segments is relative to the number of business activities. The greater *NSEG* is, the greater the number of *reported* segments is. However, a higher Herfindahl index (*HERF*) indicates a less diversified firm. In sum, a greater *DISAGG* and *NSEG* and a lower *HERF* mean that more disaggregated information is reported. After measuring these three alternative variables for the pre- and post-131 periods, we calculate their *change* by taking the difference between the two periods. More specifically, we calculate the difference in the variables as $\Delta DISAGG = DISAGG_{post} - DISAGG_{pre}$; $\Delta HERF = HERF_{pre} - HERF_{post}$; and $\Delta NSEG = NSEG_{post} - NSEG_{pre}$. Finally, we plug in $\Delta DISAGG$, $\Delta HERF$, and $\Delta NSEG$ to replace *CHG*.

Table 8 presents the regression results. In general, the regression results using these alternative disaggregation measures corroborate our earlier results. The coefficients on $\Delta DISAGG \times NPR$ and $\Delta HERF \times NPR$ before the adoption of SFAS No. 131 are significantly positive and subsequently become insignificant in the post-131 period. The effect of the aggregation of segment information is not as strong when we use the change in the number of reported segments ($\Delta NSEG$). The coefficient on $\Delta NSEG \times NPR$ remains positive, but is insignificant. Table 8 also shows that the predictive power of insider trades declines as a company increases the *level* of information disaggregation. In all of the specifications, the post-131 period estimation suggests that there is no systematic difference in insider trading profits along with the level of information disaggregation. Collectively, the results in this table provide strong support for our primary results.

7. Conclusion

In this paper, we ask two important questions: (1) Do insiders obtain abnormal profits from insider trades by utilizing the information asymmetry that is induced by the non-disclosure of segment information? (2) If they do, then was their ability to do so mitigated by the enhanced disclosure of segment data required by the SFAS No. 131? We find that insiders' trading profits, as measured by the trading predictability of firms that began to provide segment data after the adoption of SFAS No. 131, declined both economically and statistically compared to those in firms unaffected by the new rule. We also find that this decrease in insider gains is more pronounced in large firms whose segment information is more complex and difficult to disentangle, in firms with no analyst coverage, and in pre-131 single-segment firms. Overall, the results presented in this paper suggest that insiders use private segment information to obtain abnormal trading profits and that these profits are reduced once firms begin to provide more segment data. This study is unique in that we provide direct evidence to support the findings of Baiman and Verrecchia (1996) and show that a firm's disclosure strategy is closely related to its degree of insider trading.

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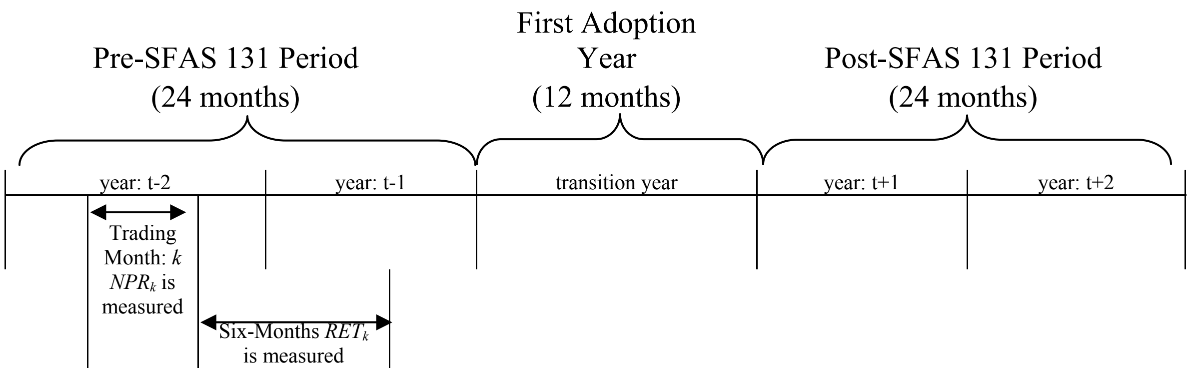
Figure 1

Definition of Sample Periods



Pre-SFAS 131 period: Two-year fiscal period (24 firm months) before the first adoption year.
Post-SFAS 131 period: Two-year fiscal period (24 firm months) after the first adoption year.

Table 1
Changes in Segment Reporting after SFAS 131

Panel A: Segment Reporting Status in Pre- versus Post-131 Eras

	Post-SFAS 131 Era		
	Single Segment	Multiple Segments	Total
Pre-SFAS 131 Era			
Single Segment	742	588	1330
	(55.8%)	(44.2%)	(70.6%)
Multiple Segments	0	553	553
	(0.0%)	(100.0%)	(29.4%)
Total	742	1141	1883
	(39.4%)	(60.6%)	(100.0%)

Panel B: Changes in the Number of Reported Segments

	Number of Increased Segments after SFAS 131						
	NOCHG Firm	*CHG Firm*					*Total*
	0	1	2	3	4	> = 5	*CHG Firm*
Pre-131 Reporting Status							
Single Segment	742	240	214	78	34	22	588
Multiple Segments	325	120	57	32	9	10	228
No. of Firms	1067	360	271	110	43	32	816
Percent	56.66	19.12	14.39	5.84	2.28	1.71	43.34

Panel A presents the number of single- and multiple-segment firms in the pre- and post-131 eras. The sample consists of 1,883 firms that had insider transactions in the 11,716 trading months between 1996 and 2001. These firms are required to have had at least one insider transaction in both periods. Panel B presents the two-way distribution of the sample firms according to the number of segments after the adoption of SFAS No. 131 and the pre-131 reporting status. CHG firms are defined as those that increased their number of reported business segments in the post-131 era. NOCHG firms are defined as those with no change in the number of reported segments in the post-131 era.

Table 2
Insider Trading in Pre- and Post-SFAS 131 Eras

Panel A: Aggregate Insider Trading Frequencies in Pre- versus and Post-131 Eras

	Total	*NOCHG* Firms (N = 1067)		*CHG* Firms (N = 816)	
		Pre-SFAS131	Post-SFAS131	Pre-SFAS131	Post-SFAS131
Trading Months	11716	3263	3357	2550	2546
# of trades	42702	10118	13908	8641	10035
# of purchases	*12243*	*2862*	*4029*	*1916*	*3436*
# of sales	*30459*	*7256*	*9879*	*6725*	*6599*
# of trades per sample firm	15.83	5.37	7.39	10.59	12.30
# of purchases	*4.54*	*1.52*	*2.14*	*2.35*	*4.21*
# of sales	*11.29*	*3.85*	*5.25*	*8.24*	*8.09*

Panel B: Average Insider Trading Activities in Pre- versus and Post-131 Eras

	NOCHG Firms (N = 1067)			*CHG* Firms (N = 816)			Diff (2)-(1)
	Pre -SFAS131	Post -SFAS131	Post-Pre (1)	Pre -SFAS131	Post -SFAS131	Post-Pre (2)	
Purchase Share (%)	0.122	0.150	0.028	0.173	0.187	0.014	-0.014
Purchase Value (%)	0.119	0.151	0.032	0.173	0.191	0.018	-0.014
Sales Share (%)	0.349	0.275	-0.074	0.721	0.404	-0.318	-0.244
Sales Value (%)	0.356	0.297	-0.059	0.746	0.444	-0.302	-0.243
Trading Share (%)	0.471	0.426	-0.046	0.894	0.591	-0.303	-0.257
Trading Value (%)	0.475	0.448	-0.027	0.920	0.635	-0.284	-0.257

The sample consists of 11,716 firm months with insider transaction(s) 24 firm months before and after the adoption of SFAS No. 131. Panel A provides the insider trading frequencies in the pre- and post-131 eras. The number of trades per sample firm is obtained by dividing total transactions by the number of firms. Panel B presents insider trading intensity using (1) trading volume and (2) trading value. Both variables are size-adjusted to make a comparison among the different firm sizes more meaningful. Trading volume is measured as the number of shares traded as a percentage of the total shares outstanding. Trading value is measured by multiplying the number of shares traded by the closing market price on the trading date divided by the value of common stock outstanding. Each trade is aggregated separately for the pre- and post-131 periods.

Table 3
Summary Statistics for the Study Variables

	(1) *CHG* Firms			(2) *NOCHG* Firms			(1)-(2)	(1)-(2)
	Mean	Median	Std Dev	Mean	Median	Std Dev	Mean	Median
RET	0.049	-0.010	0.472	0.050	-0.012	0.483	0.001	0.002
NPR	-0.230	-1.000	0.963	-0.203	-1.000	0.969	-0.027	0.000
INSHOLD	13.852	14.410	4.082	13.714	14.454	3.873	0.138	-0.044
RDDUM	0.474	0.000	0.499	0.443	0.000	0.497	0.031***	0.000***
MB	2.371	1.606	3.012	2.609	1.721	2.823	-0.238***	-0.114***
SIZE	6.464	6.386	2.307	5.975	5.967	2.195	0.490***	0.419***
ANALYST	1.624	1.792	1.094	1.497	1.609	1.097	0.128***	0.182***
NUM_SEG	3.397	3.000	1.389	1.473	1.000	0.973	1.924	2.000
VOL	0.039	0.035	0.020	0.037	0.032	0.021	0.002	0.002

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed.

Variable definitions:

RET	=	six-month cumulative buy-and-hold returns from the date of the last transaction in the event month, adjusted by subtracting CRSP value-weighted buy-and-hold returns
CHG	=	a dummy variable for firms that increased their number of reported segments after implementation of SFAS No. 131
NPR	=	the net purchase ratio defined as (1)
INSHOLD	=	the natural logarithm of the average value of shares held by the insiders who trade in each month
RDDUM	=	a dummy variable for R&D expenditure that takes a value of one if the firm reported R&D expenses and zero if it did not or if the information on these expenses is missing
MB	=	market-to-book ratio calculated as the market value of equity divided by the book value of equity, both measured at the beginning of the fiscal year
SIZE	=	the natural logarithm of the firm's market capitalization
ANALYST	=	the number of analysts following a firm, based on data retrieved from the I/B/E/S summary tape
NUM_SEG	=	the number of a firm's business segments, with all change and no change firms having more than one such segment
VOL	=	stock return volatility measured as the standard deviation of the daily stock returns in year *t*-1.

Each observation corresponds to one firm-month. *RET*, *NPR*, and *INSHOLD* are measured by firm-month. *ANALYST*, *MB*, *RDDUM*, and *VOL* are measured by the firm-fiscal year.

Table 4
Correlation Matrix

Panel A: Pearson Correlations of the Study Variables

	RET	*CHG*	*NPR*	*INSHOLD*	*RDDUM*	*MB*	*SIZE*	*ANALYST*	*NUM_SEG*
CHG	0.001								
	(0.92)								
NPR	0.081	-0.014							
	(0.00)***	(0.13)							
SIZE	0.056	0.108	-0.430						
	(0.00)***	(0.00)***	(0.00)***						
INSHOLD	-0.001	0.017	-0.171	0.285					
	(0.93)	(0.06)*	(0.00)***	(0.00) ***					
RDDUM	0.019	0.031	-0.090	0.062	-0.013				
	(0.04)**	(0.00)***	(0.00)***	(0.00)***	(0.14)				
MB	0.199	-0.041	-0.238	0.303	0.149	0.254			
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***			
NUM_SEG	-0.013	0.631	-0.001	0.265	0.008	0.004	-0.106		
	(0.16)	(0.00)***	(0.88)	(0.00)***	(0.37)	(0.68)	(0.00)***		
ANALYST	0.016	0.058	-0.362	0.765	0.233	0.042	0.197	0.121	
	(0.08)*	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	
VOL	0.040	-0.051	0.155	-0.464	-0.093	0.189	0.103	-0.216	-0.352
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***

Panel B: Pearson Correlations between Returns and NPR in the Change versus No-Change Firms

	RET		*DIFF*
	NOCHG	*CHG*	*CHG-NOCHG*
NPR	0.039	0.100	0.061
(Pre-SFAS 131)	(0.03) **	(< 0.01)***	(< 0.01) ***
NPR	0.075	0.064	-0.011
(Post-SFAS 131)	(< 0.01) ***	(< 0.01) ***	(< 0.01) ***
Change	0.036	-0.036	-0.072

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed. P-values are in parentheses.
The variable definitions are provided in Table 3.

Table 5
Changes in the Predictability of Insider Trades between the Change and No-Change Firms

	MODEL 1			MODEL 2			MODEL 3		
	PRE	POST	POST-PRE	PRE	POST	POST-PRE	PRE	POST	POST-PRE
CHG	0.020	-0.008	-0.028	0.017	0.036	0.019	0.018	0.042	0.024
	(1.85)*	(-0.54)	(-1.54)	(1.24)	(1.92)*	(0.84)	(1.34)	(2.27)**	(1.05)
NPR	0.015	0.041	0.026	0.063	0.035	-0.028	-0.041	-0.125	-0.084
	(2.08)**	(4.33)***	(2.16)**	(2.68)***	(1.13)	(-0.73)	(-0.93)	(-3.10)***	(-1.40)
NPR×CHG	0.025	-0.005	-0.030	0.035	-0.016	-0.051	0.032	-0.025	-0.057
	(2.22)**	(-0.31)	(-1.58)*	(2.60)***	(-0.84)	(-2.20)**	(2.31)**	(-1.31)	(-2.42)***
SIZE				0.022	-0.002	-0.024	0.030	0.013	-0.017
				(7.41)***	(-0.52)	(-4.98)***	(5.61)***	(2.04)**	(-2.10)**
NPR×SIZE				-0.003	-0.010	-0.007	0.009	0.000	-0.009
				(-0.91)	(-2.60)***	(-1.48)	(1.59)	(0.04)	(-1.07)
INSHOLD				-0.002	-0.004	-0.002	-0.002	-0.004	-0.002
				(-1.30)	(-2.29)**	(-0.91)	(-1.20)	(-2.25)**	(-1.04)
NPR×INSHOLD				-0.001	0.000	0.001	-0.001	0.000	0.001
				(-0.93)	(0.20)	(1.30)	(-0.92)	(0.01)	(0.32)
RDDUM				-0.041	-0.012	0.029	-0.036	-0.004	0.032
				(-3.44)***	(-0.77)	(1.52)	(-3.02)***	(-0.25)	(1.71)*
NPR×RDDUM				0.028	0.050	0.022	0.024	0.029	0.005
				(2.37)**	(3.34)***	(1.15)	(1.97)**	(1.92)*	(0.24)
MB				0.029	0.065	0.036	0.028	0.062	0.034
				(5.15)***	(8.42)***	(3.69)***	(5.08)***	(7.85)***	(3.58)***
NPR×MB				0.006	0.030	0.024	0.002	0.025	0.023
				(0.99)	(3.88)***	(6.17)***	(0.32)	(3.17)***	(4.45)***
NUM_SEG				0.001	-0.010	-0.011	-0.001	-0.015	-0.014
				(0.12)	(-1.77)*	(-1.45)	(-0.24)	(-2.53)**	(-1.83)*
NPR×NUM_SEG				-0.005	0.012	0.017	-0.005	0.017	0.022
				(-1.13)	(2.08)**	(2.37)***	(-1.08)	(2.90)***	(2.91)***
ANALYST							-0.013	-0.033	-0.020

							(-2.07)**	(-2.94)***	(-1.56)*
NPR×ANALYST							-0.003	0.006	0.009
							(-0.51)	(0.54)	(0.72)
VOL							0.054	-0.457	-0.511
							(0.10)	(-0.96)	(-0.71)
NPR×VOL							1.568	2.583	1.015
							(2.69)***	(5.31)***	(1.34)
CONSTANT	-0.021	0.128	0.149	-0.169	0.068	0.237	-0.196	0.063	0.259
	(-2.91)***	(13.51)***	(12.48)***	(-7.29)***	(2.22)**	(6.17)***	(-4.61)***	(1.59)	(4.45)***
N	5813	5903		5813	5903		5813	5903	
Adj. R-square	0.01	0.01		0.04	0.09		0.05	0.09	

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed.
The variable definitions are provided in Table 3.

Model 1: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \varepsilon$

Model 2: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \beta_4 SIZE + \beta_5 NPR\times SIZE + \beta_6 INSHOLD + \beta_7 NPR\times INSHOLD + \beta_8 RDDUM + \beta_9 NPR\times RDDUM + \beta_{10} MB + \beta_{11} NPR\times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR\times NUM\_SEG + \varepsilon$

Model 3: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \beta_4 SIZE + \beta_5 NPR\times SIZE + \beta_6 INSHOLD + \beta_7 NPR\times INSHOLD + \beta_8 RDDUM + \beta_9 NPR\times RDDUM + \beta_{10} MB + \beta_{11} NPR\times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR\times NUM\_SEG + \beta_{14} ANALYST + \beta_{15} NPR\times ANALYST + \beta_{16} VOL + \beta_{17} NPR\times VOL + \varepsilon$

Table 5 presents the cross-sectional OLS regression results of the aforementioned models estimated separately in the pre- and post-131 eras. The first column reports the regression results of the models in the pre-131 period and the second column those of the models in the post-131 period. The third column reports the change in the coefficients estimated in the pre- and post-131 periods. To test the significance of the change in each coefficient, we construct a model by interacting all of the control variables with a dummy variable, *POST*, that takes a value of one if the trading month belongs to the post-131 period and is zero otherwise, and then estimate the model for both periods. We then take the t-statistics of each variable that interacts with *POST* as the t-statistics of the change in the coefficients.

Table 6
Changes in the Predictability of the Insider Trades in Different Subsamples

	Small Firms (N = 5858)			Large Firms (N = 5858)		
	Pre	Post	Post-Pre	Pre	Post	Post-Pre
NPR	0.131***	0.005	-0.126**	0.087	0.009	-0.078
	(3.50)	(0.09)	(-1.83)	(1.53)	(0.15)	(-0.94)
NPR×CHG	0.039**	0.042	0.003	0.033**	-0.071***	-0.103***
	(1.96)	(1.26)	(1.07)	(1.97)	(-2.96)	(-3.52)
N	3114	2744		2699	3159	
Adj. R-square	0.04	0.09		0.06	0.11	

	Firms with No Analyst Coverage (N = 2589)			Firms with Analyst Coverage (N = 9127)		
	Pre	Post	Post-Pre	Pre	Post	Post-Pre
NPR	0.055***	0.032	-0.022	0.081***	-0.022	-0.103**
	(1.32)	(0.45)	(-0.27)	(2.54)	(-0.63)	(-2.17)
NPR×CHG	0.103***	0.022	-0.081*	0.009	-0.013	-0.022
	(3.63)	(0.45)	(-1.65)	(0.57)	(-0.61)	(-0.83)
N	1545	1044		4268	4859	
Adj. R-square	0.05	0.11		0.04	0.09	

	Pre-131 Single-segment Firms (N = 8543)			Pre-131 Multiple-segment Firms (N = 3173)		
	Pre	Post	Post-Pre	Pre	Post	Post-Pre
	0.091***	-0.001	-0.092**	-0.008	0.151**	0.160**
NPR	(3.19)	(-0.03)	(-2.04)	(-0.18)	(2.43)	(2.00)
	0.037*	-0.020	-0.057	0.025	-0.002	-0.027
NPR×CHG	(1.76)	(-0.58)	(-1.55)	(1.08)	(-0.08)	(-0.75)
N	4241	4302		1572	1601	
Adj. R-square	0.04	0.09		0.06	0.07	

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed. The variable definitions are provided in Table 3.

Model: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \beta_4 SIZE + \beta_5 NPR\times SIZE + \beta_6 INSHOLD + \beta_7 NPR\times INSHOLD + \beta_8 RDDUM + \beta_9 NPR\times RDDUM + \beta_{10} MB + \beta_{11} NPR\times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR\times NUM\_SEG + \varepsilon$,

Table 6 presents the cross-sectional OLS regression results of the aforementioned model estimated separately for the pre- and post-131 eras. The first column reports the regression results of the model in the pre-131 period and the second column those of the model in the post-131 period. The third column reports the change in the coefficients estimated in the pre- and post-131 periods. To test the significance of the change in each coefficient, we construct a model by interacting all of the control variables with a dummy variable, *POST*, that takes a value of one if the trading month belongs to the post-131 period and is zero otherwise, and then estimate the model for both periods. We then take the t-statistics of each variable that interacts with *POST* as the t-statistics of the change in the coefficients. The coefficients on the other variables are omitted for brevity.

Table 7
Robustness Test: Regression Using Alternative Definition of NPR

	MODEL 2			MODEL 3		
	PRE	POST	POST-PRE	PRE	POST	POST-PRE
CHG	0.017	0.036	0.019	0.018	0.042	0.024
	(1.24)	(1.93)*	(0.83)	(1.34)	(2.28)**	(1.05)
NPR	0.063	0.033	-0.030	-0.042	-0.123	-0.081
	(2.68)***	(1.09)	(-0.76)	(-0.96)	(-3.07)***	(-1.37)
NPR× CHG	0.035	-0.014	-0.049	0.031	-0.023	-0.054
	(2.58)***	(-0.75)	(-2.12)**	(2.29)**	(-1.23)	(-2.34)**
SIZE	0.022	-0.002	-0.024	0.03	0.013	-0.017
	(7.36)***	(-0.52)	(-4.96)***	(5.61)***	(2.04)**	(-2.07)**
NPR×SIZE	-0.002	-0.010	-0.008	0.009	0.000	-0.009
	(-0.83)	(-2.53)**	(-1.47)	(1.68)*	(0.03)	(-1.12)
INSHOLD	-0.002	-0.004	-0.002	-0.002	-0.004	-0.002
	(-1.36)	(-2.27)**	(-0.97)	(-1.26)	(-2.24)**	(-1.00)
NPR×INSHOLD	-0.002	0.000	0.002	-0.002	0.000	0.002
	(-1.06)	(0.15)	(0.07)	(-1.04)	(0.06)	(0.59)
RDDUM	-0.04	-0.011	0.029	-0.036	-0.004	0.032
	(-3.40)***	(-0.74)	(1.53)	(-2.96)***	(-0.24)	(1.68)*
NPR×RDDUM	0.029	0.052	0.023	0.025	0.031	0.006
	(2.41)**	(3.45)***	(1.22)	(2.02)**	(2.07)**	(0.33)
MB	0.03	0.065	0.035	0.028	0.062	0.034
	(5.12)***	(8.31)***	(3.64)***	(5.05)***	(7.72)***	(3.52)**
NPR×MB	0.006	0.03	0.024	0.002	0.025	0.023
	(1.04)	(3.82)***	(2.47)**	(0.36)	(3.13)***	(2.38)**
NUM_SEG	0.000	-0.01	-0.010	-0.001	-0.015	-0.014
	(0.10)	(-1.76)*	(-1.44)	(-0.24)	(-2.50)**	(-1.80)
NPR×NUM_SEG	-0.006	0.012	0.018	-0.005	0.017	0.022
	(-1.20)	(2.06)**	(2.36)**	(-1.05)	(2.87)***	(2.90)***
ANALYST				-0.013	-0.033	-0.020
				(-2.10)**	(-2.93)***	(-1.54)
NPR×ANALYST				-0.004	0.006	0.010
				(-0.59)	(0.55)	(0.77)
VOL				0.031	-0.433	-0.464
				(0.06)	(-0.91)	(-0.64)
NPR×VOL				1.57	2.537	0.967
				(2.74)***	(5.23)***	(1.29)
CONSTANT	-0.167	0.068	0.235	-0.194	0.062	0.256
	(-7.22)***	(2.21)**	(1.22)	(-4.56)***	(1.54)	(4.37)***
N	5813	5903		5813	5903	
Adj. R-square	0.04	0.09		0.05	0.09	

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed. The variable definitions, except for that of *NPR*, are provided in Table 3.

NPR is the net purchase ratio and is defined as

$$NPR_{it} = \frac{Number\ of\ Shares\ Purchased_{it} - Number\ of\ Shares\ Sold_{it}}{Number\ of\ Shares\ Purchased_{it} +\ Number\ of\ Shares\ Sold_{it}}.$$

Model 2: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \beta_4 SIZE + \beta_5 NPR\times SIZE + \beta_6 INSHOLD + \beta_7 NPR\times INSHOLD + \beta_8 RDDUM + \beta_9 NPR\times RDDUM + \beta_{10} MB + \beta_{11} NPR\times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR\times NUM\_SEG + \varepsilon$

Model 3: $RET = \alpha + \beta_1 CHG + \beta_2 NPR + \beta_3 NPR\times CHG + \beta_4 SIZE + \beta_5 NPR\times SIZE + \beta_6 INSHOLD + \beta_7 NPR\times INSHOLD + \beta_8 RDDUM + \beta_9 NPR\times RDDUM + \beta_{10} MB + \beta_{11} NPR\times MB + \beta_{12} NUM\_SEG + \beta_{13} NPR\times NUM\_SEG + \beta_{14} ANALYST + \beta_{15} NPR\times ANALYST + \beta_{16} VOL + \beta_{17} NPR\times VOL + \varepsilon$

Table 7 presents the cross-sectional OLS regression results of the foregoing models using an alternatively defined *NPR* measure estimated separately in the pre- and post-131 eras. The first column reports the regression results of the models in the pre-131 period and the second column those of the models in the post-131 period. The third column reports the change in the coefficients estimated in the pre- and post-131 periods. To test the significance of the change in each coefficient, we construct a model by interacting all of the control variables with a dummy variable, *POST*, that takes a value of one if the trading month belongs to the post-131 period and is zero otherwise, and then estimate the model in both periods. We then take the t-statistics of each variable that interacts with *POST* as the t-statistics of the change in the coefficients.

Table 8
Robustness Test: Regression Using Alternative Definitions for the Change Firms

	ΔDISAGG			*ΔHERF*			*ΔNSEG*		
	PRE	POST	POST-PRE	PRE	POST	POST-PRE	PRE	POST	POST-PRE
DISAGG (or HERF, NSEG)	-0.003	0.024	0.027	-0.056	-0.052	0.004	-0.008	-0.001	0.007
	[-0.23]	[1.65]*	[1.37]	[-2.11]**	[-1.41]	[0.07]	[-1.26]	[-0.15]	[0.71]
NPR	0.065	0.034	-0.031	0.061	0.030	-0.031	0.068	0.031	-0.037
	[2.78]***	[1.10]	[-0.82]	[2.57]**	[0.97]	[-0.79]	[2.89]***	[0.99]	[-0.97]
NPR× ΔDISAGG (or ΔHERF, ΔNSEG)	0.031	-0.020	-0.051	0.098	0.012	-0.086	0.010	-0.006	-0.016
	[2.35]**	[-1.42]	[-2.64]***	[3.67]***	[0.33]	[-1.86]*	[1.56]	[-0.79]	[-1.61]*
SIZE	0.022	-0.002	-0.024	0.022	-0.002	-0.024	0.021	-0.003	-0.024
	[7.21]***	[-0.58]	[-4.96]***	[7.22]***	[-0.56]	[-4.92]***	[7.04]***	[-0.76]	[-4.98]***
NPR×SIZE	-0.002	-0.010	-0.008	-0.002	-0.008	-0.007	-0.003	-0.010	-0.007
	[-0.81]	[-2.59]***	[-1.52]	[-0.56]	[-2.16]**	[-1.34]	[-1.00]	[-2.52]**	[-1.35]
INSHOLD	-0.002	-0.004	-0.002	-0.002	-0.004	-0.002	-0.002	-0.004	-0.002
	[-1.25]	[-2.25]**	[-1.02]	[-1.32]	[-2.32]**	[-1.02]	[-1.22]	[-2.19]**	[-1.22]
NPR×INSHOLD	-0.001	0.000	0.001	0.001	0.000	-0.001	-0.001	0.000	0.001
	[-0.99]	[0.22]	[0.78]	[0.96]	[0.12]	[-0.96]	[-0.96]	[0.21]	[0.76]
RDDUM	-0.039	-0.010	0.029	-0.037	-0.010	0.027	-0.040	-0.010	0.030
	[-3.32]***	[-0.69]	[1.52]	[-3.06]***	[-0.65]	[1.40]	[-3.35]***	[-0.68]	[1.55]
NPR×RDDUM	0.030	0.050	0.020	0.029	0.049	0.019	0.029	0.05	0.021
	[2.51]**	[3.29]***	[1.02]	[2.42]**	[3.21]***	[1.00]	[2.40]**	[3.31]***	[1.10]
MB	0.029	0.065	0.036	0.031	0.065	0.034	0.030	0.065	0.035
	[5.06]***	[8.44]***	[3.68]***	[4.97]***	[7.93]***	[3.31]***	[5.12]***	[8.46]***	[3.66]***
NPR×MB	0.005	0.030	0.025	-0.007	-0.030	-0.023	0.006	0.030	0.024
	[0.92]	[3.87]***	[2.54]***	[-1.06]	[-3.63]***	[-2.25]**	[0.93]	[3.87]***	[2.52]***
NUM_SEG	0.005	-0.007	-0.012	-0.002	-0.006	-0.004	0.01	-0.001	-0.011
	[0.86]	[-1.34]	[-1.54]	[-0.40]	[-1.18]	[-0.62]	[1.61]	[-0.23]	[-1.28]
NPR×NUM_SEG	-0.004	0.012	0.016	0.006	-0.007	-0.013	-0.004	0.012	0.016
	[-0.84]	[2.40]**	[2.27]**	[1.34]	[-1.42]	[-1.96]**	[-0.65]	[1.93]*	[1.84]*
CONSTANT	-0.170	0.068	0.238	-0.163	0.069	0.232	-0.174	0.067	0.241
	[-7.34]***	[2.25]**	[6.24]***	[-7.01]***	[2.26]**	[6.04]***	[-7.46]***	[2.17]**	[6.25]***
N	5813	5903		5751	5848		5813	5903	
Adj. R-square	0.05	0.09		0.05	0.08		0.04	0.09	

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. The tests are two-tailed.

DISAGG	=	number of segments/number of different two-digit SIC codes the firm operates in during the reporting year
HERF	=	the revenue-based Herfindahl index calculated as $\sum_{i=1}^{n}(Sales_i)^2 / \left(\sum_{i=1}^{n} Sales_i\right)^2$, where $Sales_i$ is segment i's sales revenue
NSEG	=	the number of reported segments

The definitions of the other variables are provided in Table 3.

Model 1: $RET = \alpha + \beta_1\, \Delta DISAGG + \beta_2 NPR + \beta_3 NPR \times \Delta DISAGG + \beta_4 SIZE + \beta_5 NPR \times SIZE + \beta_6 INSHOLD$
$+ \beta_7 NPR \times INSHOLD + \beta_8 RDDUM + \beta_9 NPR \times RDDUM + \beta_{10} MB + \beta_{11} NPR \times MB$
$+ \beta_{12} NUM\_SEG + \beta_{13} NPR \times NUM\_SEG + \varepsilon$

Model 2: $RET = \alpha + \beta_1\, \Delta HERF + \beta_2 NPR + \beta_3 NPR \times \Delta HERF + \beta_4 SIZE + \beta_5 NPR \times SIZE + \beta_6 INSHOLD$
$+ \beta_7 NPR \times INSHOLD + \beta_8 RDDUM + \beta_9 NPR \times RDDUM + \beta_{10} MB + \beta_{11} NPR \times MB$
$+ \beta_{12} NUM\_SEG + \beta_{13} NPR \times NUM\_SEG + \varepsilon$

Model 3: $RET = \alpha + \beta_1\, \Delta NSEG + \beta_2 NPR + \beta_3 NPR \times \Delta NSEG + \beta_4 SIZE + \beta_5 NPR \times SIZE + \beta_6 INSHOLD$
$+ \beta_7 NPR \times INSHOLD + \beta_8 RDDUM + \beta_9 NPR \times RDDUM + \beta_{10} MB + \beta_{11} NPR \times MB$
$+ \beta_{12} NUM\_SEG + \beta_{13} NPR \times NUM\_SEG + \varepsilon$

Table 8 presents the cross-sectional OLS regression results of these models using alternative definitions of disaggregation: *DISAGG*, *HERF*, and *NSEG*. Each model is estimated separately in the pre- and post-131 eras. The first column reports the regression results of the models in the pre-131 period, and the second column those of the models in the post-131 period. The third column reports the change in the coefficients estimated in the pre- and post-131 periods. To test the significance of the change in each coefficient, we construct a model by interacting all of the control variables with a dummy variable, *POST*, that takes a value of one if the trading month belongs to the post-131 period and is zero otherwise, and then estimate the model in both periods. We then take the t-statistics of each variable that interacts with *POST* as the t-statistics of the change in the coefficients.