THE ANTECEDENTS AND MARKET IMPACT OF CHANGES IN SEGMENT DISCLOSURE: TWO ESSAYS

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CHANGES IN SEGMENT DISCLOSURE: TWO ESSAYS

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Abstract

This set of two essays addresses questions about the impact of SFAS No. 131, which provides the current GAAP for segment reporting. Many firms enhanced their segment reports in compliance with SFAS No. 131, while some did not. The first essay documents the impact of the new standard on the market for stocks of firms that began reporting disclosure for multiple segments (Change firms) compared to that of firms that did not report multiple business segments (Control firms). Share volume and price increased abruptly following release of the new disclosure while volatility and the adverse selection component of the bid-ask spread decreased. These changes were significant for subsets of Change firms identified as being more likely to face information asymmetry problems (i.e., low capitalization and high bid-ask spread firms). The second essay compares firms' segment disclosures from pre- to post-implementation of the standard. Newly-reported segments tend to be smaller than previously-disclosed segments, and they are often combined with larger segments in a related industry prior to implementation of the standard. Firms providing relatively aggregated segment reports tend to be large, to have international operations, and complex operating structures compared to firms providing more detailed disclosures in the pre-SFAS No. 131 period.

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CHAPTER 1 THE INFORMATION CONTENT OF SEGMENT DISCLOSURE

Preface

SFAS No. 131 *Disclosures about Segments of an Enterprise and Related Information* requires more public firms to report financial information about their business segments, and also increases the level of detail required regarding segment operations. Earlier research has shown that financial disclosure can bring about a reduction in information asymmetry, which in turn has been linked to increases in market liquidity. The impact of enhanced disclosure, however, is not predictable. Alternative studies provide evidence that information asymmetry can intensify when a limited number of investors use detailed disclosures more efficiently than their trading counterparts to gain an advantage in the market. To gauge the impact of SFAS No. 131, measures of liquidity from pre- and post-implementation of the standard are compared for a group of NYSE firms whose segment reporting format changed. Liquidity measures from affected firms are also compared to a control group of firms whose segment reporting did not change. Control firms did not experience changes in liquidity. Bid-ask spreads remained stable while quoted depth declined for firms disclosing additional segments in compliance with the new standard. Finally, the adverse selection component of the bid-ask spread declined for stocks of firms disclosing additional segments, particularly for firms whose trading costs were high prior to the reporting change.

1.1 Introduction

In June 1997, the Financial Accounting Standards Board (FASB) issued SFAS No. 131, *Disclosures about Segments of an Enterprise and Related Information.* SFAS No. 131 governs the required format and content of segment information included in the 10-K filings of publicly-traded firms. Segment reports provide disaggregated information about firms' operations and are, therefore, an

important source of information to stakeholders. Changes brought about by the new standard substantially increased the required content of segment reports. In a sense, SFAS No. 131 is unprecedented among accounting standards because it requires firms to disclose business segment information as it is tracked internally. As a result, outsiders view virtually the same information management uses to develop the firm's strategy without many of the accounting adjustments that would typically be made to bring the segment reports into conformity with Generally Accepted Accounting Principles (GAAP). Overall, SFAS No. 131 increased the number of firms required to report segmented information, as well as the amount of segment information required (Ettredge, et al. 2005). New segment information provided in compliance with SFAS No. 131 typically was released with the 1998 10-K.

Informative disclosure is vital to capital markets because it helps unite firms seeking capital with various parties seeking investment opportunities. Measuring the impact of disclosure choices is important because information production represents a cost to firms which should be justifiable in terms of its benefits. If disclosures are redundant or irrelevant, for example, they do not benefit the firm in terms of reducing information asymmetry. SFAS No. 131 is just one component of the wide array of mandated and voluntary disclosures that contribute to each firm's public information set. There is no disputing that segment disclosure was enhanced under SFAS No. 131 but the question that still remains is whether this enhanced disclosure has provided new and useful information to market participants, and whether the information impacted information asymmetry for affected firms. This paper provides direct evidence on these issues.

Specifically, the empirical tests presented use trading data for NYSE firms to compare changes in market liquidity for stocks of firms that disclosed additional segments under SFAS No. 131 (Change firms) to those that did not change the number of business segments disclosed (Control firms). Changes in bid-ask spreads and quoted depth have been established in prior literature as

proxies for the dealer's changing perceptions of information asymmetry (Lee et al. 1993). Accordingly, results are provided from univariate and multivariate tests for changes in bid-ask spreads and quoted depth over the period spanning the release of the 1998 10-K report. The paper also estimates the portion of the bid-ask spread attributable to adverse selection costs and analyzes changes in this component over time.

The results indicate that liquidity for some firms in the Change sample was favorably affected by SFAS No. 131. While prior research has examined several effects of SFAS No. 131, trading data have not been analyzed. This study, therefore, contributes to accounting research by enhancing available evidence regarding the effects of SFAS No. 131 and introduces an alternative technique for assessing the effects of disclosure regulation.

1.2 Literature Review and Hypothesis Development

1.2.1 How Disclosure Impacts Information Asymmetry in Capital Markets

Information asymmetry arises in markets when some participants have superior information about a company as compared to other participants. When the less-informed participants include market makers in the company's stock, information asymmetry can affect the trading environment of the stock by having an adverse effect on liquidity. In this framework, a reduction in information asymmetry can benefit market participants by improving the efficiency of the trading environment. If increases in disclosure potentially reduce information asymmetry, one could argue that mandated changes in disclosure requirements like SFAS No. 131 can result in improvement in the trading environment for stocks affected by the change. It cannot be assumed, however, that all information released to the market promotes efficiency. For example, if disclosures are redundant, they may have no effect on information asymmetry. Alternatively, if certain disclosures can be used more efficiently by a subset of investors, an *increase* in information asymmetry may result. Kim and

Verrecchia (1994) show analytically that just such a scenario might occur due to "diverse interpretations of a firm's performance from a common source of public information."

The effects of disclosure in financial markets have been empirically analyzed in a number of studies. Botosan et al. (2002) find that high quality ratings for annual (regulated) disclosures are related to reductions in the cost of capital, but quarterly disclosures of quality are associated with increases in the cost of capital. They suggest that quarterly disclosure emphasizes short-term results, which leads to more volatility in stock prices. Bushee, et al. (2000) offer an alternative explanation to this finding. Specifically, they argue that institutional investors profit by trading aggressively on detailed quarterly information, which, in turn, leads to higher volatility in stock returns. The implication of these papers is that the effect of enhanced disclosure on information asymmetry continues to be an empirical question.

Segment disclosures have generally been linked in prior research to reductions in information asymmetry. Analyzing effects of the standard preceding SFAS No. 131, Greenstein et al. (1994) document a downward shift in bid-ask spreads for stocks of firms that began reporting segment information in compliance with that standard. In contrast, such a downward shift is not observed for a control group of firms. The downward shift was greater in magnitude for firms reporting a greater number of additional segments. This evidence suggests that the liquidity of stocks improved in conjunction with segment disclosure.

Several prior studies have specifically addressed the effects of SFAS No. 131. Using a sample of single-segment firms that began reporting multiple segments in 1998, Botosan and Stanford (2005) find that newly-reported segments tended to have better-than-average performance, consistent with managerial reluctance to disclose information about exceptionally profitable investment opportunities to competitors. They also find a sustained increase in analysts' consensus for earnings forecasts of firms with increased segment disclosures as a result of the new standard.

This effect was not observed for a control sample of firms, consistent the expectation that new disclosures under SFAS No. 131 contain relevant information for more accurate pricing.

Berger and Hann (2003) find that some of the newly-reported segment information was already reflected in one-year-ahead analyst forecasts. This finding indicates that some (but not all) of the SFAS No. 131 information was redundant. They also document a reduction in analyst forecast errors after implementation of the standard for firms that increased the number of reported segments. This finding is also consistent with the expectation that information contained in the enhanced segment disclosure reduces information asymmetry.

1.2.2 Information Asymmetry is Reflected in Intraday Data

As noted previously, markets are impeded by information asymmetry. Trading data from the TAQ database provides a detailed view of market activity that can be used to test the effects of information on market factors. For each day and each stock, TAQ provides the dealers' quoted bid and ask prices, quoted depth (the number of shares that are available at the quoted price), the prices at which trades took place, and the volume associated with each trade. The bid price is the best price at which a dealer is willing to buy the stock, while the ask (offer) price is the best available selling price. The difference between the bid and ask is the bid-ask spread and it represents the potential profit the dealer can make in a round-trip transaction. The dealer updates quotes throughout the day in response to changes in inventory, information asymmetry and conditions in the market.

Frequently, trades are executed at a price inside of the quoted spread. This occurs when the dealer makes a concession on the quoted price in actual trading. The difference between the quoted price and the actual, or "effective" price is referred to as price improvement. When price improvement occurs, the actual spread paid (received), the effective spread, is smaller than the quoted spread. The effective spread is twice the difference between the actual price at which a trade

is executed and the midpoint of the quote. Effective spreads are preferable for analyzing market liquidity because they represent the terms of actual trades.

Several econometric methods have been developed to estimate how the bid-ask spread, used as a proxy for the dealer's gross profit, is allocated to cover dealer costs. Information cost models decompose the bid-ask spread into two components: order processing costs, and adverse selection costs (George et al., 1991; Lin et al., 1995; Madhaven et al., 1997). Order processing costs include normal business expenses such as exchange dues, the costs of maintaining an office and staff, and inventory holding costs. These costs are assumed to be a fixed amount per share of stock traded (George et al., 1991).

The remaining portion of the bid-ask spread represents adverse selection costs. Dealers expect to lose money to informed traders who can estimate the traded security's intrinsic value better than the dealer (Harris, 2003). This follows from the fact that an informed trader would buy a stock only if the ask price is lower than the value they have estimated. Similarly, an informed trader would sell the stock only if the bid price is greater than the estimated value. These adverse selection costs are a necessary expense of trading for dealers because they are unable to tell which traders have superior, or "private," information. Some traders acquire private information through direct association with the firm (e.g., insider trading), but private information also refers to superior information gained by traders who research more extensively or synthesize information more effectively than others (Kim and Verrecchia 1994). Dealers adjust spreads to recoup losses due to adverse selection. Higher levels of information asymmetry lead to increases in the adverse selection component of spreads. Firms with stocks that trade with high absolute bid ask spreads are therefore associated with high levels of information asymmetry.

In addition to adjusting spreads via quoted bid and ask prices, quoted depth also helps limit the dealer's exposure to adverse selection costs. The dealer only commits to trading the number of

shares quoted at the ask and bid prices. When information asymmetry risk is high, the dealer reduces quoted depth, resulting in her or him not being obligated to trade more than the quoted depth before having the opportunity to update the quote.

When trading costs are low, traded securities have more liquidity, resulting in lower costs of capital for firms. Amihud and Mendelson (1986) show that firms with lower bid-ask spreads have lower average expected returns. Brennan and Subrahmanyam (1995) find a return premium associated with illiquidity in stocks. Enriching the set of publicly-available information, therefore, is an appropriate public policy goal in that it promotes equitable and well-functioning capital markets (Lev 1988) and stimulates capital formation. Empirically identifying which specific policies or disclosures are useful to investors is essential to the process of maintaining market liquidity.

1.2.3 Financial Disclosure Mitigates Adverse Selection Costs

Verrecchia (2001) states that "[I]nformation asymmetry reduction provides a rationale for efficient disclosure choice." Because financial accountants are key suppliers of disclosure, evaluation of disclosure alternatives is of particular interest to accounting researchers. Several studies have related aspects of financial disclosure to the bid-ask spread. For example, Raman and Tripathy (1993) find that the magnitude of the change in the adverse selection component of the bid ask spread for 31 over-the-counter (OTC) oil- and gas-producing firms is driven in part by the magnitude of the change in the present value of newly-discovered petroleum reserves voluntarily disclosed in the firms' 10-K reports. In short, the more informative a firm's reserve data, the greater the reduction in the bid-ask spread from pre- to post-10-K release.

Welker (1995) compares relative quoted bid-ask spreads[1] of firms with their disclosure quality ratings. He finds that the quoted bid-ask spreads of lower-ranked firms are 50% higher than

[1] The relative quoted bid-ask spread is equal to the difference between the bid and ask prices divided by the quote midpoint. Thus, the relative bid-ask spread is expressed as a percentage of the security's value. This can also be interpreted as a cost per dollar of asset traded. Use of the relative specification of the spread facilitates comparison of spreads across firms. A price effect remains, however, because as the

quoted bid-ask spreads for the higher-ranked group. Similarly, Heflin et al. (2005) find that effective spreads are lower for firms whose disclosures are rated of high quality. The evidence from Welker (1995) and Heflin et al. (2005) suggests that publicly available information can mitigate asymmetric information costs, as reflected in bid-ask spreads. Healy et al. (1999) analyze a sample of 97 firms whose disclosure ratings show large and sustained improvements. Overall, the firms experienced a significant, permanent reduction in relative quoted bid-ask spreads. Interestingly, raters providing data for the Healy et al. (1999) study most often cited better segment disclosure as the reason for improved ratings.

1.2.4 Measuring Information Asymmetry in Intraday Data

As previously discussed, changing quoted depth and bid-ask spreads are complementary responses by the dealer to perceived information asymmetry, and they move inversely in the short-term (Huang and Stoll 2001), so risk-related factors will move spreads and depth in opposite directions. For example, Stoll (1978) identifies share volume and return variance as proxies for the riskiness of a given stock; he finds that high volume and low return variance are each associated with lower spreads. Accordingly, these factors would also be associated with higher depth. Lower stock prices are associated with higher relative spreads, in part because order processing costs are fixed with respect to price. A low stock price is also associated with greater depth because, holding the total cost of a hypothetical transaction constant, the number of shares in the transaction will be greater given a lower-priced stock. In effect, dealers increase quoted depth on lower-priced stocks in order to accommodate larger trade sizes.

A group of studies, however, finds that reductions in minimum tick-size are followed by *reductions* in quoted depth (Van Ness et al. 2000; Bacidore 1997). Additionally, Heflin et al. (2005) find an inverse relation between depth and disclosure quality. The authors of these studies suggest

price of a stock increases, the spread increases at something less than a constant rate (due to the fact that order processing costs are essentially fixed with respect to share price), so that higher-priced stocks are associated with lower relative bid-ask spreads (Benston 1974).

that when available profits are reduced, suppliers of depth exit the market. Reductions in tick-size would reduce available profits, as would reductions in information asymmetry resulting from improvements in the quality of disclosure. A permanent enhancement in disclosure quality (e.g., disclosure under SFAS No. 131) could be associated with a decrease in depth as informed traders lose advantage and move to other markets. Given ambiguity in extant research regarding the effect of disclosure on liquidity, no prediction can be made concerning the impact of SFAS No. 131 on quoted depth. One can only say that changes in liquidity (including depth) are expected to differ between firms whose number of business segments increased versus those whose segment reports remained unchanged.

1.2.5 Hypotheses

As discussed previously, many approaches have been used in extant literature to identify the ways in which disclosure impacts firms, their stakeholders, and the market for their securities, because disclosure is widely recognized as a mechanism for reducing information asymmetry. SFAS No. 131 represents an attempt on the part of FASB to reduce information asymmetry stemming from the overly-aggregated segment disclosures provided by some firms. The standard prompted a non-trivial number of publicly-traded firms to disclose their operations in more detail than previously, but whether the new information was effective in reducing information asymmetry is an empirical matter. In an effort to ascertain whether expected reductions in information asymmetry occurred pursuant to implementation of SFAS No. 131, tests are performed in this paper to detect changes in established proxies for information asymmetry. Specifically, tests for post-disclosure changes in bid-ask spreads, depth, and the adverse selection component of the bid-ask spread are conducted. The following hypotheses (presented in alternative form) are tested to ascertain whether expected reductions in information asymmetry occurred pursuant to implementation of SFAS No. 131:

H1: Firms that report additional business segments after implementation of SFAS No. 131 will experience reductions in total effective bid-ask spreads relative to firms that do not report additional segments.

H2: Firms that report additional business segments after implementation of SFAS No. 131 will experience changes in total quoted depth relative to firms that do not report additional business segments.

H3: Firms that report additional business segments after implementation of SFAS No. 131 will experience reductions in the estimated adverse selection component of the bid-ask spread relative to firms that do not report additional business segments.

1.3 Research Design and Empirical Proxies

1.3.1 Univariate Tests of Changes in Market Liquidity

Certainly, analyzing intraday trading data is a valid way to test for the impact of disclosure alternatives, but cross-sectional analyses of the impact of disclosure on trading costs must be undertaken in light of the fact that *many* factors affect the adverse selection component of the bid-ask spread, including insider ownership, analyst following, share price, trading volume, firm size and earnings volatility. Because each firm differs on the many attributes that affect trading costs, the influence of disclosure choices is likely to be obscured in typical pooled, cross-sectional analysis designs (Callahan et al. 1997). To address this issue, firms are compared against themselves in initial univariate tests following the method in Skinner (1989). A ratio is formed for each firm in which the value of a given measure in the post-SFAS No. 131 period is divided by the corresponding value for the same firm prior to implementation of SFAS No. 131. Matching each firm to data for the same firm at an earlier time controls for many cross-sectional factors and provides a cleaner test of the impact of disclosure.

Figure 1 provides an illustration of the time-line organization of the data. Time t_1 is the filing date of the final pre-SFAS No. 131 10-K. Time t_2 is the post-SFAS No. 131 10-K filing date[2].

[2] Until 2002, when 10-K filing deadlines were accelerated by the SEC, many firms had 90 days after the close of the fiscal year in which to file the 10-K. Calendar year firms, therefore, often reported earnings in February and filed the

A median value for each statistic analyzed is computed for each firm for three time periods: Period 1 provides a base level for each measure under analysis, and spans the 20-trading-day period beginning seven days after t_1. Period 2 (the immediate pre-event period) includes data from the 20-trading-day period ending at $t_2 - 7$ days. Finally, Period 3 (the post-event period) includes 20 consecutive trading days beginning at $t_2 + 7$ days[3]. Note that data for seven calendar days preceding and following the 10-K filing dates is excluded to avoid including effects from early dissemination or late assimilation of the information disclosed. Ratios used in the analysis are equal to the current period value divided by the corresponding prior period value. Ratios greater than one indicate an increase in values over time, while ratios less than one indicate decreases. Analyzing ratios of median values helps overcome econometric issues involving non-normal distribution of the data and also serves to condense the data to reduce the likelihood of type 1 errors resulting from overly large sample sizes. Initially, univariate analysis is conducted on several measures of liquidity and order flow, including bid-ask spreads, quoted depth, trading volume, price and the variance of returns using the ratio approach described above. Post-period to pre-period ratios of bid-ask spreads and quoted depth are used as proxies for the dealer's perception of information asymmetry. Two specific tests are performed. First, median spread and depth ratios are calculated for Control and Change firms separately. The Wilcoxon signed-rank test is then used to estimate the probability that the median value of each ratio is one. A finding that spread ratios are less than one and depth ratios have changed for the Change group, coupled with ratios equal to one for the Control group, would be consistent with Hypotheses 1 and 2. Results are also provided for sub-samples, including stocks of small, large and high-spread firms. A second test is performed in which ratios for Change and

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10-K in March. Samples taken after the SEC's change in filing deadlines may be dissimilar in the timing of reported earnings and 10-K filing dates.

[3] In addition to the 20-day time period used in this study, the same tests were performed using windows of 3 and 5 days immediately preceding and following the 10-K filing, as well as 10, 30 and 45 trading days with a seven-day buffer period surrounding the event. Longer time periods do not give significant results, perhaps because of the increased influence of confounding events over time. Shorter time periods resulted in quantitatively similar results with the exception of the 3-day window.

Control stocks within sub-samples are compared to each other to determine whether the distribution of ratios is different as indicated by the Wilcoxon rank-sum test. Analogous ratios for trading volume, price, and return variance are also analyzed because these variables are key determinants of bid-ask spreads and depth. In essence, I document contemporaneous changes in their levels in order to make (or rule out) inferences about the source of changes in spreads and depth.

For each variable, Period 3-to-Period 2 ratios are of primary interest, because the two values used in the ratio immediately follow and precede the event of interest. Ratios comparing both period 3 and period 2 to median values from the previous year (period 1) are shown in order to place the Period 3-to-Period 2 ratio within a long-term context. Period 3-to-Period 1 ratios span a 52-week period, Period 2-to-Period 1 ratios reflect changes over a 40-week period, while Period 3-to-Period 2 ratios reflect changes in the 11-week period surrounding the release of the post-SFAS No. 131 10-K. Given the shorter time span covered by the Period 3-to-Period 2 ratio, one would expect its magnitude to be lower than the other ratios, ceteris paribus.

Despite the use of ratios, the distribution of data for every variable is generally leptokurtic and right-skewed. To address this issue, non-parametric tests are used for univariate analysis because the results of these tests do not rely upon normally-distributed data. A limitation of univariate tests is that changes in variables are considered in isolation without taking into account interrelationships between market factors, but they do provide an initial impression of how Change and Control firms differed over the year preceding, and for a period after, implementation of SFAS No. 131.

1.3.2 Multivariate Tests of Changes in Market Liquidity

To gain a better understanding of market changes surrounding adoption of SFAS No. 131, results of least squares regression of changes in the proxies for information asymmetry are also provided. This method of analysis carries the assumption that the data are normally distributed. The use of median-

value ratios (as described above) results in distributions that are closer to being normally distributed than average-value ratios would be, but additional transformation is required. To address the non-normality issue, the data are Winsorized at the first and ninety-ninth percentile for all variables. Following Winsorization, the natural log of one plus the value of each ratio is taken in order to reduce the skew of the distribution.

In tables 1.12 through 1.15, ratios representing changes in effective relative bid-ask spreads, and separately, quoted depth, are regressed on ratios reflecting contemporaneous changes in factors shown in prior literature to be determinants of these variables, including trading volume, price and return variance. The ratios are for Period 3-to-Period 2, comparing data for the month just after the filing of the first 10-K to include segment reporting under SFAS No. 131 to the month preceding it. The regression models are as follows:

$$\text{SpreadRat}_j = \beta_{S0} + \beta_{S1}\ \text{VolumeRat}_j + \beta_{S2}\ \text{PriceRat}_j + \beta_{S3}\ \text{RetVarianceRat}_j + \varepsilon_{Sj}$$

and

$$\text{DepthRat}_j = \beta_{D0} + \beta_{D1}\ \text{VolumeRat}_j + \beta_{D2}\ \text{PriceRat}_j + \beta_{D3}\ \text{RetVarianceRat}_j + \varepsilon_{Dj}$$

Where SpreadRat, DepthRat, PriceRat, RetVarianceRat, and VolumeRat are each equal to the natural log of one plus the Period 3-to-Period 2 ratio for the variable in question. [4]

4 Additional explanatory variables are considered in alternative specifications of the model (not shown), but are excluded for lack of explanatory power. These variables include market capitalization, book-to-market ratio, number of segments reported, change in number of segments reported, an index of disaggregation in the concentration of segment sales, two-digit SIC code, share turnover (share volume divided by shares outstanding), transaction frequency and trade size, as well dummy variables for designation as high-tech based on NAICS code and fiscal year-end.

Trading volume is the product of average trade size and trading frequency. For the data set analyzed, changes in volume, either in total or expressed in factored form, are not consistently significantly correlated with changes in the relative bid-ask spread. Increases in trade size and frequency are both significantly correlated with increases in depth. In tests of changes in bid-ask spreads and depth, volume is included as a unified factor because the effects of its components on the dependent variables are consistent.

Due to the fact that the same panel data are used to estimate each regression, the regression equations shown were estimated jointly using the Seemingly Unrelated Regression (SUR) technique. This approach compensates for cross-equation parameter restrictions and correlated error terms. Regression coefficients are identical under ordinary least squares and SUR; therefore, R-squared statistics are reported separately for each model and cross-model correlations are omitted.

Results of regression are initially reported separately for Control and Change firms; under the null hypothesis, no changes should be observed in bid-ask spreads or depth for either group. Specifically, all intercept terms would be insignificant under the null. After the initial regression models are estimated, the Control and Change samples are combined. A dummy variable (indicating one for Change firms and zero otherwise) and interaction terms are added to the model to test whether changes in bid-ask spreads and depth differ between Change and Control firms over the period of interest. Significant coefficients for these added variables would support the notion that Control and Change firms' spreads and depth behaved differently over the period in which new segment information was disclosed; a negative (positive) coefficient for the dummy variable in the spread (depth) model would be consistent with improvements in the liquidity of Change stocks not shared by Control stocks. Results of least squares regressions are discussed in section 5.2.

1.3.3 Multivariate Tests of Changes in Information Asymmetry

If changes in market liquidity are observed after enhanced segment disclosure, they are expected to originate in, and reflect, changes in the information environment of affected firms. If such is the case, effects of SFAS No. 131 should also be reflected in the adverse selection component of the bid-ask spread. Two approaches are used to address this issue. First, following Lin et al. (1995), the adverse selection portion of the bid-ask spread is estimated twice for each firm—once just prior to, and once after, disclosure of the new segment data, as follows:

$$\Delta M_{t+1} = \lambda z_t + \varepsilon_{t+1}$$

where ΔM is the natural log of the midpoint of the quoted bid-ask spread at time t + 1 less the natural log of the quote midpoint of the preceding transaction, and $z_t = P_t - M_t$ is the natural log of the price of a transaction at time t, less the natural log of the prevailing quote midpoint. The slope coefficient of z_t from the regression, denoted by λ, is the estimated adverse selection component of the bid-ask spread.

Following Skinner (1989), adverse selection component ratios are formed for each firm, where the numerator is the estimated adverse selection portion of the bid-ask spread in Period 3 (the period following the 1998 10-K filing) and the denominator is the corresponding value from Period 2 (the period immediately preceding the 1998 10-K filing). The resulting ratio represents the change in the adverse selection component of the bid-ask spread over the period of interest. As in the previous section, these ratios are regressed on factors known to impact transaction costs—volume (proxied by trading frequency and average trade size in a day), price, and the variance of returns. The basic model is as follows:

$$\text{Adverse Rat}_j = \beta_0 + \beta_1 \text{ TradeFreqRat}_j + \beta_2 \text{ TradeSizeRat}_j + \beta_3 \text{ PriceRat}_j + \beta_4 \text{ RetVarianceRat}_j + \beta_5 \text{ Group}_j + \varepsilon_j$$

As in the earlier tests, the natural log of one plus the Period 3-to-Period 2 ratio is used in regression for each variable. As before, group is a dummy variable with a value of one for Change firms, and zero for Control firms. Interaction terms (crossing the group dummy variable with trade frequency, trade size, and price) are added to the model to allow for the fact that changes in these independent variables may impact adverse selection costs differently, depending on whether the firm is a Change or Control firm.

Note that for the tests of adverse selection, trading volume is entered into the model in factored form. Trading volume (the number of shares transacted in a day) is equal to trading frequency (the number of transactions per day) times the average trade size. For the full sample of stocks, the Pearson correlation coefficient for the adverse selection ratio and the trading frequency ratio is – 0.103, for the adverse selection ratio and the trade size ratio, 0.160, while that for the adverse selection ratio and the volume ratio is 0.029. This suggests that a decrease in trading frequency is associated with an increase in adverse selection costs over the SFAS No. 131 adoption period, while an increase in trade size is positively associated with changes in adverse selection costs. Given the opposite effects of changes in trading frequency and average trade size on changes in adverse selection costs, these variables are entered separately in the regression model. As an empirical matter, the predictive value of the model is strengthened relative to the use of a model in which trading volume alone is included as an independent variable (not shown). A negative coefficient for the Group dummy would be consistent with a reduction in adverse selection costs for Change firms. Results for the full sample of stocks as well as for sub-samples including small, large, and high-spread firms, are shown in Tables 1.16 and 1.17 and are discussed in section 5.3.

The foregoing tests provide evidence about whether adverse selection costs differed between Change and Control stocks, and in what direction. Hypothesis 3, however, predicts a specific

behavior for each group's costs. The adverse selection component of the spread is expected to decline measurably for Change stocks after the 1998 10-K filing, and to remain stable for Control stocks. Table 1.18 includes the results of tests involving a second approach to measuring adverse selection costs. Following George, et al. (1991), the adverse selection component of the bid-ask spread is estimated using a two-stage regression procedure. Initially, the share-weighted average effective relative spread, and the time-weighted quoted bid-ask spread are calculated for each day in the pre-SFAS No. 131 and post-SFAS No. 131 periods for each firm (i.e., Periods 2 and 3). Using this data, the following regression is estimated twice for each firm, once in the pre- and again in the post-period:

$$\text{MedEffRelSpd}_j = \beta_{0j} + \beta_1 \text{ MedQuotedRelSpd}_j + \varepsilon_{Sj}$$

The coefficient β_1 is the estimated order processing component of the bid-ask spread for each firm. The pre- and post-period coefficients for each firm are in turn used in cross-sectional regression equations of the following form:

$$\text{MedEffRelSpd}_j = \beta_{0j} + \beta_1 \text{ MedQuotedRelSpdj} + \beta_2 \text{ Period} + \beta_3 \text{ MedEffRelSpd}_j \text{ x Period} + \varepsilon_{Sj}$$

where Period is a dummy variable that takes the value of zero for 1997 data and one for 1998 data, and MedEffRelSpd x Period is an interaction term. Note that the number of observations per regression is twice the number of firms in each sample. A positive and significant coefficient for the interaction term would be consistent with an increase in order processing costs, and by extension, a decrease in adverse selection costs over time. As before, tests are conducted for the full sample of stocks as well as for the high-spread, small, and large capitalization subsets. Results are discussed in section 5.3.

1.4 Sample Selection and Description

1.4.1 Sample selection

As noted, some firms were required under SFAS No. 131 to begin reporting segment information in a more detailed way than had previously been required under SFAS No. 14. To test the impact of segment information disclosed under SFAS No. 131, an initial sample is formed that includes all New York Stock Exchange (NYSE) firms listed on Compustat that reported one or more line of business segments in 1997[5]. Firms that reported the same number of line of business segments in 1997 and 1998 (Control firms) are compared to firms that increased the number of segments reported in 1998 (Change firms).[6] If changes in liquidity are observed, and the changes are in fact related to mandated segment disclosure, one would expect Change and Control firms to be affected differentially.

From the original sample of Compustat firms, I exclude firms with annual sales less than $20 million, regulated utilities, and financial services firms. Firms in regulated industries are likely subject to unique disclosure requirements that would cloud the effects of their compliance with SFAS No. 131. Firms whose sales or share price differed in 1998 by more than 50% of the 1997 value are also eliminated, because it is likely that major events led to these observed changes, and such events are also likely to have an effect on variables of interest in this study, including volume and return variance. Firms whose shares outstanding at the end of 1998 are less than half or more than 2.5 times the 1997 value are eliminated, as are firms whose segment sales do not match the consolidated sales figure from Compustat's Annual Industrial File. In essence, the foregoing firms

[5] The level of information asymmetry is known to be lower for NYSE firms compared, for example, to NASDAQ firms. Inclusion of NASDAQ firms in the study may yield stronger results in terms of finding increased liquidity for firms increasing disclosure. At the same time, inclusion of NASDAQ firms in the study would introduce challenges in terms of conducting the tests because many NASDAQ firms are infrequently traded. Restriction of the sample to NYSE firms was done to avoid econometric issues associated with asynchronous trading.

[6] Twenty-one firms reported fewer line-of-business segments in 1998; these were eliminated from the sample. One goal of SFAS No. 131 was to increase the number of business segments reported by firms. The distribution of the sample (i.e. few reductions in segments reported, many increases) is consistent with attainment of that goal.

are eliminated from the sample to help ensure that observed increases in reported segments are the result of the change in disclosure.

Finally, single-segment firms are eliminated from the Control sample. Given the fact that Change firms reported two or more business segments in 1998, these firms arguably were always multi-segment firms that masqueraded as single-segment firms under the latitude provided by GAAP prior to SFAS No. 131. As such, these firms are not comparable to true single-segment firms. Even after elimination of single-segment Control firms, Change firms are generally larger and more liquid than their Control group counterparts. If single-segment firms were included in the Control group, this difference would be even more pronounced[7].

The final sample consists of firms that survive the above screens and have sufficient data available to perform the empirical tests outlined earlier. These data include dates of 10-K filings from the U.S. Securities and Exchange Commission's EDGAR database, segment data from the Compustat North American Segments file, descriptive data from the Compustat North American Quarterly and Annual Industrial files, price and volume data from the Center for Research in Security Prices (CRSP) daily stock file, and intraday transactions data from the NYSE Trade and Quote (TAQ) database. Reconciliation of the original to final sample is shown in Table 1.01, Panel A.

INSERT 1.01 ABOUT HERE

The final sample includes a total of 261 NYSE firms. In 1998, 118, or 54.8% of sample firms, continued to report the same number of business segments as reported in 1997, while 143, or 45.2%, increased the number of reported segments (see Table 1.01, Panel B). The number of

[7] Table 3 provides additional detail regarding the size of Control versus Change firms.

additional business segments reported by sample firms is shown in the right half of Table 1.01, Panel B. Control firms reported no additional segments by design, while Change firms reported between one and five additional segments. A sample of 40 firms was selected in order to examine earnings announcements and 10-K reports for SFAS No. 131-compliant information that may have been released earlier than the 1998 10-K filing date. None of the firms included new segment information in their earnings announcements, nor did any sample firms implement the standard before being required to do so.

1.4.2 Sample description

Descriptive data for the final sample are presented in Table 1.02. Panel A shows the distribution of firms by industry. Firms in the Control and Change samples are comparably distributed on this basis. Panel B shows distribution by fiscal year end. Change firms are more likely to use a calendar year end, while Control firms have a greater tendency to use fiscal year ends. In additional tests (results not shown), fiscal year end firms are excluded from analysis; results are qualitatively and quantitatively similar. Table 1.02, Panel C shows the distribution of sample firms by size, as well as by manufacturing versus non-manufacturing. Specifically, the Change and Control samples are each subdivided into large and small samples where the median firm size of the pooled sample ($1,534.79 million) is used as the cutoff point. Firm size is of interest because previous research suggests that firm size moderates the impact of disclosure. Larger firms and their information intermediaries enjoy economies of scale in the production of information, so more publicly available information exists for large firms. Furthermore, since information is contained in the trades of investors, the prices of frequently traded securities adjust more quickly to reflect private information than do the prices of small, illiquid stocks (Morse et al. 1989). As a result, measurable effects of a new requirement directed at mitigation of information asymmetry (such as SFAS No. 131) would be expected to be most evident in a sample of small firms.

INSERT TABLE 1.02 ABOUT HERE

Prior to the adoption of SFAS No. 131, some firms provided comment letters in opposition to mandatory business segment disclosure, predicting that a loss of competitive advantage would result from publicly disclosing proprietary information. Comment letter authors tended to be managers of manufacturing firms. This fact raises the question of whether manufacturers were indeed differentially affected by the standard. If new information disclosed under SFAS No. 131 by manufacturing firms promoted informed trading by enabling a small proportion of investors to generate and trade on private information, a decline in liquidity for manufacturing firms would be observed. Table 1.02 Panel C shows that of 188 manufacturing firms included in the full sample, 105, or 55.9% increased the number of segments reported. The proportion of non-manufacturing change firms is just slightly lower; 38 of 73, or 52.1%, of non-manufacturers began to report additional segments. Nonetheless, whether the impact on stock liquidity of enhanced reporting differs between manufacturing and non-manufacturing firms is an empirical question. Analyses of order flow, liquidity, and changes in the adverse selection component of the bid-ask spread were performed separately for manufacturing versus non-manufacturing firms, and no significant differences were evident. As a consequence, results are presented with both groups combined. Note that although this finding does not support the contentions of comment letter authors, it also does not disprove them because information asymmetry in equity markets and competitive harm from enhanced disclosure are separate sources of loss.

Table 1.03 shows descriptive statistics for 1998 and 1997 for the full sample of firms, partitioned by Change and Control groups. Firm size is the market value of common equity on the last trading day of each calendar year. Change firms are substantially larger than Control firms in

both years. For example, the mean (median) market value of Change firms at the end of 1998 was $7,842.85 ($1,701.42) million versus $6,840.78 ($1,696.92) for Control firms.

INSERT TABLE 1.03 ABOUT HERE

Remaining statistics shown in Table 1.03 are calculated as follows: data for each firm are from the 20 consecutive trading days beginning seven calendar days after the release of the 10-K for each year. The median value of the 20 daily observations for each firm is used to form a sample for the group for each measure shown. Refer to Figure 1 for a schematic depiction of the organization of data analyzed in this study. With the exception of market value, statistics shown in Table 1.03 are taken from Periods 3 and 1 (for 1998 and 1997, respectively) as defined in Figure 1.

INSERT FIGURE 1 ABOUT HERE

Several measures of order flow for sample firm stocks are included in Table 1.03. Ceteris paribus, increased trading activity is considered to be an indication of higher market quality. Change firms' daily trading volume (1998 mean trading volume, 4,014.87 shares) exceeds that for Control firms' (2,818.88 shares); Change firms are not only larger, but are traded more than Control firms, despite the fact that they reported fewer segments per firm on average than Control firms in the base year, 1997. The data show an increase in share volume from 1997 to 1998 for both Control and Change stocks. Share volume is the product of two factors, trade size and trading frequency. The observed increase in volume can be explained by greater trading frequency; median 1998 trades per day for Change (Control) firms are 118.00 (78.50), up from 91.00 (62.50) in 1997. In contrast, trade size declined at the mean level for both groups between 1997 and 1998. The prices at which

Change and Control shares trade is comparable. Daily dollar volume is the product of share price and share volume. Consistent with other measures of volume, dollar volume is substantially greater at both the mean and median for Change firms, and tended to increase from 1997 to 1998.

The lower half of Table 1.03 summarizes intraday trading cost and quote data. The effective dollar spread is twice the difference between the transaction price and the midpoint of the prevailing quote at the time of a given trade. Note that bid-ask spreads reflect the cost of a "round trip" through the market. The cost of a given trade, therefore, is equal to half the effective spread. As previously discussed, quoted spreads are posted prices at which the dealer is willing to buy (the bid price) or sell (the ask price) shares. Quoted spreads as shown are time-weighted in accordance with the amount of time each quote is valid. Faced with an offer to trade, the dealer frequently improves the terms of the actual trade relative to the quoted price. This accounts for the fact that effective spreads are smaller than quoted spreads. Both effective and quoted spreads are expressed on a relative and absolute (dollar) basis. Relative bid-ask spreads are deflated by the midpoint of the quote; the resulting figure is a cost per dollar of traded value. Both dollar and relative effective spreads are slightly lower for Change stocks, but comparable across groups. For example, the effective relative spread for Change stocks in 1998 was 0.37% compared to 0.39% for Control stocks. Relative trading costs are generally higher in 1998 than in 1997 despite the fact that dollar costs were stable. This fact is a reflection of a decline in share prices that occurred during the period in response to widespread increases in the number of shares sample firms had outstanding.

The final measure shown in Table 1.03 is quoted depth, which is the average of the number of shares the dealer is willing to trade at the bid and ask prices. Depth is expressed in terms of round lots of 100 shares per lot. Consistent with the pattern of data for all measures shown in Table 1.03, quoted depth is greater for Change than for Control stocks. For Change stocks, the mean (median) number of round lots available at the ask or bid is 29.4 (24.9) compared to 25.8 (20.4) lots for

Control stocks. Overall, Table 1.03 shows that Change firms are generally larger than Control firms. Recall that information asymmetry costs are less likely to be problematic for large firms. Further, Change firms' stocks exhibit a higher level of trading intensity both before and after compliance with the new standard relative to Control firms'. The market characteristics observed for Change firms' stocks thus far do not fit the expected profile. SFAS No. 131 was written to compel under-disclosed firms to disaggregate their financial reports in order to address an alleged paucity of information, but Change firms are more liquid than Control firms, even prior to implementation of the standard.

Note that the median effective dollar spread in Table 1.03 for both Control and Change stocks is $0.063. On January 24, 1997 (prior to the time periods encompassed by the current study), the New York Stock Exchange adopted a minimum tick size (bid-ask spread) of one-sixteenth, or $0.0625. The fact that the median effective dollar bid-ask spread is equal to the minimum tick size means that trading costs for a large number of sample firms' transactions are constrained at the lower bound. As a result, the probability of finding support for H1, which predicts that a reduction in bid-ask spreads will occur, is low. As a practical means of addressing this issue, firms with higher-than-average effective spreads ("high-spread" firms) are analyzed separately throughout the analyses presented in this paper. This sub-set is likely to contain firms with high levels of information asymmetry, and these are the very firms that may be affected by enhanced disclosure under SFAS No. 131. The high-spread sample is composed of stocks whose median effective spread for period 1 (the 20 consecutive trading days beginning seven days after the release of the 1997 10-K) is larger than the median spread of all firms. The high-spread sample includes 88 firms, 45 of which are Control firms, while the remaining 43 are Change firms.

INSERT TABLE 1.4 ABOUT HERE

Descriptive statistics for firms in the high-spread sample are shown in Table 1.04. As is the case for the full sample, stock prices for high-spread firms declined from 1997 to 1998, while share volume increased. By design, relative spreads are high for this sample, and as would be expected, quoted depth is lower than it is for the full sample. In contrast to the full sample, Change firms in this group tend to be smaller than Control firms and their stocks less liquid.

An obvious approach to identifying firms likely to experience liquidity improvements as a result of compliance with SFAS No. 131 would be to identify firms with ineffective disclosures in the time prior to implementation of the standard. These are the firms most likely to benefit from enhanced disclosure. Any attempt to directly identify poorly-disclosed firms, however, necessitates controlling for endogenous determinants of each firm's comprehensive disclosure "package." Core (2001) notes that the optimal disclosure policy for a firm represents a series of trade-offs between its need to attract stakeholders and the costs of disclosure, including the effort and expense of developing information, as well as competitive costs. Further, developing proxies that measure disclosure quality is an arduous process (e.g., Botosan et al., (2000) develops a proprietary system of disclosure quality measurement). Up until fiscal year 1995, members of the Association for Investment Management and Research (AIMR) evaluated the disclosure policies of many public firms, making the resulting disclosure rankings available for public use. The AIMR rankings were used in a variety of studies, as discussed earlier, but they are, unfortunately, no longer available. As a result of the challenges inherent in identifying firms with ineffective disclosure programs, ex ante measures of information asymmetry (such as those provided in TAQ data) may provide the best means of identifying the firms most likely to be affected by a change in disclosure.

1.4.3 Capitalization Per Segment

INSERT TABLE 1.05 ABOUT HERE

Table 1.05 shows the average and median market capitalization per segment for Control and Change firms in 1997 and 1998. Change firms' capitalization per segment is far higher than Control firms' in 1997. One explanation for the conspicuous difference in capitalization per segment between Control and Change firms is that Change firm managers preferred to disclose very aggregated segment information as a reporting strategy, and obviously were able to do so under the latitude of SFAS No. 14. The magnitude of the difference in capitalization per share between samples in 1997 suggests that the extent of aggregation in Change firms' segment reports was non-trivial. Results for 1998 reveal that under-reporting (Change) firms were likely to be large firms with more segments.

Given the apparent propensity of large firms to under-report segments prior to SFAS No. 131, firms are sub-divided into large and small capitalization samples for analysis in an attempt to capture effects of a potential interaction between firm size and the effects of the standard. The median value of market equity for the full sample ($1,534.79 million) is used to delineate the samples. Given the fact that firms in the high-spread group tend to be small in size, a question might arise regarding the degree of overlap between high-spread and small capitalization groups. The majority of high-spread group firms are considered to be small capitalization, but 30% of high-spread firms come from the large capitalization group.

1.4.4 Collection of intraday trade and quote data

In order to examine the microstructure characteristics of sample firms, trade and quotes data for the test periods in question are collected for all 261 firms from the TAQ database[8]. The data are screened for integrity as follows: for trades, all out of sequence trades are eliminated, and trades that occur at the same time and price are combined. The first trade and the last five minutes of trading for each day are eliminated. Observations with zero or missing values for the price or size of a trade are eliminated. The condition variable must be blank, indicating that the trade was normal (as opposed, for example, to being executed subject to conditions that might later invalidate the trade). The correction variable must be zero, indicating that the trade was recorded without error. For quotes, the condition and correction variables must also be missing and zero, respectively. If the bid, offer, bid size or offer size is zero, the observation is dropped. To eliminate unreasonable spreads, the offer price must be less than one and one-half times the size of the bid price. The quotes mode must be 12, meaning that the quotes were posted in a normal trading environment, as opposed to opening/closing quotes, or quotes posted under special circumstances.

After the data have been screened, trades are lagged five seconds to compensate for systematic reporting delays that are known to occur. The appropriate lag for a given data set is an empirical question. Five seconds was established as an appropriate lag for the data in the current study using the method described by Lee and Ready (1991, p. 739) (results not shown). Every (lagged) trade is matched with the prevailing quote at the time of the trade. The TAQ data does not indicate whether the dealer is buying or selling stock. To estimate adverse selection and order processing costs, however, inferences must be made about whether transactions are buyer or seller initiated. The classification of trades is accomplished using a combination of a quote and tick test

[8] The Trades and Quotes (TAQ) data base, provided by the New York Stock Exchange Group and made available through the Wharton Research Data Services (WRDS) data base, is a daily record of individual trades and quote updates that occur on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), the Nasdaq National Market System (NMS), and small cap issues.

following the Lee and Ready (1991) algorithm. The empirical tests that follow examine the effects of SFAS No. 131 as reflected in intraday data.

1.5 Results

1.5.1 Results of univariate analyses

Relative quoted bid-ask spread ratios are shown in Table 1.06 for the full sample and for three subsets—high-spread firms, small, and large capitalization firms. Within each data subset, the mean and median value of each ratio is shown for Control and Change firms separately, along with the proportion of stocks with ratios greater than one (indicating an increase in quoted bid-ask spreads), and the p-value for the probability that the median of the sample is one. If increased disclosure under SFAS No. 131 diminished information asymmetry, Change firms would be expected to experience a decrease in quoted spreads while Control firms' spreads would remain constant. Under each sub-sample and ratio, the p-value for the Wilcoxon rank-sum test is given. Recall that Period 3-to-Period 2 ratios are of primary interest because the values used to compute the ratio span the 1998 10-K filing. As a result, Period 3-to-Period 2 ratios reflect changes associated with the event of interest.

INSERT TABLE 1.06 ABOUT HERE

For the All firms sample shown in Table 1.06, the median Period 3-to-Period 2 ratio for Change firms is 1.02 with a p-value of 0.0005, which leads to the rejection of 1.00 as the median value for the sample ratios. This is consistent with an *increase* in quoted bid-ask spreads for Change firms. In contrast, the median value for Control firms, 1.00, is inconsistent with a change in quoted spreads from the month before, to the month after, the release of the 1998 10-K. In fact, none of the sub-samples for the Control group Period 3-to-Period 2 ratios yield evidence of a significant change

in quoted bid-ask spreads. Change firms' quoted spreads increased slightly in all sub-samples with the exception of the high-spreads group, where the median ratio is 0.97. This value, however, is not significantly different from one. Further, results of the Wilcoxon rank-sum test only support the conclusion that Control firms differ from Change firms for the large market capitalization firms sub-set ($p = 0.0107$), and the direction of the difference is inconsistent with an improvement in liquidity for Change firms.

INSERT TABLE 1.07 ABOUT HERE

Effective spreads reflect actual transactions data, and may be a better indicator of changes in information asymmetry. Table 1.07 shows univariate test results for effective relative spreads. Note that in the longer periods represented by Period 2-to-Period 1 and Period 3-to-Period 1 ratios, Control and Change firms in all sub-samples reflect an increase in effective spreads. Absolute effective spreads (not shown) were relatively stable from 1997 to 1998, but given the widespread decline in share prices (as reflected by the data in Table 1.10), trading costs per dollar of value traded increased. With respect to the ratio of primary interest (Period 3-to-Period 2), only Change firms in the small firms sub-sample experienced a significant change in execution costs with a median ratio of 0.97 ($p = 0.0246$). This decline in spreads was not shared by small Control firms. As indicated by the Wilcoxon rank-sum test p-value of 0.0178, it is appropriate to reject the hypothesis that ratios in both groups belong to the same distribution. This finding lends some support to Hypothesis 1, which states that firms that report additional business segments after implementation of SFAS No. 131 (i.e., Change firms) will experience reductions in total effective bid-ask spreads relative to firms that do not report additional segments.

INSERT TABLE 1.08 ABOUT HERE

Observed changes in bid-ask spreads provide incomplete information about liquidity when considered in isolation. Contemporaneous changes in quoted depth must also be taken into account (Lee et al. 1993) because dealers adjust both spreads and depth in response to perceived information asymmetry. As a result, depth complements spreads as a measure of liquidity. While increasing quoted bid-ask spreads allows dealers to recoup losses to informed traders, reducing quoted depth limits dealers' exposure to informed traders by limiting the size of any given trade[9]. Dealers maintain greater depth for larger firms as well as for stocks with lower prices per share in order to accommodate increased order flow. Results in Table 1.08 show that quoted depth remained relatively stable for sample firms in the time frame represented by the Period 3-to-Period 2 ratios. Further, for these ratios, Period 3-to-Period 2, no statistical differences in depth are found either over time or between groups. These findings do not support hypothesis 2, which states that Change firms will experience changes in total quoted depth following the release of the first 10-K that includes the new segment information, and this increase will not be shared by Control firms.

INSERT TABLE 1.09 ABOUT HERE

As discussed in section 4.2, share volume, return variance and price are used as control variables in the multivariate tests of bid-ask spreads and depth that follow. Tables 1.09 through 1.11 present univariate analysis of changes in these variables to facilitate an intuitive assessment of the extent to which each of these variables might impact spreads and depth in the multivariate tests.

Share volume activity is presented in Table 1.09. As noted, throughout the sub-samples and periods, there is a trend toward increased volume. Activity for Change stocks is distinguishable

[9] Recall that informed traders prefer to trade in large blocks in order to maximize profits from private information.

from activity for Control stocks for the Period 3-to-Period 2 ratios for the high-spread and small capitalization groups. Change stocks' ratios are significantly greater than one (note the median values of 1.20 for high-spread stocks and 1.23 for small firms), signifying an increase in share volume over the period in which Change firms disclosed new segments. Ratios for Control firms in the same groups are not significant. Looking at the Period 2-to-Period 1 ratios for Change stocks in the same groups, the median ratios were both 0.87 (and not significantly different from one), so it cannot be said that the significant increases in share turnover reflected in the Period 3/Period 2 ratios were the continuation of a trend that began earlier. Recall that increases in order flow are associated with better market quality. The data presented in Table 1.09 suggest that, in some cases, enhanced disclosure would be most beneficial to firms whose levels of information asymmetry are high.

INSERT TABLE 1.10 ABOUT HERE

Reductions in stock price are associated with increased relative spreads and depth; therefore price is a key determinant of the liquidity measures used in this study. Changes in spreads and depth must be interpreted in light of stock price trends. Table 1.10 reveals that prices for sample firm stocks fell significantly between 1997 and 1998 for each subsample (refer to Period 3/Period 1 ratios). In contrast, Change stocks in every subsample exhibit a significant increase in prices over the short period of time spanning the 1998 10-K filing, while Control stocks' prices are stable. These results are consistent with investors' favorable reassessments of Change firms, possibly due to the newly-disclosed segment information and the expectation that benefits would accrue to Change firms as a result of enhanced disclosure.

INSERT TABLE 1.11 ABOUT HERE

Table 1.11 presents univariate analysis of changes in the variance of returns, calculated as the mean squared difference between each transaction's return and the mean return for a given day for each firm. The return for a given transaction is the midpoint of the prevailing quote less the midpoint from the prior transaction, divided by the midpoint from the prior transaction. For each firm, each ratio is based on the median variance of returns taken from all days in the period under consideration (Period 1, Period 2, or Period 3). Note that the midpoint of the spread is used in order to exclude bid-ask bounce as a source of price variability.

The variance of returns for the Period 3-to-Period 2 ratios did not change significantly for Control stocks. Median (mean) ratios are significantly less than one for Change stocks in the high-spread subsample (0.92 (0.96)) and small capitalization subsample (0.93 (0.97)), consistent with an improvement in liquidity for the firms most associated with information asymmetry. Ratios for high-spread Change firms are also significantly different (less than) their Control sample counterparts ($p = 0.0222$). Raman, et al. (1993) point out that, "Increased price variability[10] or increased trading volume could itself represent the effects of an information event." A reduction in the variance of returns, therefore, is consistent with a reduction in information asymmetry, although results of multivariate tests that follow provide additional information on this issue.

1.5.2 Results of Least Squares Regression Predicting Bid-Ask Spreads and Quoted Depth

Tables 1.12 through 1.15 present results of least squares regression in which relative effective bid-ask spreads and quoted depth are, separately, regressed on share volume, price and the variance of

[10] Note that the variance of returns control variable used in this paper is related to price variance used by Ramen (1993) in the sense that returns are the standardized first difference of price changes. When the regression equations in this study are estimated using price variance rather than the variance of returns (results not shown), quantitatively similar results are obtained.

returns. Consistent with prior research, spreads and depth are both inversely related to share price. Of the three predictors, share price is most strongly related to the dependent variables, both for the full sample and for sub-samples. As expected, share volume is negatively related to bid-ask spreads and positively related to depth. Finally, return variance is positively related to bid-ask spreads and negatively related to depth. The initial regressions for each subsample are estimated separately by group (Control versus Change firms). In the far right panel, results are shown for all firms combined. A dummy variable has been added to control for sample differences. Further, interaction terms are included in the depth regression to allow for differences across samples in the price and return variance variables[11].

From the results for the far-right panel of Table 1.12, depth increased for Change and Control firms (intercept = 1.1869, p = 0.0001), but Change stocks experienced less of an increase than Control firms (dummy coefficient for Change firms = -0.702, p = 0.0022). These results indicate that depth increased about 42% less for Change firms. The interaction terms for price and return variance counteract the main effects for the same variables; that is, although decreases in price and variance of returns are associated with increases in depth, this relation is weaker for Change firms.

For the full sample, the model does not show a significant difference between Change and Control firms for spreads. However, a significant difference is shown between groups for depth. This difference is consistent with depth increasing more over the period for Control firms. Further, it suggests that there is more response to decreases in price and the variance of returns for the Control group. These findings do not support Hypothesis 1, which states that spreads will decrease for Change firms relative to Control firms after disclosure of the new segment data. Hypothesis 2,

[11]When interaction terms were added to the spread model, their coefficients were not significant, and the coefficients of other independent variables were quantitatively similar to the those in the model as shown (absent interaction terms). The same is true of share volume ratio in the model predicting quoted depth. It is, therefore, omitted.

which simply predicts that changes in quoted depth will differ between Change and Control firms, is supported.

Results for sub-samples shown in Tables 1.13–1.15 are similar to those shown in Table 1.12 for the full sample. Again, changes in spreads do not differ by group. Depth increases for both groups throughout all sub-samples, but to a lesser extent for Change than Control firms. Depth for stocks of Change firms is not as closely related to changes in price and the variance of returns as depth for Control firms.

1.5.3 Results of multivariate tests of adverse selection costs

As discussed in section 3.3, information effects of SFAS No. 131 should also be reflected in the adverse selection component of the bid-ask spread. Following the method of Lin, et al. (1995), the adverse selection component of the bid-ask spread is calculated twice for each stock—once for the month preceding, once for the month following, the disclosure of the 1998 10-K. A ratio is formed for adverse selection costs in the same manner as other ratios used previously in this study. Tables 1.16 and 1.17 show results of ratios reflecting the change in the adverse selection component of the bid-ask spread over time regressed on volume, price, and the variance of returns—previously-discussed factors influencing the adverse selection component. For the full sample of firms, the first regression model (far left) includes a dummy variable which takes the value of one for stocks of Change firms, and zero for stocks of Control firms. The dummy variable is insignificant, but the intercept for the model is negative and significant, indicating that a reduction in adverse selection costs occurred over the time that Change firms introduced new segments in their 1998 10-Ks. Note that the beta for the group dummy becomes significant (and the intercept becomes insignificant) when interaction terms are added to the model (group dummy beta is -0.597, $p = 0.0048$; intercept beta is -0.187, $p = 0.3791$). In essence, a reduction in the adverse selection component of the bid-ask spread was experienced by Change firms only.

Results are similar for the high-spread sub-sample, but the reduction in the adverse selection component of the bid-ask spread is larger for these firms than for the full sample. Firms with high information asymmetry would be expected to gain the most from enhanced disclosure, so the greater magnitude of the intercept and dummy variable coefficients is consistent with expectations. Finally, trade size loses significance in the base model when a trade size interaction term is added. The sign of the estimated coefficient indicates that as trade size increases, adverse selection costs increase. This is also consistent with previous literature, suggesting that larger trade sizes are preferred by information traders. However, the finding that trade size influences only Change firms in the determination of the adverse selection component of the spread is an open question. Overall, results presented for the full and high-spread samples support hypothesis 3, which states that firms that report additional business segments after implementation of SFAS No. 131 will experience reductions in the estimated adverse selection portion of the bid-ask spread relative to firms that do not report additional business segments. Table 1.17 shows results for similar regressions for the small and large capitalization sub-samples. Results in Table 1.17 are not dissimilar to the results shown in Table 1.16, but the coefficients do not reach the level of significance required to support hypothesis 3. Significant differences between groups are not evident from the results of these subsamples, which implies that significant results for the full sample may be driven by the high-spread subsample.

In order to provide additional evidence regarding changes in adverse selection costs that may have occurred in association with SFAS No. 131, a second approach is taken, as discussed in section 3.3. Median effective and quoted spreads are calculated twice for each firm—once before, and again after, the release of the 1998 10-K. Following George, et al. (1991), effective spreads are regressed on quoted spreads to obtain an estimate of the order processing component of the spread. Specifically, the coefficient of quoted spreads (denoted by β_1) is equal to estimated order processing

costs. A dummy variable for period is included in the model (where the pre-event observation is equal to zero and the post-even period is equal to one) as well as the interaction between quoted spreads and period. An increase in estimated order processing costs (denoted by the interaction term with coefficient $\beta_{3)}$ is taken as evidence of a reduction in information asymmetry.

The results in Table 1.18 show that Change firms' order processing costs as a proportion of total order execution costs are less than Control firms' with the exception of the small capitalization firms. By extension, the adverse selection component of the bid-ask spread is larger for Change firms, as would be expected if these firms' lack of disclosure lead to increased information asymmetry. The beta of the interaction term (denoted by β_3) is significant and positive for Change stocks in the full and high-spread samples, consistent with an increase in order processing costs, and a decrease in adverse selection costs. The interaction terms are not significant for Control firms, nor are they significant for the large and small capitalization subsamples. Once again, it is possible that the high-spread sample is driving the significant result for the full sample. Results for the full and high-spread samples provide support hypothesis 3, which states that firms that firms that report additional business segments after implementation of SFAS No. 131 will experience reductions in the estimated adverse selection component of the bid-ask spread relative to firms that do not report additional business segments.

1.6 Conclusions

Existing capital markets research suggests that information asymmetry leads to market inefficiency, but meaningful disclosure improves the informational environment. The current structure of disclosure procedures and options is complex, and at times controversial. Empirical analysis can help identify areas of information asymmetry in markets, as well as the likely benefits and costs of disclosure efforts. Such evidence is of use to firms, stakeholders and policy makers in developing and using the disclosure system in an economically efficient way.

The empirical tests in this paper have been used to identify the effects of a change in mandated disclosure on a sample of firms most affected by the standard (Change firms). Changes in liquidity evidenced in the market for Change firms' stocks is compared to changes in liquidity of stocks for a Control group of firms for which no change in reporting was required. Initially, univariate tests are used to gauge the impact of the new standard on bid-ask spreads and quoted market depth. The univariate results are consistent with an increase in depth for Control firms that is not shared by Change firms during the short period spanning SFAS No. 131 adoption. At the same time, Change firms experienced an increase in price and trading volume. Each of these changes are consistent with reductions in information asymmetry. Regression equations are then estimated to differentiate between potential sources of observed changes in liquidity metrics. Specifically, changes in bid-ask spreads and quoted depth are modeled as a function of changes in price, trading volume and stock return variance. To the extent that liquidity for stocks of Change firms changes over the brief period covered by the analysis without a similar change for Control firms, the new disclosure filed under SFAS No. 131 must be suspected as a likely source of influence. Results of these tests indicate that Change firms, particularly high-spread stocks, experienced an increase in share volume and price as well as a decrease in the variance of returns and ultimately, a decrease in the adverse selection component of the bid-ask spread. For Control firms, the estimated intercept for depth in results of the multivariate tests is consistently high, indicating that the increase in depth revealed by univariate analysis is a robust effect, that is not explained by any of the factors included in the regression models.

In the realm of disclosure, more is not necessarily better. Compliance with disclosure requirements can be costly. Information contained in mandated disclosure may be redundant, thus creating no value. A growing literature suggests that in practice, some types of disclosure exacerbate information asymmetry, which in turn promotes illiquidity. Overall, the tests presented

in this paper are intended to provide a multi-faceted view of the effects of increased mandatory disclosure on liquidity. Results of analysis are consistent with an improvement in market quality for affected firms. The evidence suggests that firms whose number of segments reported increased as a result of compliance with SFAS No. 131 gained market quality, but the effect was generally limited to stocks of firms whose liquidity was relatively low.

1.7 Appendix

In June 1997, the FASB issued SFAS 131, effective for firms whose fiscal years began after December 15, 1997, with earlier application encouraged. SFAS No. 131, *Disclosures about Segments of an Enterprise and Related Information*, was a conscious attempt on the part of the Financial Accounting Standards Board to improve the quality of segment information over that which had been available under the previous standard, SFAS No. 14, *Financial Reporting for Segments of a Business Enterprise*. Under the previous standard, firms were required to use industry classifications to define reportable segments, despite the fact that a substantial proportion of firms did not define segments along industry lines for internal reporting. A result of this *industry approach* was a tendency for firms to report fewer segments publicly than actually existed from a managerial perspective. Further, the calculation of segment operating profits under SFAS No. 14 followed Generally Accepted Accounting Principles (GAAP). As firms adjusted their internal segment reports to conform with standardized industry classifications and GAAP, much of the information used by managers for strategic planning and incentives was obscured. The relevance of segment information to investors, therefore, was at issue. Financial analyst groups lobbied actively for a change in the standard, while managers cited the potential for competitive harm as a criticism of the new standard as it was proposed and eventually accepted (AICPA 1994).

In contrast to SFAS No. 14's industry approach, SFAS No. 131 requires a *management approach* in which segment results are reported publicly using the same delineation of segments and calculation of profits as used by management for internal decision making. Compared to the previous standard, SFAS 131 increased the number of firms required to report segmented results of operations. Further, it revised standards for the content, format and frequency of information reported about operating segments.

Under SFAS 131, the operating results of a firm component must be disclosed individually in the firm's quarterly financial statements if several conditions are met. Specifically, separate reporting is required if the component generates revenues and incurs expenses, discrete financial information for the component is available, and the component's operating results are regularly reviewed by the firm's chief operating decision maker to allocate resources and assess performance. The standard defines a reportable segment as one with any of the following: revenues of at least 10% of total revenues of all reported operating segments (including intersegment revenues), or profit or loss of at least 10% of the total profit or loss of all segments reported, or assets of at least 10% of the sum of assets reported for all segments. Combined revenues of reported segments must represent at least 75% of external revenues for the firm.

SFAS No. 131 requires firms to report the sources of each segment's revenue (including a breakdown of internal/external revenues), list the key products and services, geographic locations of operation, and customers of each segment, its cash flow, profit or loss (identifying any unusual items), interest revenue (expense), depreciation, depletion, amortization expense, income tax expense, extraordinary items, additions to, and total of, long-lived segment assets, and the amount of any investments in equity method investees as well as the amount of segment equity in equity investees' net incomes. Reporting requirements for geographical segment information are sharply reduced, and reporting of segment liabilities is not required. Segment disclosure amounts must be reported as prepared for management use, and reconciled in total to reported consolidated information.

The change from an industry approach to the management approach improved comparability between reported segment results and other sections of the annual report, such as the Business Review and Management Discussion and Analysis sections, because these sections often refer to operations of segments as defined by management. Further, segment operations as presented reflect

the same information used for decision-making by firm managers. Finally, the new standard reduces firms' reporting burden because extensive adjustments of internal data are no longer needed. Taken as a whole, SFAS No. 131 increased both the number of firms required to report segmented information, and the amount of segment information required.

CHAPTER 2 DETERMINANTS OF FIRMS' SEGMENT REPORTING CHOICES

Preface

Beginning with their 1998 10-K filings, publicly-traded U.S. firms were required to provide greater detail about segmented operations in compliance with SFAS No. 131, *Disclosures about Segments of an Enterprise and Related Information.* By comparing firms' segment disclosures from the year before, to the year after, implementation of the standard, inferences are drawn about why firms failed to disclose detailed segment information in the relatively unrestricted pre-SFAS No. 131 period. Evidence from a sample of 294 firms reporting 794 segments shows that newly-reported segments tended to be of less importance to the firm than previously-disclosed segments. "New" segments were often combined with larger segments in a related industry prior to implementation of the new standard. At a minimum, the previous standard required delineation of segments on the basis of similarity in products, production processes, or markets. In many cases, an aggregated approach to reporting satisfied the prior standard's requirements. Firms providing relatively aggregated segment reports tend to be large, to have international operations, and as evidenced by the 1998 10-K filings, tended to have complex operating structures compared to firms providing more detailed disclosures in the pre-SFAS No. 131 period. Finally, the evidence does not suggest that a tax avoidance motive played a role in firms' decisions to aggregate segment disclosures prior to implementation of the new standard.

2.1 Introduction

When the Financial Accounting Standards Board (FASB) issued SFAS No. 131, *Disclosures about Segments of an Enterprise and Related Information* in 1997, the desired goal of inducing firms to disaggregate their segment reporting was, in fact, one of the standard's key results. Botosan, et al. (2009) report that as a direct result of SFAS No. 131, newly-disclosed segments in listed firms'

1998 filings numbered in the thousands, and that the total number of segments reported in 1998 was about 25% greater than in 1997. A natural question that arises is, why did some firms provide segment disclosures under the prior standard[12] with sufficient detail to meet the requirements of the new standard, while other firms did not? The current study addresses this issue, first, by examining evidence about whether newly-disclosed segments are in some way different from segments whose results had been disclosed prior to the standard, and second, by examining evidence about whether non-disclosing firms themselves differ from their peers.

To address the former issue, newly-disclosed segments are matched against previously-disclosed segments from the same firm on the basis of standard industrial classification (SIC) code and sales. In addition to examining attributes of newly-disclosed segments to determine why firms did not provide detailed segment reports under SFAS No. 14, current study also considers attributes of firms themselves, and how those attributes influenced segment disclosure. For example, firms with a tax incentive to shift income between taxing jurisdictions may be motivated to aggregate operations in the relevant jurisdictions to avoid the scrutiny of revenue authorities. As another line of reasoning, some firms may view segment disclosures as an important tool for communicating with stakeholders, but managers of firms with low information asymmetry may have chosen only to invest as much effort in segment disclosure as the existing standard required. Given such a scenario, the more relevant question would be why did some firms exceed the requirements of the standard by providing very detailed segment reports?

In order to conceptually evaluate the potential reasons for firms' aggregation of significant segments prior to the current standard, a basic understanding of the relevant features of SFAS No. 131 (as compared to the prior standard) is needed. Under SFAS No. 14 firms were required to organize and report segment information on the basis of industry, taking into account similarities in

[12] SFAS No. 131 was preceded by SFAS No. 14 *Financial Reporting for Segments of a Business Enterprise*

the nature of the products, production processes, or markets and marketing methods. While the standard allowed that "no single set of characteristics is uniformly applicable," (para. 99), it suggested the use of Standard Industrial Classification (SIC) codes for use in delineating business segments. Because SIC codes are organized into groups by products and services, line-of-business segment reports under SFAS No. 14 are also organized by product or service. SFAS No. 14 differed in focus from its successor in the sense that firms were essentially asked to report the extent of their involvement in whatever industries they operated. No mention was made of providing information about their internal structures.

Under SFAS No. 131, firms are required to organize and report segment information on whatever basis the firm uses internally to allocate resources among segments and evaluate segment performance (SFAS No. 131, para. 10 b). Specifically, if a segment manager reports directly to the firm's chief operating decision maker, and discrete financial data are available for the segment, then operating information about the segment is required to be separately disclosed. As a result, an operating segment may be defined on the basis of geographic area, industry grouping, or on an alternative basis that meets the firm's individual needs. If the operating segments are not organized in a manner that is consistent with major geographic components of the firm, then revenues and assets must be separately reported on a geographic basis.

The number of segments reported by many firms increased after implementation of SFAS No. 131[13]. Previous studies have tested for differences between the newly-reported segments and existing segments in order to characterize the additional information that investors received under SFAS No. 131, and to draw conclusions about what motivated firms to withhold that information under SFAS No. 14. Piotroski (2003) contends that, "Under SFAS 14, firms frequently aggregated

[13] Although the exception to the rule, some firms did report fewer segments. For example, Bristol Myers Squibb Co. reported five segments in 1997 and four in 1998, and FedEx reported four, compared to three the previous year.

dissimilar lines of businesses into coarse segments or retained consolidated-only reporting practices despite operating in multiple, loosely related businesses."

One explanation for this observation is that firms simply delineated segments more finely for internal reporting than perceived compliance with SFAS No. 14 required. In essence, aggregation of segment information under SFAS No. 14 may reflect managers' efforts to minimize compliance costs. The Background Information and Basis for Conclusions section of SFAS No. 131 recognizes this point (para 114):

> This Statement will reduce the cost of providing disaggregated information for many enterprises. Statement 14 required that enterprises define segments by both industry and by geographical area, ways that often did not match the way that information was used internally. Even if the reported segments aligned with the internal organization, the information required was often created solely for external reporting because Statement 14 required certain allocations of costs, prohibited other cost allocations, and required allocations of assets to segments.

As discussed more fully in the following section, extant literature has not addressed administrative explanations for firms' failure to disaggregate segment information more extensively under SFAS No. 14. For example, Botosan and Stanford (2005) write, "[O]ur results suggest that the managers of firms forced to initiate segment disclosures under SFAS No. 131 withheld segment information under SFAS No. 14 to protect profits in less competitive industries…" Berger and Hann (2007) characterize this finding as "unrealistic" (p. 872), and present evidence that managers tended not to separately disclose segments with abnormally low profits, presumably to avoid external monitoring.

Existing studies document apparent reporting biases by some firms within carefully selected samples. For instance, Berger and Hann (2007) analyze subsets of segments having abnormally high or low performance. Botosan and Stanford (2005) analyze only firms reporting a single segment prior to SFAS No. 131. Ettredge et al. (2006) present evidence that single segment firms that reported multiple segments after SFAS No. 131 are much smaller than a typical publicly-traded

firm. The authors assert that listed firms' experiences with SFAS No. 131 are not well-represented by a sample that is restricted in this way. The current study differs from existing studies in that it does not make use of sample restrictions, and instead presents evidence about the motivations of the majority of firms.

In the current study, new segments are measured against previously-disclosed segments of the same firm in terms of their industry classification and relative importance to the firm as a whole. Many new segments are found to be carved from an existing segment operating in the same, or a closely-related SIC code. Firms with complex operating structures emerge as being likely to have reported on an aggregated basis by combining smaller segments that, under the new standard, are separately disclosed. The resulting evidence suggests that the requirements of the old standard were likely a major factor in shaping the overly-aggregated disclosures provided by complex firms. By tracing newly-reported segments to their sources, the current study provides a more realistic view of the changes in reporting that occurred. Understanding firms' efforts to comply with disclosure requirements given the unique economic realities of their own operations is essential to creating accessible disclosure standards going forward. Without question, segment disclosure under SFAS No. 131 has enriched the information environment of affected firms' equity markets. The evidence presented here, however, clarifies earlier findings that appear to demonstrate widespread abusive reporting under the prior standard.

2.2 Background and Hypothesis Development

Various studies that address some firms' incentives for avoiding segment disclosure prior to SFAS No. 131 have yielded conflicting results and conclusions. If segment disclosure is irrelevant to the market, the structure of the disclosure chosen by managers would be relatively unimportant. Prior research on the market impact of segment disclosure has also had mixed results, but the evidence generally supports an improvement in the information environment of affected firms resulting from

the new information disclosed. Berger and Hann (2003) show that the diversification discount increased for firms disclosing a single segment before, but multiple segments after, adoption of the standard. This is consistent with the new information having changed investors' valuations of the firms involved. They also find that some of the segment information disclosed after implementation of SFAS No. 131 was already reflected in analysts' earnings forecasts prior to its disclosure. For the same sample, they find that analysts' earnings forecast errors declined slightly for firms reporting additional segments under SFAS No. 131 compared to firms that did not report additional segments.

Botosan and Stanford (2005) document an increase in analysts' forecast consensus for firms reporting additional segments under the new standard, signifying an increase in reliance on public information. At the same time, however, the authors find that the error in analysts' mean earnings forecasts increased. Ettredge, et al (2005) find that the forward earnings response coefficient[14] increased for all multiple-segment firms post-SFAS No. 131, regardless of whether the firms reported additional segments. This finding implies that segment reports prepared under the new standard aided investors in pricing the stocks of the companies involved. The authors point out that analysis comparing firms reporting a greater number of segments under SFAS No. 131 to those that did not fails to consider the fact that all firms increased the number of data items included in segment reports, and further, that many firms reporting the same number of segments throughout nevertheless changed the delineation of segments. Their observations speak to the importance of analyzing segment-level, in addition to firm-level, data to form a complete picture of the impact of the new standard. In summary, compliance with SFAS No. 131 brought new information to the market, but the issues surrounding how particular groups of firms were affected are complex.

A separate question arises concerning whether motives can be identified to explain managers' failure to reveal many of their business segments previously. In this vein, Botosan and

[14] The forward earning response coefficient is the association between current-year returns and next-year earnings.

Stanford (2005) gather information about the degree of competition in newly-disclosed segments' industries, as well as the profitability of newly-disclosed segments. To explore industry competition, the authors compute the ratio of total sales for the four top firms in a given industry (as defined by three-digit SIC) to total industry sales for each newly-reported segment. The result proxies for industry concentration. If the top firms control a relatively large proportion of sales relative to the industry, this variable will take on a large value, indicating a less competitive industry. Comparing segment-based ratios to concentration ratios for the firms' primary industries, the authors find that 56% of previously-undisclosed segments operate in industries that are less competitive than the primary industry of the firm. Further, the authors compare segment-level profits for new segments post-SFAS No. 131 to benchmark profits and find that previously-undisclosed segments outperform disclosed segments matched on size and industry. Based upon the analysis of industry competition and profitability, the authors conclude that newly-reported segments were previously undisclosed because, fearing competitive harm, firms hid segments that tended to operate in less competitive industries and also those that generated abnormally high profits.

Berger and Hann (2007) point out that the findings in Botosan and Stanford (2005) are questionable because managers are able to identify less competitive industries through sources other than their peers' segment reports, so this would not be a likely motive for non-disclosure of segments. The specification of profits used in Botosan and Stanford (2005) raises an additional issue. SFAS No. 131 rescinded the previously-existing requirement that firms allocate many common costs to segments. As a result, reported segment margins are not comparable across firms. Botosan and Stanford (2005) compute abnormal segment profits as the difference between reported segment profit and reported segment revenues multiplied by the median net profit margin of the

industry. This measure may capture more information about the extent to which firms allocate common costs to segments than it does actual profitability.

Results of analysis by Berger and Hann (2007) counter the findings discussed above. Their analysis cites unresolved agency conflicts as a motive for non-disclosure. Specifically, the authors argue that managers who choose to retain under-performing segments in violation of shareholder interests will attempt to avoid market discipline through non-disclosure of the segment in question. Consistent with this notion, Berger and Hann (2003) find that firms disclosing new segments under SFAS No. 131 experienced an increase in the diversification discount. The results, however, are not statistically related to the magnitude of cross-segment subsidization as might be expected.

In order to further test the likelihood that agency conflicts are the root cause of some firms' failure to disclose segments, the authors form a subset of "agency cost" firms from a sample of firms reporting one or more additional segments post-SFAS No. 131. Agency cost firms are defined as having at least one underperforming segment whose return on sales (ROS) is less than the weighted average ROS of the remaining segments of the firm. Additionally, the underperforming segment's free cash flow must be insufficient to cover its capital expenditures. The authors do not address the issue of performance relative to industry because, by definition, agency costs are exacted when managers persist in doing business in areas that compromise the value of the particular firm in question. So, for example, a segment may underperform its industry peers and still be a valuable component of the firm to which it belongs. All segments from the agency cost firms are then pooled, regardless of whether the segments are newly-reported. The authors estimate a logit model at the segment level and find evidence that the segments designated as underperforming tend to be newly-disclosed, consistent with an agency cost motivation to withhold segment information. The strength of the results, however, suggests that as-yet unidentified factors influenced firms' decisions not to disclose certain segments. Specifically, the results suggest that, as abnormal profits

decrease by one standard deviation, the probability of a segment being newly-reported increases 4%.

In the current study, additional factors are examined as potentially influencing managers' disclosure decisions. The importance to the firm of the segments that were undisclosed is expected to be significantly less than existing segments. These segments are also expected to be operating in the same SIC codes as existing segments. The combination of these factors suggests that as managers prepared segment disclosures under SFAS No. 14 using the line-of-business (industry) approach, they combined information about less important segments with information about other, closely related segments. Such a finding would be consistent with a neutral application of SFAS No. 14. The following hypotheses (stated in alternative form) are tested:

> **H1:** The segment operations that were newly-disclosed under SFAS No. 131 were of less significance to their firms than previously-disclosed segments.
>
> **H2:** The segment operations that were newly-disclosed under SFAS No. 131 operate in the same primary industry as previously-disclosed segments.

The hypotheses above focus on attributes of the newly-disclosed segments to explain the failure of firms to separately disclose them. Additional reasons for non-disclosure of segments may be related to attributes of the firms themselves. As discussed in SFAS No. 131, the impetus to revise the segment reporting standard came from stock analysts who felt that disclosures under SFAS No. 14 were inadequate. The analysts cited very large firms such as Gap Inc., Merck & Company and Sysco as being difficult to assess because these firms reported a single segment. One explanation for the failure to disaggregate may be that management at these firms was reluctant to produce segment reports under the existing standard and judged disclosures provided apart from the segment reports to be adequate. In essence, high-profile firms with otherwise good investor relations programs may have preferred not to subject their segment information to the reporting requirements

of SFAS No. 14, which the FASB acknowledged was in need of revision, and at times resulted in misleading reports. To test this possibility, the following hypothesis is formulated (in alternative form):

> **H3:** The magnitude of disaggregation observed as a result of compliance with SFAS No. 14 is positively related to firm size.

Considering the convolution of SFAS No. 14's guidance on the delineation of segments, it is likely that complex firms struggled with the issue of how to disaggregate their operations to a greater extent because of the diversity of their operations. To illustrate, consider the following portion of the standard (para. 15): "If an enterprise's profit centers cross industry lines, it will be necessary to disaggregate its existing profit centers into smaller groups of related products and services (before re-aggregating the resulting groups into reportable industry segments)."

Given the fact that firms' SFAS No. 14-compliant segment reports were apparently more aggregated than their internal segment reports, it is likely that aggregation would have been intensified for diversified entities. It is expected that these firms disaggregated to a greater extent under the more accessible requirements of SFAS No. 131. Complex firms are operationalized as those having high average within-segment diversity (i.e., the diversity of operations contained under the umbrella of one segment). Note that segment reports include a primary and secondary SIC code for each segment. These codes are useful for gauging within-segment diversity as discussed more fully in the section detailing the research design and empirical proxies. In light of this suspected effect, the following hypothesis is tested:

> **H4:** The segment operations that were newly-disclosed under SFAS No. 131 came from firms with high within-segment diversity.

None of the studies examining the impact of SFAS No. 131 have considered tax avoidance as a motive for segment reporting choices, despite the fact that the influence of taxes on managerial

decision-making is well-established. Managers pursue tax avoidance strategies whenever possible in a legitimate effort to maximize shareholder value. Krull (2004) finds that multinational firms use intracompany payment arrangements to manage earnings, achieve investment goals, and reduce taxes. Further, she finds that foreign segments increase the magnitude of deductible payments to domestic segments when tax rates abroad exceed the domestic tax rate[15]. Such a tax avoidance program would increase the variability of profits across segments. Berger and Hann (2003) cite the potential scrutiny of regulators as a source of firms' reluctance to disaggregate segmented operations; this argument suggests that firms engaging in tax avoidance would be more likely to provide aggregated segment disclosures.

Ettredge et al. (2006) find that intersegment profit variability increases after SFAS No. 131. This would be consistent with the existence of an intersegment payment arrangement aimed at reducing the firm's total tax burden. To investigate the relationship between segment nondisclosure and available tax benefits, the following hypothesis is tested for the year prior to, and after, firms' adoption of SFAS No. 131:

> **H5:** Firms operating in a jurisdiction that taxes income at a rate higher than their domestic rate reveal more previously-undisclosed segments than firms with no identifiable tax motivation.

The remainder of the paper proceeds as follows: section III describes the research design and empirical proxies. Section IV describes the sample selection procedure and description. Section V contains the results of empirical tests. Section VI summarizes the findings and concludes.

[15] Note that the U.S. foreign tax credit (FTC) prevents domestic firms from receiving a tax benefit from shifting earnings out of the U.S. to lower tax rate jurisdictions abroad. Specifically, the Internal Revenue Code requires U.S.-based firms to begin with the assumption that worldwide profits are taxable. A credit is granted for foreign taxes paid up to the amount that would otherwise be paid on domestic earnings, unless foreign earnings are designated as permanently reinvested abroad, in which case they are excluded from U.S. taxation.

2.3 Research Design and Empirical Proxies

2.3.1 Univariate Tests

Note that in the univariate tests that follow, hypotheses 1 and 2 are tested at the segment level, while hypotheses 3 through 5 are tested at the firm level. Hypothesis 1 states that the segment operations that were newly-disclosed under SFAS No. 131 were of less significance to their firms than previously-disclosed segments. To assess the importance of a given segment to the firm, four measures are used. Each of the measures is compared for newly-disclosed and existing segments. Segment sales as a proportion of total firm sales are compared for newly-disclosed and existing segments. The sum of segment sales is nearly always equal to consolidated sales; Berger and Hann (2007) note that less than 1% of firms' total segment sales deviate more than 5% from consolidated sales. Sales are therefore the most reliable proxy for the importance of a given segment to the firm. For various reasons, Compustat often records a segment with negligible sales and little if any other data. For this reason, observations with sales less than 2% of combined sales are eliminated. The revenues threshold at which a segment is separately reportable under both the old and new standard is 10%.

Alternative variables suffer from measurement issues that are unique to segmented income statements. For example, although the standard includes segment assets as a reportable item for segment disclosures, this information is frequently missing from the Compustat segment files, and the sum of segment assets often differs appreciably from reported firm assets. Assessing segments on the basis of profits is similarly challenging. SFAS No. 131 requires firms to record common cost allocations on whatever basis is used internally to arrive at segment profit. As a result, segment profit (even as a proportion of total profits) is not comparable across firms. These measures are therefore of questionable value in assessing the relative importance of a segment. Univariate tests provide four measures of segment significance: relative segment sales, absolute segment sales,

identifiable segment assets, and segment operating profits. Because neither the distribution of existing, or newly-reported, proportionate segment sales is normal, the Mann-Whitney U test is used. A finding that newly-reported segments were not as significant to their firms is consistent with issues of materiality influencing managers' decisions not to separately disclose particular segments, as opposed to several strategic motivations offered in prior studies.

Hypothesis 2 states that the segment operations that were newly-disclosed under SFAS No. 131 operate in the same industry as previously-disclosed segments. Support for this hypothesis would be consistent with delineation of segments on the basis of relatedness between business processes. Tests of hypothesis 2 are based on the segments' two-digit SIC codes. Note that SFAS No. 14 explicitly discusses 2-digit SIC codes (of which there are 84) as one potential basis for delineating segments. To ascertain whether a newly-reported segment is more likely to operate in the same industry as an existing segment of the same firm than an existing segment, chi-square tests of homogeneity and association are applied.

Hypothesis 3 states that the magnitude of disaggregation observed as a result of compliance with SFAS No. 14 is positively related to firm size. Firm size is equal to the natural log of the market value of common equity at the end of each firm's fiscal year prior to implementation of SFAS No. 131. For each firm, the measure of disaggregation is equal to the change in average sales per segment from 1997 to 1998, standardized by average 1997 sales per segment. Natural logs are taken of segment sales. A positive and significant coefficient would support hypothesis 3, which, intuitively, suggests that larger firms disaggregated their segment reporting in response to SFAS No. 131 to a proportionately greater extent than smaller firms did.

Hypothesis 4 states that the segment operations that were newly-disclosed under SFAS No. 131 came from complex firms, which are operationalized as firms with high average within-segment diversity. In other words, the diversity of operations combined under the umbrella of each

segment is greater, on average, for a complex firm. Following Givoly et al. (1999), inter-segment diversity of operations is measured by the average difference between the primary and secondary SIC codes of a firm's segments as reported in 1997. Specifically, if the secondary SIC code is missing, the difference in primary and secondary SIC codes is assigned a value of zero. If the first three digits match, but the last digit differs, the difference is assigned a value of 1. If the first two digits match, the difference is assigned a value of 10. If only the first digit matches, the difference is assigned a value of 100, and if all four digits differ, the difference is assigned a value of 1,000. Finally, the average of all intersegment differences is divided by 1,000. New segments are expected to be associated with highly-complex firms because the challenge of reporting under SFAS No. 14 given greater operational diversity is expected to be greater. As in hypotheses 1 and 2, the Mann-Whitney U test is used to measure the difference between the measure of intersegment operational diversity for newly-reported versus existing segments .

Hypothesis 5 states that firms operating in a jurisdiction that taxes income at a rate higher than the domestic rate reveal more previously-undisclosed segments than firms with no identifiable tax motivation. If a U.S.-based firm faces higher tax rates on profits earned from foreign operations, the firm has an incentive to make agreements between foreign and domestic segments whereby foreign segments make deductible payments to domestic segments in the form of interest, royalties, administrative fees and so forth in order to reduce foreign income and increase U.S. income. Note that if the disparity in tax rates is reversed, the incentive to shift profits between tax jurisdictions is eliminated by U.S. tax law.

The foreign tax rate (FTR) is computed as foreign income tax as a percentage of pretax foreign income. Although the U.S. corporate tax rate is now among the highest internationally, at the time SFAS No. 131 was issued, the national corporate tax rate in many foreign countries exceeded the top domestic rate of 35%. The domestic tax rate (DTR) is computed as domestic

income tax as a percentage of domestic income, as provided on the Compustat Fundamentals Annual data. Positive differences between the FTR and DTR are expected to be positively related to the number of additional segments disclosed by a given firm. The magnitude of the disparity in tax rates represents the potential tax benefit of shifting income from a (foreign) high-tax jurisdiction to a (domestic) low-tax jurisdiction. The tax avoidance motive provides an alternative explanation for firms' reluctance to fully disclose segment information.

2.3.2 Multivariate Tests

In practice, managers weigh multiple factors simultaneously in the process of structuring disclosures within the parameters of existing regulations. In order to model the influence of the incentives discussed on managers' segment reporting choices, the following model is estimated using logit regression:

$$NewSeg_{it} = \propto_0 + \beta_1 SegSalesProp_{it} + \beta_2 2DigitSIC_{it-1} + \beta_3 LnCEquity_{it} + \beta_4 DifSIC_{it-1} + \beta_5 FTRdif_{it} + \beta_6 FTC_{it-1} \times FTRdif_{it} + \varepsilon$$

Variable definitions

NewSeg	A binary variable that takes on the value of 1 if the segment is newly-disclosed (as defined in the Sample Description section) in 1998, or 0.
SegSalesProp	A value between 2% and 100%, representing a given segment's sales as a proportion of total firm sales. Lower values of this variable are expected to be associated with newly-reported segments. Accordingly, the expected sign of the coefficient is negative.
2DigitSIC	A binary variable which takes on the value of one if the segment in question matches an existing segment of the same firm on the basis of 2-digit SIC code, and zero otherwise. Because newly-reported segments are expected to be carved from previously-reported aggregations of operating segments, a positive coefficient is expected.
LnCEquity	The natural log of 1997 year end common equity Larger firms are expected to be associated with more extensive aggregation in the pre-adoption period. The expected sign of the coefficient is positive.
DifSIC	The average difference between primary and secondary SIC codes for all segments reported by a given firm. Specifically, if no secondary SIC code is listed, the difference is zero. If the first digit differs, the difference is one. If the first two digits differ, the difference is ten. If the first three digits differ, the difference is 100. If none of the digits are the same, the difference is 1,000. DifSIC is equal to the firm-level average difference in primary and secondary SIC codes is divided by 1,000. The expected sign of the coefficient is positive.

FTC — Foreign tax credit. Dummy variable equal to 1 if the foreign tax rate is greater than the domestic tax rate, signifying that an opportunity for tax savings exists for firms that repatriate what would otherwise be foreign earnings as deductible payments to U.S. segments.

FTRdif — Difference between the foreign and domestic corporate income tax rates. Computed as foreign income tax divided by foreign after-tax earnings less the corresponding figure for domestic tax. Expected sign is not determined.

FTC x FTRdif — Interaction term that represents the potential value of tax avoidance. Equal to zero if the domestic tax rate exceeds the foreign tax rate in order to reflect the fact that the U.S. foreign tax credit prevents tax benefits from being realized by shifting income from the U.S. to lower-rate jurisdictions abroad. Segment aggregation is expected to have been greater under SFAS No. 14 when tax benefits are available. The expected sign of the coefficient, therefore is positive.

2.4 Sample Selection and Description

The original sample includes all firms having segment data available on the Compustat Segments File for both 1997 and 1998. Firms must also have data available on the Compustat Industrial Annual File sufficient to perform the tests described earlier. Firms are required to have consolidated sales exceeding $20 million, and are required to disclose two or more business segments in 1997. This exclusion criterion is used since firms that reported a single segment prior to SFAS No. 131 are systematically different from multiple segment firms. As Ettredge et al. document, "Market capitalization of the average M-M firm (i.e., a firm reporting multiple segments in both 1997 and 1998) is four times greater than that of the average S-M firm (i.e., a firm reporting a single segment in 1997, but multiple segments in 1998), while total assets are five times greater." Additionally, single segment firms may have international operations, but the information disclosed by such firms is not adequate to provide relevant evidence about tax avoidance incentives, and thus are excluded from analysis.

Table 2.1 shows sample selection criteria and the process by which the final sample was obtained. Of the 1,805 firms included in the original sample, 317 firms were financial services firms or public utilities. These firms were dropped from the sample because firms from these industries face specialized reporting regulations that are likely to confound the results of the analysis to be

conducted. Additionally, 142 firms' sales were less than $20 million. Smaller firms do not typically have well-developed investor relations programs. For this reason, firms whose sales are very low have dissimilar information environments compared to the rest of the firms under analysis and are, therefore, not included in the sample.

Firms that delisted in 1998, or those experiencing mergers, divestitures, or similar transactions (n = 539) are eliminated from the sample because it would be impossible to disentangle potential effects of these changes from the effects of revised segment reporting under SFAS No. 131. A number of firms did not report taxes paid on foreign income on the Compustat Annual Industrial File, despite having foreign source income. These firms were also eliminated from the sample. Without information about foreign earnings and taxes paid, however, the foreign tax rate cannot be estimated. For each firm, the foreign tax rate is averaged over a three-year period in order to reduce the potential influence of anomalous events on the estimation of the relevant variables. Firms without data available for the three consecutive years immediately preceding the study period (1994 through 1996, n = 218) are dropped from the sample. Finally, 295 firms lacked sufficient segment data to conduct the segment-level analysis; these firms were also eliminated from the sample.

Table 2.2 shows the distribution of remaining firms among industries, by firm as well as segment. Segments within a given firm tend to operate in the same, or closely related industries. Both firms and segments are concentrated in manufacturing, but a fairly broad cross-section of industries is represented, both at the firm and segment level. Table 2.3 contains descriptive data at both the firm (top panel), and segment level. Note that the segment level data provides some support for hypothesis 1, which states that the segment operations that were newly-disclosed under SFAS No. 131 are of less significance to their firms than previously-disclosed segments. Newly-reported segments (compared to existing segments) have lower relative sales, lower sales per

segment, and fewer traceable assets. Operating profits are higher for new segments at the mean (new segments, $248.38 million versus existing segments, $202.09 million), but are lower at the median, indicating that a few extremely large values may be driving the mean results. As shown in Table 2.3, firms included in the current study (n = 294) reported an average of 2.7 (2.0) segments in 1998 (1997). This represents an increase of 34.2% (1998, n = 793; 1997, n = 591). This finding is consistent with prior studies; for example, Botosan et al. (2009) find a 33.8% increase in the number of reported segments post-SFAS No. 131 for a sample of firms reporting a single segment in 1997. The number of existing and newly-reported segments is nearly equal in 1998 (existing, n = 406, or 51.2%; newly-reported, n = 387, or 48.8%) because more than one-third of the segments reported in 1997 were so altered by the new delineation of segments that no surviving segment could be identified. Because the data have been screened for firm-level activities (such as divestitures) that would account for the loss of 1997 segments, the disproportionate gain in new segments can reasonably be attributed to revised segment delineation. This phenomenon is consistent with findings documented in Berger and Hann (2007), who find the proportion of newly-reported segments in their sample to be 50.1%.

2.5 Empirical Results

2.5.1 Univariate Results

Table 2.4 shows the results of tests of hypothesis 1, which states that newly-reported segments are of less significance than existing segments to their firms. In each of the measures provided, the results are directionally consistent with hypothesis 1. As discussed previously, the four measures examined: relative segment sales, absolute segment sales, identifiable segment assets, and segment operating profits have diminishing reliability in the order listed. The strength of the results declines in accordance with the reliability of the measure involved. As shown in the descriptive statistics, segment sales as a proportion of total firm sales are lower for newly-disclosed segments ($p <$

0.0001), as are sales expressed on an absolute basis. The value of identifiable assets for newly-listed segments is marginally lower ($p = 0.0662$). Segment operating profits for newly-listed firms are directionally lower than those for existing firms, but the difference is not significant ($p = 0.2431$).

Hypothesis 2 states that the segment operations that are newly-disclosed under SFAS No. 131 operate in the same industry as previously-disclosed segments. At issue is whether firms failed to separately disclose certain segments prior to 1998 on the basis of guidance from SFAS No. 14, which suggests that the delineation of line-of-business segments may have been made according to a two-digit SIC code. Table 2.5 shows the distribution of newly-reported and existing 1998 segments into two categories: firms that operate in the same two-digit SIC code as another segment of the same firm that was reported in 1997, and firms that do not. Results of Chi-square tests of homogeneity and association are shown beneath the table.

The results show that firms frequently operate more than one segment in related industries; of 793 segments disclosed in 1998, nearly one-third were in this position (31.8%, or 253 of 793 total segments). Further, given such a segment, the likelihood of it being a new segment is double the likelihood of it being an existing one ($n = 171$ of 253 total segments, or 67.46%). This evidence is relevant to the body of literature that explains why some firms withheld separate disclosure of certain segments. For the study sample, 44% of previously-undisclosed segments could have been combined with existing segments under the guidance of SFAS No. 14. Chi-square results indicate that it is highly unlikely that the distribution of segments shown is due to chance ($p < 0.0001$). This finding supports hypothesis 2.

Hypothesis 3 states that the magnitude of disaggregation observed as a result of compliance with SFAS No. 14 is positively related to firm size. For each firm, DisaggEquity is the change in common equity reported per segment from 1997 to 1998, standardized by the 1997 value. Similarly, DisaggSales is equal to the change in average sales per segment from 1997 to 1998, standardized by

average 1997 sales per segment. Natural logs are taken of segment sales and equity. A positive outcome is consistent with a decline in the amount of firm value reported per segment, and is taken as an indication of more disaggregation. Hypothesis 3 predicts that larger firms will disaggregate their operations for the purpose of segment reports to a greater extent than smaller firms. The relation between common equity and measures of disaggregation as described is tested for the full sample of firms (n = 294), as well as for the sample that includes only firms that reported additional segments in 1998 (n = 110). Spearman rank correlation coefficients assessing the probability of a relation between firm size and disaggregation are shown in the second and third columns of Table 2.6. The analysis does not support a relation between the measure of Sales disaggregation and common equity, either for the full or reduced samples. Note that the direction of the hypothesized relation changes sign from the full sample, where the coefficient is -6.88% (p = 0.2394), and the reduced sample, where the coefficient is 14.79% (p = 0.1231).

Tests for the relation between common equity and the equity-based measure of disaggregation are significant for both the full and reduced samples. As would be expected, the relation is stronger for the reduced sample. For the full sample, the correlation between firm size (as proxied by common equity) and the measure of disaggregation is 11.51% (p = 0.0486). For the reduced sample, the correlation is 20.36% (p = 0.0329). Larger firms are indeed associated with disaggregating the results of operations in segment reports. Results of analysis support hypothesis 3.

The far-right column of Table 2.6 shows the results of a nonparametric, univariate test of hypothesis 4, which states that that the segment operations that were newly-disclosed under SFAS No. 131 came from complex firms. Complexity is operationalized as the average difference between primary and secondary SIC codes for all segments reported by a given firm. Specifically, if no secondary SIC code is listed, the difference is zero. If the first digit differs, the difference is one. If the first two digits differ, the difference is ten. If the first three digits differ, the difference is 100. If

none of the digits are the same, the difference is 1,000. DifSIC is equal to the firm-level average difference in primary and secondary SIC codes is divided by 1,000. The variable of interest, DisaggDivSIC, represents the change in complexity for a given firm from 1997 until 1998. The Spearman correlation coefficients are insignificant for both the full and reduced samples; thus, no significant changes in complexity are identified. The lack of results may be related to the proxy used. In short, hypothesis 4 is not supported.

The final hypothesis states that firms operating in a jurisdiction that taxes income at a rate higher than their domestic rate reveal more previously-undisclosed segments than firms with no identifiable tax motivation. Recall that firms that use deductible intersegment payments in order to transfer funds to more favorable tax jurisdictions have an added incentive to aggregate segment reports to avoid the scrutiny of regulators. In order to test hypothesis 5, firms with higher foreign tax rates relative to the U.S. rate are coded as 1; otherwise, 0. Chi-square analysis is conducted to determine if this difference between firms appears to influence firms' decisions to report additional segments in 1998. As shown in Table 2.7, no association is established between these factors ($p = 0.4008$).

2.5.2 Multivariate Results

Several factors have been identified that may have influenced managers' decisions to withhold segments from disclosure. Segment attributes, such as a relatively small size or operations closely related to existing segments, appear to have most strongly affected disclosure choices. The results of univariate tests are consistent with larger firms having been more proactive than small ones in disaggregating segment reports as they moved to comply with SFAS No. 131. In reality, managers weigh relevant factors in their decisions about how to structure disclosure in situations where regulations fail to provide definitive answers. In the following analysis, logit regression is used to identify which factors were most salient to managers that chose to combine some segments and

separately disclose others. The dependent variable differs according to whether it was newly-reported or existed prior to SFAS No. 131. Newly-reported segments take on a value of 1, and 0 otherwise.

Results from the logit regression as presented in Table 2.8 reveal that SegSalesProp, the proportion of total sales represented by the sales of the segment in question, is a significant factor in predicting which segments managers may have chosen not to separately disclose their financial data ($p = 0.0001$). Specifically, the smaller the segment in terms of its contribution to total firm sales, the less likely it was to have been disclosed. This finding confirms the results of the univariate tests of hypothesis 1. Likewise, 2DigitSIC, an indicator variable set equal to one if the segment's 2-digit primary SIC code is equal to the firm's, or an existing segment's primary SIC code (and zero otherwise), is also a significant predictor. A segment operating in an industry closely related to the firm's, or another (presumably larger) segment's industry was likely to have been separately disclosed only under the new standard. This finding supports hypothesis 2. Firm size, as operationalized by LnDEquity, does not appear to be a significant predictor in logit regression, despite the fact that results of univariate tests were consistent with smaller firms reporting more new segments after implementation of SFAS No. 131. Evidence regarding hypothesis 3, therefore is mixed. Newly-reported segments tend to have high intersegment variability (as proxied by DifSIC) ($p = 0.0001$). This confirms the results of univariate analysis and lends support to hypothesis 4. One possible explanation for this finding is that, under SFAS No. 14, managers identified and reported the largest, most homogeneous segments, and only later, under SFAS No. 131 began to report smaller segments with mixed operations. Hypothesis 5 predicts that tax incentives also influence managers' motives to disclose segments in finer detail Tax motives, as represented by FTRDif, FTCint, and the interaction variable, FTC x FTRDif do not appear to be significant in the model

predicting which segments were previously undisclosed. Specifically, the coefficients have conflicting signs and offset one another.

2.6 Summary and Conclusions

Prior research on managers' motivation for non-disclosure of business segments acknowledges that, given the opportunity, managers will structure disclosures opportunistically. Botosan and Stanford (2005) find that managers withheld information about segments operating in less competitive industries in an effort to avoid alerting potential competitors to exceptionally attractive profit opportunities. Berger and Hann (2007) find that newly-disclosed segments under SFAS No. 131 tended to underperform compared to previously-disclosed segments operated by the same firm. They offer an agency cost explanation for this finding, arguing that managers concealed segments with poor performance to avoid market discipline for retaining operations that result in the destruction of market value.

Existing studies are predicated on the assumption that the number of segments reported may be opportunistically determined by managers, yet segment profits as reported are implicitly taken by the same studies to reflect neutral accounting by management for each segment, independent of other segments that the firm may operate. This assumption engenders a logical inconsistency. Specifically, extant research on the impact and consequences of SFAS No. 131 fails to recognize the distorting effects of financial interdependence. Givoly et al. (1999) find that the magnitude of the measurement error in segment reporting increases with the degree of cross-segment integration. Alternative explanations for differences in segment disclosures are proposed in this study. The results from this research indicate that segment size relative to the firm, the degree of relatedness of the firm's operations to other operations the firm undertakes, and the degree of intersegment variability, all influenced mananagers' decisions to withhold separate disclosure for some segments. This study contributes to existing research by helping to reconcile conflicting explanations for

disparities that are observed in the segment reporting choices that became evident when firms adopted SFAS No. 131. The evidence provides an additional and perhaps more convincing reason for managers' reluctance to disclose certain segments than the agency cost explanation considered by prior research.

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Table 1.01 Sample Selection Criteria and Composition by Group (Control versus Change)

Panel A Reconciliation of original to final sample

Reported at least one business segment for 1997		1,839
Non-New York Stock Exchange firms	379	
Sales < $20 million	16	
Regulated utilities and financial firms	325	
1998 sales < 0.5 or > 1.5 1997 sales	131	
1998 share price < 0.5 or > 1.5 1997 share price	158	
1998 shares outstanding < 0.5 or > 2.5 the 1997 value	3	
Firm reported fewer business segments in 1998 than in 1997	21	
Segment sales and Industrial Annual sales do not agree, mixed segments, etc.	73	
Compustat Industrial Annual file data items missing	123	
Pure play single segment firms	144	
Trade and quote data were unavailable for sample periods	205	1,578
Sample firms		261

Panel B Distribution among number of segments reported and increase in number of segments reported

Number of segments reported					Increase in segments reported				
	Control		Change			Control		Change	
Reported segments	1997	1998	1997	1998	New segments	N	%	N	%
1	0	0	88	0	0	118	100%	0	0%
2	49	49	27	32	1			62	43%
3	44	44	17	47	2			43	30%
4	14	14	7	24	3			24	17%
5	6	6	1	30	4			13	9%
6	4	4	3	4	5			1	1%
7	1	1	0	3					
8	0	0	0	1					
9	0	0	0	2					
Total	118	118	143	143	Total	118	100%	143	100%

Table 1.01
Panel A shows the number of firms reporting at least one line-of-business segment in the 1997 10-K (n = 1,839) followed by the number of firms eliminated from the initial sample for each disqualifying attribute. All sample firms traded on the New York Stock Exchange, reported greater than $20 million in sales, and were not classified by primary Standard Industrial Classification (SIC) code as a regulated utility, financial services firm, or government entity. Firms whose 1998 consolidated sales or share price differed from the 1997 value by more than 50% were dropped from the sample. Firms whose number of common shares outstanding for 1998 were less than 0.5 of the 1997 number, or increased by more than 2.5 times, were also dropped. Firms reporting fewer business segments in 1997 than 1998 were not analyzed. Further, consolidated sales as reported on Form 10-K must be within 10% of the sum of segment sales reported in the Compustat Segments File. Finally, each sample firm must have available all data required to perform tests described in this analysis, including segment and consolidated financial statement data reported on Compustat's North American segment and Industrial Annual files, intraday quote and trade data for the relevant time periods from the NYSE TAQ database, and security price and volume data from the Center for Research in Security Prices (CRSP) database.

Panel B shows the number of line-of-business segments reported in 1997 and 1998 as well as the change in number of segments reported.

Table 1.02 Distribution of Sample Firms by Industry, Size and Reporting Characteristics

Panel A Distribution of sample firms by industry

		Control --		Change ---		Total	
SIC Code	Industry	N	%	N	%	N	%
0000 - 1000	Agriculture	0	0.0%	1	0.7%	1	0.4%
1000 - 1999	Mining/construction	10	8.5%	8	5.6%	18	6.9%
2000 - 2999	Manufacturing	34	28.8%	49	34.3%	83	31.8%
3000 - 3999	Manufacturing	50	42.4%	56	39.2%	106	40.6%
4000-4999	Regulated Utilities	6	5.1%	7	4.9%	13	5.0%
5000 - 5999	Wholesale/retail	9	7.6%	9	6.3%	18	6.9%
6000 - 6999	Financial services	0	0.0%	0	0.0%	0	0.0%
7000 - 7999	Services	8	6.8%	11	7.7%	19	7.3%
8000 - 8999	Services	1	0.8%	2	1.4%	3	1.1%
9000 - 9999	Government	0	0.0%	0	0.0%	0	0.0%
		118	100.0%	143	100.0%	261	100.0%

Panel B Distribution of sample firms by fiscal year end

	Control --		Change --		Total	
Fiscal year end	N	%	N	%	N	%
January	5	4.2%	5	3.5%	10	3.8%
February	1	0.8%	5	3.5%	6	2.3%
March	7	5.9%	6	4.2%	13	5.0%
April	1	0.8%	3	2.1%	4	1.5%
May	4	3.4%	3	2.1%	7	2.7%
June	5	4.2%	0	0.0%	5	1.9%
July	2	1.7%	0	0.0%	2	0.8%
August	2	1.7%	0	0.0%	2	0.8%
September	14	11.9%	0	0.0%	14	5.4%
October	5	4.2%	0	0.0%	5	1.9%
November	6	5.1%	1	0.7%	7	2.7%
December	66	55.9%	120	83.9%	186	71.3%
Total	118	100.0%	143	100.0%	261	100.0%

Panel C Distribution of sample firms by size and industry

	Manufacturing		Non-manufacturing		
	Control	Change	Control	Change	Totals
Large	41	48	21	20	130
Small	42	57	14	18	131
Total	83	105	35	38	
Industry		188		73	261
Group			118	143	261

Table 1.02

Panel A shows the distribution of sample firms among Standard Industrial Classification (SIC) codes by group (Control versus Change) and in total. Control firms reported the same number of business segments in 1997 and 1998. Change firms increased the number of reported business segments. Firms classified under industrial codes 4950 - 4999, 6000 - 6999, and 9000 - 9999, representing regulated utilities, financial services firms, and government entities, respectively, were eliminated from the sample.

Panel B shows the distribution of sample firms among fiscal year ends by group (Control versus Change), and in total.

Panel C shows the distribution of sample firms among manufacturing and non-manufacturing industrial codes by group (Control versus Change), among large and small capitalization pools by group (Control versus Change), and in total. Median market capitalization for the full sample of $1,534.79 million is used to deliniate large and small capitalization pools.

Table 1.03 Descriptive Statistics for Sample Firms

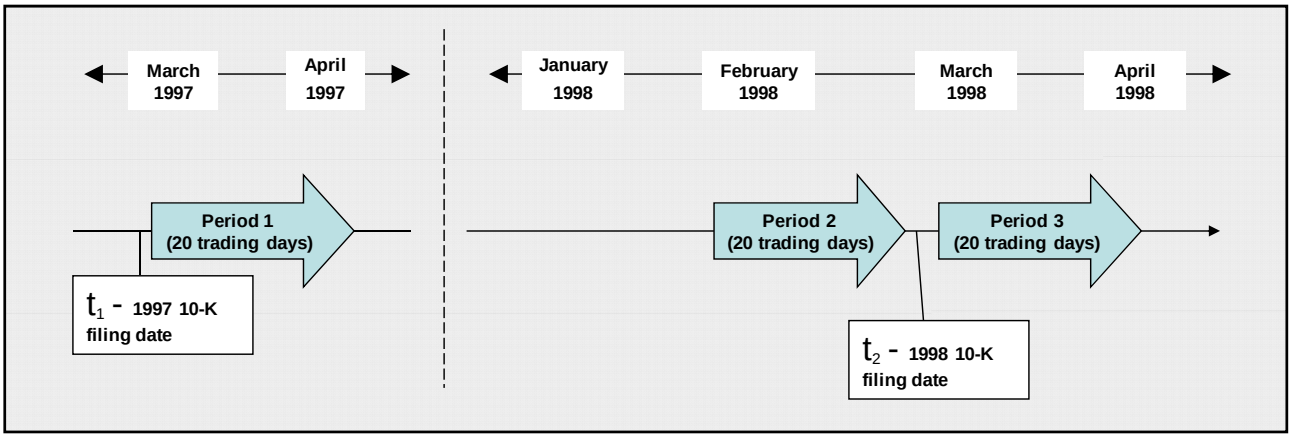
All firms - Control, n = 118; Change, n = 143	1998				1997			
	Control		Change		Control		Change	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Firm size ($000,000's)	6,840.78	1,696.92	7,842.85	1,701.42	6,063.48	1,786.73	7,067.76	1,791.74
Daily share volume (00's)	2,818.88	786.75	4,014.87	1,385.00	2,120.80	608.25	2,967.95	1,268.00
Trade size in shares	479.24	500.00	529.72	500.00	538.87	500.00	576.75	500.00
Trading frequency	182.43	78.50	219.97	118.00	133.73	62.50	157.49	91.00
Share Price ($)	37.98	28.08	35.08	29.13	43.98	36.63	40.75	37.75
Daily dollar volume ($000's)	14,768.9	2,570.6	21,153.5	3,792.5	11,586.6	2,257.7	16,592.7	4,720.5
Effective dollar spread ($)	0.092	0.063	0.082	0.063	0.090	0.063	0.081	0.063
Effective relative spread	0.39%	0.26%	0.37%	0.25%	0.30%	0.23%	0.29%	0.20%
Quoted dollar spread ($)	0.176	0.159	0.160	0.152	0.175	0.158	0.154	0.147
Quoted relative spread	0.73%	0.53%	0.68%	0.51%	0.58%	0.46%	0.53%	0.41%
Quoted depth (00's)	25.8	20.4	29.4	24.9	24.2	20.0	30.8	25.4

Table 1.03
Descriptive statistics for 1998 and 1997 for a sample of NYSE firms reporting multiple line-of-business segments in 1998. Control firms reported the same number of segments 1998 and in 1997, while Change firms reported additional segments in 1998. Firm size is the market value of common equity as of the last trading day of the calendar year. Remaining statistics reflect data for 20 consecutive trading days following each firm's Form 10-K filing for 1998 and 1997. Statistics for each sample (Control and Change) are calculated using the median value of all trading days for each firm. Daily share volume is the number of shares traded in a day. Daily share volume factors into trade size and trading frequency. Trade size in shares is the average number of shares traded per transaction. Trading frequency is the number of transactions per day. Share price is the price at which a trade is executed. Daily dollar volume is the dollar value of all shares traded in a day. Effective dollar spread is twice the difference between the price of a trade and the midpoint of the prevailing quote. Effective relative spread is the effective dollar spread deflated by the midpoint of the prevailing quote. The remaining statistics reflect aspects of the dealer's quote. For remaining statistics, a time-weighted statistic is calculated for each trading day in the sample period, and the median value for each firm is used to form the sample, as before. Quoted dollar spread is the difference between the bid and ask prices of the prevailing quote. Quoted relative spread is the quoted dollar spread deflated by the midpoint of the prevailing quote. Quoted depth is half the sum of the shares offered at the bid and ask, and is expressed in terms of round lots of 100 shares.

Table 1.04 Descriptive Statistics for High-Spread Firms

All firms - Control, n = 45; Change, n = 43	1998				1997			
	Control		Change		Control		Change	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Firm size ($000,000's)	2,413.99	585.64	1,111.63	575.37	2,510.39	557.63	1,157.27	716.72
Daily share volume (00's)	928.08	251.00	551.35	253.50	476.44	224.00	488.46	219.00
Trade size in shares	471.01	400.00	505.78	450.00	407.77	400.00	521.66	500.00
Trading frequency	89.02	29.00	55.12	30.00	46.16	28.50	28.50	24.00
Share Price ($)	41.09	25.56	33.11	27.19	50.29	32.22	41.31	30.63
Daily dollar volume ($000's)	4,506.2	589.7	2,641.8	693.2	3,398.0	670.1	2,469.3	612.1
Effective dollar spread ($)	0.126	0.125	0.115	0.125	0.134	0.125	0.124	0.125
Effective relative spread	0.50%	0.38%	0.53%	0.40%	0.41%	0.38%	0.48%	0.37%
Quoted dollar spread ($)	0.222	0.192	0.207	0.190	0.225	0.210	0.204	0.197
Quoted relative spread	0.88%	0.70%	0.92%	0.72%	0.72%	0.65%	0.78%	0.65%
Quoted depth (00's)	17.6	13.5	15.3	13.7	15.7	12.2	16.0	13.8

Table 1.04
Descriptive statistics for 1998 and 1997 for a sample of NYSE firms reporting multiple line-of-business segments in 1998. Control firms reported the same number of segments 1998 and in 1997, while Change firms reported additional segments in 1998.Statistics shown are for firms whose underlying stocks' effective dollar spreads were above the median of the full sample in 1997 (i.e., high-spread firms). Firm size is the market value of common equity as of the last trading day of the calendar year. Remaining statistics reflect data for 20 consecutive trading days following each firm's Form 10-K filing for 1998 and 1997. Statistics for each sample (Control and Change) are calculated using the median value of all trading days for each firm. Daily share volume is the number of shares traded in a day. Daily share volume can be factored into trade size and trading frequency. Trade size in shares is the average number of shares traded per transaction. Trading frequency is the number of transactions per day. Share price is the price at which a trade is executed. Daily dollar volume is the dollar value of all shares traded in a day. Effective dollar spread is twice the difference between the price of a trade and the midpoint of the prevailing quote. Effective relative spread is the effective dollar spread deflated by the midpoint of the prevailing quote. The remaining statistics reflect aspects of the dealer's quote. For remaining statistics, a time-weighted statistic is calculated for each trading day in the sample period, and the median value for each firm is used to form the sample, as before. Quoted dollar spread is the difference between the bid and ask prices of the prevailing quote. Quoted relative spread is the quoted dollar spread deflated by the midpoint of the prevailing quote. Quoted depth is the sum of the shares offered at the bid and ask, divided by two, and is expressed in terms of round lots of 100 shares.



t_1 -- 1997 10-K filing date, typically in March for calendar year firms

t_3 -- 1998 10-K filing date, typically in March for calendar year firms

Period 1 – The period beginning seven calendar days after time t_1 and continuing for 20 consecutive trading days thereafter

Period 2 – The period ending seven calendar days prior to time t_2 and beginning 20 consecutive trading days prior to that date

Period 3 – The period beginning seven calendar days after time t_2 and continuing for 20 consecutive trading days thereafter

Period 3/Period 2 ratio – x / y where x is a given statistic from Period 3 and y is the corresponding value from Period 2.

Period 3/Period 1 ratio – x / z where x is a given statistic from Period 3 and z is the corresponding value from Period 1.

Period 2/Period 1 ratio – y / z where y is a given statistic from Period 2 and z is the corresponding value from Period 1.

Each period contains approximately 28 – 30 calendar days. The date of the 10-K release and two weeks surrounding it is excluded from analysis to exclude potential effects of early dissemination and delayed assimilation of information contained in Form 10-K.

Figure 1.1 Organization of Data Presented in Tables 1.4 through 1.10

Table 1.05 Market Capitalization by Number of Segments Reported

1997 Reported segments	Control Firms N	Segments reported total	%	Mean mkt cap ($MM)	Median mkt cap ($MM)	Mkt cap per segment ($MM)	Change Firms N	Segments reported total	%	Mean mkt cap ($MM)	Median mkt cap ($MM)	Mkt cap per segment ($MM)
1	0	0	0%	-	-	-	88	88	62%	4,502.5	1,135.0	4,502.5
2	49	98	42%	3,184.7	875.0	1,592.3	27	54	19%	9,994.9	3,015.5	4,997.4
3	45	135	38%	5,872.5	1,045.7	1,957.5	17	51	12%	7,064.0	5,456.0	2,354.7
4	14	56	12%	6,018.3	1,885.2	1,504.6	7	28	5%	11,234.1	9,787.2	2,808.5
5	6	30	5%	14,117.9	10,866.4	2,823.6	1	5	1%	13,031.7	13,031.7	2,606.3
6	4	24	3%	31,510.5	8,226.5	5,251.8	3	18	2%	44,284.5	42,127.5	7,380.7
7	1	7	1%	1,975.4	1,975.4	282.2	0	0	0%	-	-	-
	118	350	100%				143	244	100%			
Market cap per segment						**2,235.3**						**3,521.5**
Mean segments per firm		**2.97**						**1.71**				

1998 Reported segments	Control Firms N	Segments reported total	%	Mean mkt cap ($MM)	Median mkt cap ($MM)	Mkt cap per segment ($MM)	Change Firms N	Segments reported total	%	Mean mkt cap ($MM)	Median mkt cap ($MM)	Mkt cap per segment ($MM)
1	0	0	0%	-	-	-	0	0	0%	-	-	-
2	49	98	42%	4,428.8	1,070.8	2,214.4	32	64	22%	2,241.5	1,284.5	1,120.7
3	45	135	38%	6,126.9	1,066.4	2,042.3	47	141	33%	5,348.6	694.0	1,782.9
4	14	56	12%	6,196.8	1,603.3	1,549.2	24	96	17%	10,287.4	2,458.6	2,571.9
5	6	30	5%	15,481.5	11,264.4	3,096.3	30	150	21%	11,584.9	3,522.5	2,317.0
6	4	24	3%	33,576.7	5,156.7	5,596.1	4	24	3%	7,586.3	2,195.3	1,264.4
7	1	7	1%	2,067.7	2,067.7	295.4	3	21	2%	13,889.4	13,762.2	1,984.2
8	0	0	0%	-	-	-	1	8	1%	25,327.0	25,327.0	3,165.9
9	0	0	0%	-	-	-	2	18	1%	53,316.1	53,316.1	5,924.0
	118	350	100%				143	522	100%			
Market cap per segment						**2,465.6**						**2,516.4**
Mean segments per firm		**2.97**						**3.65**				

Table 1.05 shows the mean and median market values of common equity for Control and Change firms by number of line-of-business segments reported. For each group and year, the proportion of firms reporting a given number of segments is shown in the '% reporting N segments' column. Market capitalization for each firm is the product of items 24 (calendar year closing share price) and 25 (common shares outstanding) from the Compustat Annual Industrial file at the end of the calendar year specified. Mean (median) market capitalization is the mean (median) value of common equity for firms within each group (Control, Change) and level of segment reporting (one through nine segments). The Market capitalization per segment column is equal to the mean market capitalization of firms reporting at each level divided by the number of segments reported. In 1998 (1997), Change firms reported a mean of 3.65 (1.71) line-of-business segments; Control firms reported a mean of 2.97 segments in each year.

Table 1.06 Impact of SFAS No. 131 disclosure on relative quoted bid-ask spread ratios

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	1.01	1.05	1.02	1.03	1.00	1.02
Median	1.00	1.03	1.00	1.02	0.99	1.00
Wilcoxon signed-rank test (probability median value of ratios is one)	0.8590	0.0122	0.3756	0.0005	0.6567	0.5717
Proportion of stocks with increases in post-listing period	0.50	0.59	0.49	0.63	0.49	0.49
Wilcoxon rank sum test (probability samples have equal distributions)		0.0726		0.1255		0.4108

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 45; Change, n = 43	Control	Change	Control	Change	Control	Change
Mean	1.26	1.22	1.04	0.96	1.24	1.28
Median	1.22	1.20	1.01	0.97	1.20	1.24
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.5519	0.0985	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.76	0.74	0.56	0.47	0.69	0.88
Wilcoxon rank sum test (probability samples have equal distributions)		0.5831		0.1771		0.3193

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	1.02	1.02	1.04	1.02	0.99	1.01
Median	1.01	1.01	1.02	1.02	0.99	0.99
Wilcoxon signed-rank test (probability median value of ratios is one)	0.8170	0.7108	0.0750	0.0828	0.5920	0.3033
Proportion of stocks with increases in post-listing period	0.52	0.52	0.56	0.60	0.48	0.44
Wilcoxon rank sum test (probability samples have equal distributions)		0.9085		0.8040		0.8013

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	1.00	1.08	0.99	1.04	1.01	1.04
Median	0.99	1.04	0.99	1.03	0.99	1.01
Wilcoxon signed-rank test (probability median value of ratios is one)	0.6494	0.0019	0.4461	0.0010	0.9620	0.1137
Proportion of stocks with increases in post-listing period	0.48	0.64	0.41	0.66	0.50	0.53
Wilcoxon rank sum test (probability samples have equal distributions)		0.0185		0.0107		0.4117

Table 1.06
Relative quoted bid-ask spread ratios for 118 firms reporting the same number of segments in both 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 than in 1997 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

Relative quoted bid-ask spreads are computed as follows: The quoted spread is the difference between the posted price at which a dealer is willing to sell a stock (ask) and the posted price at which a dealer is willing to buy a stock (bid). This difference is divided by the mid-point of the quote to achieve comparability between stocks that are traded at different prices. Relative bid-ask spreads are expressed in terms of a cost per dollar. For each firm, 20 daily quoted bid-ask spreads (one for each of 20 consecutive trading days) are computed by weighting each prevailing quote by the amount of time the quote was valid during the trading day. The median bid-ask spread value from the 20 trading days included in a given firm's test period is divided by the comparable value from the prior period to form a ratio. A ratio of less than one indicates a decrease in relative quoted bid-ask spreads over time, consistent with improved market liquidity. Each test period typically includes 28 - 30 calendar days. Figure 1 shows event dates and test periods used.

Table 1.07 Impact of SFAS No. 131 disclosure on relative effective bid-ask spread ratios

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	1.30	1.31	1.02	1.00	1.32	1.35
Median	1.22	1.24	1.01	0.98	1.24	1.25
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.9245	0.0535	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.74	0.74	0.56	0.43	0.74	0.77
Wilcoxon rank sum test (probability samples have equal distributions)		0.9889		0.1862		0.7626

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 43; Change, n = 45	Control	Change	Control	Change	Control	Change
Mean	1.18	1.12	1.04	1.00	1.21	1.15
Median	1.14	1.11	1.02	0.95	1.12	1.18
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0047	0.1011	0.5975	0.3220	0.0111	0.0107
Proportion of stocks with increases in post-listing period	0.62	0.58	0.60	0.42	0.62	0.67
Wilcoxon rank sum test (probability samples have equal distributions)		0.4299		0.2883		0.9072

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	1.38	1.41	1.03	0.96	1.39	1.48
Median	1.31	1.29	1.03	0.97	1.27	1.30
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.2762	0.0246	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.77	0.81	0.66	0.37	0.77	0.87
Wilcoxon rank sum test (probability samples have equal distributions)		0.9322		0.0178		0.4447

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	1.21	1.23	1.01	1.02	1.24	1.23
Median	1.14	1.23	0.97	0.98	1.15	1.21
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.2918	0.5795	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.70	0.68	0.44	0.47	0.70	0.68
Wilcoxon rank sum test (probability samples have equal distributions)		0.7755		0.5080		0.8116

Table 1.07
Relative effective bid-ask spread ratios for 118 firms reporting the same number of segments in both 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 than in 1997 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

Relative effective bid-ask spreads are computed as follows: The effective spread is twice the difference between the price at which a trade is executed and the mid-point of the quoted bid-ask spread prevailing at the time of the trade. The relative effective spread is the effective spread divided by the mid-point of the prevailing quoted spread. The result is expressed in terms of the transaction cost per dollar of stock traded. In order to form a ratio, the median bid-ask spread value from the 20 consecutive trading days included in a given firm's test period is divided by the comparable value from the prior period. A ratio of less than one indicates a decrease in bid-ask spreads over time, consistent with improved market liquidity. Each 20-day test period typically includes 28-30 calendar days. Figure 1 shows event dates and test periods used.

Table 1.08 Impact of SFAS No. 131 disclosure on quoted depth ratios

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	1.16	1.02	1.04	1.02	1.17	1.04
Median	1.05	0.97	1.01	0.96	1.04	0.95
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0182	0.5881	0.6280	0.6825	0.0182	0.8537
Proportion of stocks with increases in post-listing period	0.53	0.48	0.51	0.43	0.55	0.45
Wilcoxon rank sum test (probability samples have equal distributions)		0.0714		0.4927		0.0788

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 43; Change, n = 45	Control	Change	Control	Change	Control	Change
Mean	1.26	1.03	1.00	0.97	1.23	0.94
Median	1.08	0.98	0.96	1.04	1.34	1.05
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0210	0.8587	0.6933	0.9150	0.0014	0.9527
Proportion of stocks with increases in post-listing period	0.58	0.47	0.42	0.47	0.64	0.47
Wilcoxon rank sum test (probability samples have equal distributions)		0.0937		0.6295		0.0222

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	1.10	1.04	1.01	1.04	1.18	1.05
Median	0.97	0.99	0.97	0.96	1.04	0.97
Wilcoxon signed-rank test (probability median value of ratios is one)	0.7062	0.7247	0.9473	0.8724	0.1200	0.8096
Proportion of stocks with increases in post-listing period	0.44	0.48	0.47	0.45	0.53	0.48
Wilcoxon rank sum test (probability samples have equal distributions)		0.6962		0.8005		0.2404

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	1.23	1.00	1.07	1.00	1.15	1.03
Median	1.09	0.96	1.03	0.97	1.03	0.94
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0347	0.2684	0.3595	0.4565	0.0827	0.9306
Proportion of stocks with increases in post-listing period	0.63	0.47	0.56	0.42	0.57	0.43
Wilcoxon rank sum test (probability samples have equal distributions)		0.0248		0.1930		0.1708

Table 1.08
Quoted depth ratios for 118 firms reporting the same number of segments in both 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 than in 1997 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

Quoted depth is defined as the time-weighted average number of securities offered at the bid and ask for each day, divided by two. For each firm, 20 daily depth values are computed, one for each of 20 consecutive trading days in the test period. The median quoted depth value from the 20 trading days included in a given firm's test period is divided by the comparable value from the prior period to form a ratio. A ratio greater than one indicates an increase in quoted depth over time, consistent with an improvement in market liquidity. Each 20-day test period typically includes 28-30 calendar days. Event dates and test periods used are shown in Figure 1.

Table 1.09 Impact of SFAS No. 131 disclosure on share volume ratios by firm size

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	1.36	1.33	1.16	1.21	1.23	1.21
Median	1.11	1.22	1.04	1.09	1.03	1.09
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0006	0.0001	0.0173	0.0001	0.0393	0.0006
Proportion of stocks with increases in post-listing period	0.56	0.63	0.54	0.60	0.53	0.56
Wilcoxon rank sum test (probability samples have equal distributions)		0.3435		0.3789		0.7445

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 45; Change, n = 43	Control	Change	Control	Change	Control	Change
Mean	1.56	1.41	1.08	1.36	1.42	1.15
Median	1.14	1.22	0.99	1.20	1.13	0.87
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0308	0.0221	0.6608	0.0002	0.0327	0.4902
Proportion of stocks with increases in post-listing period	0.58	0.58	0.49	0.72	0.56	0.44
Wilcoxon rank sum test (probability samples have equal distributions)		0.8287		0.0354		0.1409

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	1.27	1.31	1.13	1.35	1.16	1.09
Median	0.89	1.06	1.00	1.23	0.99	0.87
Wilcoxon signed-rank test (probability median value of ratios is one)	0.9684	0.0174	0.3672	0.0001	0.8273	0.8481
Proportion of stocks with increases in post-listing period	0.41	0.55	0.50	0.70	0.47	0.39
Wilcoxon rank sum test (probability samples have equal distributions)		0.1050		0.0326		0.7981

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	1.46	1.35	1.20	1.09	1.31	1.31
Median	1.41	1.28	1.09	1.03	1.08	1.30
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.0077	0.1620	0.0039	0.0001
Proportion of stocks with increases in post-listing period	0.74	0.70	0.59	0.51	0.61	0.72
Wilcoxon rank sum test (probability samples have equal distributions)		0.3390		0.2790		0.5160

Table 1.09
Share volume ratios for 118 firms reporting the same number of segments in both 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 than in 1997 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

Share volume is computed as the number of shares traded for each firm on a given day. For each firm, 20 daily share volume values are computed, one for each of 20 consecutive trading days in the test period. The median share volume value from the 20 trading days included in a given firm's test period is divided by the comparable value from the prior period to form a ratio. A ratio greater than one indicates an increase in share volume over time, consistent with an improvement in market liquidity. Each test period typically includes 28-30 calendar days. Event dates and test periods used are shown in Figure 1.

Table 1.10 Impact of SFAS No. 131 disclosure on price ratios

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	0.86	0.87	1.02	1.05	0.85	0.83
Median	0.82	0.82	1.01	1.05	0.84	0.78
Wilcoxon signed-rank test (probability median value of ratios is one)	0.000	0.000	0.069	0.000	0.000	0.000
Proportion of stocks with increases in post-listing period	0.27	0.27	0.54	0.68	0.27	0.20
Wilcoxon rank sum test (probability samples have equal distributions)		0.895		0.020		0.290

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 45; Change, n = 43	Control	Change	Control	Change	Control	Change
Mean	0.83	0.87	1.08	1.09	0.82	0.80
Median	0.80	0.83	0.99	1.06	0.80	0.78
Wilcoxon signed-rank test (probability median value of ratios is one)	0.000	0.000	0.661	0.000	0.000	0.000
Proportion of stocks with increases in post-listing period	0.22	0.18	0.49	0.74	0.31	0.11
Wilcoxon rank sum test (probability samples have equal distributions)		0.406		0.014		0.684

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	0.85	0.80	1.03	1.07	0.83	0.75
Median	0.80	0.79	1.01	1.05	0.78	0.77
Wilcoxon signed-rank test (probability median value of ratios is one)	0.000	0.000	0.279	0.000	0.000	0.000
Proportion of stocks with increases in post-listing period	0.25	0.19	0.52	0.72	0.29	0.10
Wilcoxon rank sum test (probability samples have equal distributions)		0.620		0.020		0.246

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	0.87	0.92	1.01	1.04	0.86	0.89
Median	0.88	0.82	1.02	1.06	0.89	0.82
Wilcoxon signed-rank test (probability median value of ratios is one)	0.001	0.002	0.144	0.001	0.001	0.000
Proportion of stocks with increases in post-listing period	0.30	0.33	0.57	0.64	0.25	0.28
Wilcoxon rank sum test (probability samples have equal distributions)		0.788		0.359		0.766

Table 1.10
Price ratios for 118 firms reporting the same number of segments in 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

Price is equal to the average price per share of all shares traded for a given firm in a day. For each firm, 20 daily price values are computed, one for each of 20 consecutive trading days in the test period. The median price value from the 20 trading days included in a given firm's test period is divided by the comparable value from the prior period to form a ratio. A ratio greater than one indicates an increase in price over time. Each test period typically includes 28-30 calendar days. Event dates and test periods used are shown in Figure 1.

Table 1.11 Impact of SFAS No. 131 disclosure on the volatility of returns ratios

All firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 118; Change, n = 143	Control	Change	Control	Change	Control	Change
Mean	1.20	1.27	1.00	1.00	1.20	1.29
Median	1.14	1.20	0.99	0.99	1.16	1.21
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.7844	0.3412	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.75	0.74	0.50	0.45	0.66	0.78
Wilcoxon rank sum test (probability samples have equal distributions)		0.1062		0.3780		0.0980

High-spread firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 45; Change, n = 43	Control	Change	Control	Change	Control	Change
Mean	1.20	1.19	1.05	0.96	1.17	1.27
Median	1.14	1.14	1.03	0.92	1.15	1.18
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0003	0.0001	0.2118	0.0410	0.0072	0.0001
Proportion of stocks with increases in post-listing period	0.76	0.70	0.62	0.36	0.60	0.77
Wilcoxon rank sum test (probability samples have equal distributions)		0.9103		0.0222		0.2845

Small firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 64; Change, n = 67	Control	Change	Control	Change	Control	Change
Mean	1.22	1.34	1.02	0.97	1.21	1.40
Median	1.15	1.22	1.02	0.93	1.16	1.29
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.8688	0.0190	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.73	0.78	0.53	0.36	0.64	0.85
Wilcoxon rank sum test (probability samples have equal distributions)		0.1065		0.1443		0.0466

Large firms -	Period 3 / Period 1		Period 3 / Period 2		Period 2 / Period 1	
Control, n = 54; Change, n = 76	Control	Change	Control	Change	Control	Change
Mean	1.17	1.21	1.01	1.02	1.18	1.19
Median	1.10	1.17	0.99	1.01	1.14	1.17
Wilcoxon signed-rank test (probability median value of ratios is one)	0.0001	0.0001	0.7372	0.2424	0.0001	0.0001
Proportion of stocks with increases in post-listing period	0.75	0.72	0.46	0.53	0.68	0.72
Wilcoxon rank sum test (probability samples have equal distributions)		0.4427		0.6921		0.7522

Table 1.11
Volatility of returns ratios for 118 firms reporting the same number of segments in both 1997 and 1998 (Control firms) versus comparable ratios for 143 firms reporting at least one additional segment in 1998 than in 1997 (Change firms). Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997.

The volatility of returns is computed as the mean squared difference between each transaction's return and the mean return for a given day. The return for a given transaction is the midpoint of the prevailing quote less the midpoint from the prior transaction, divided by the midpoint from the prior transaction. Note that the midpoint of the spread is used in order to exclude bid-ask bounce as a source of variability in returns. For each firm, 20 daily volatility of returns values are computed, one for each of 20 consecutive trading days in the test period. The median volatility of returns value from the 20 trading days included in a given firm's test period is divided by the comparable value from the prior period to form a ratio. A ratio less than one indicates a decrease in volatility over time, consistent with an improvement in liquidity. Each test period typically includes 28-30 calendar days. Event dates and test periods used are shown in Figure 1.

Table 1.12 Relation between Changes in Liquidity and Share Volume, Price and the Variance of Returns

Dependent Variables	Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat	
Sample	Control firms, n = 118				Change firms, n = 143				All Firms, n = 261			
Independent Variables												
Intercept	0.683	**	1.867	**	0.910	**	1.170	**	0.792	**	1.869	**
	(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)	
logShareVolRat	-0.016		0.073	**	0.006		0.070	**	-0.003		0.071	**
	(0.3971)		(0.0022)		(0.6885)		(0.0004)		(0.8060)		(0.0001)	
log PriceRat	-0.247	**	-0.565	**	-0.324	**	-0.284	**	-0.283	**	-0.566	**
	(0.0008)		(0.0001)		(0.0001)		(0.0003)		(0.0001)		(0.0001)	
log RetVarianceRat	0.410	**	-0.946	**	0.164		-0.390	*	0.283	**	-0.946	**
	(0.0020)		(0.0001)		(0.1418)		(0.0107)		(0.0009)		(0.0001)	
Group Dummy									0.003		-0.702	*
									(0.8088)		(0.0022)	
log PriceRat x Group											0.281	*
											(0.0168)	
log RetVarianceRat x Group											0.558	*
											(0.0112)	
Model R-square	22.3%		35.33%		23.1%		16.7%		22.5%		28.1%	

Table 1.12
Regression estimates from two pairs of cross-sectional regressions of the following form:

$logSpreadRat_j = \beta S_0 + \beta S_1\ logShareVolRat_j + \beta S_2\ logPriceRat_j + \beta S_3\ logRetVarianceRat_j + \varepsilon S_j$
and
$logDepthRat_j = \beta D_0 + \beta D_1\ logShareVolRat_j + \beta D_2\ logPriceRat_j + \beta D_3\ logRetVarianceRat_j + \varepsilon D_j$

where $logSpreadRat_j$ is the natural logarithm of one plus the ratio of the relative effective bid-ask spread in the 20-trading-day period starting seven days after the release of the 1998 10-K to the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. $logShareVolRat_j$, $logPriceRat_j$, $logRetVarianceRat_j$ and $logDepthRat_j$ are the corresponding natural logarithms of the ratios for daily share volume, price per share, variance of returns, and depth, respectively. Results are shown for the Change and Control firms samples separately in the first two regressions, followed by the full sample at the far right. A dummy variable as well as interaction terms are included for Group in the full sample regression, where Change and Control observations are given values of 1 and 0, respectively. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.13 Relation between Changes in Liquidity and Share Volume, Price and Variance of Returns for High-Spread Stocks

Dependent Variables	Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat	
Sample	Control firms, n = 45				Change firms, n = 43				All Firms, n = 88			
Independent Variables												
Intercept	0.216		1.880	**	0.905	**	1.295	*	0.563	*	1.939	**
	(0.4512)		(0.0001)		(0.0005)		(0.0001)		(0.0030)		(0.0001)	
logShareVolRat	-0.023		0.081		-0.025		0.014		-0.020		0.045	
	(0.5330)		(0.0541)		(0.4153)		(0.6615)		(0.3750)		(0.0814)	
log PriceRat	0.003		-0.462	*	-0.248	*	-0.080		-0.143		-0.488	*
	(0.9836)		(0.0058)		(0.0456)		(0.5170)		(0.1253)		(0.0011)	
log RetVarianceRat	0.710	*	-1.102	**	0.130		-0.784		0.426	*	-1.089	**
	(0.0065)		(0.0002)		(0.6121)		(0.0046)		(0.0146)		(0.0001)	
Group Dummy									0.023		-0.735	
									(0.4513)		(0.0578)	
log PriceRat x Group											0.396	
											(0.0523)	
log RetVarianceRat x Group											0.398	
											(0.3008)	
Model R-square	14.4%		30.3%		8.4%		17.0%		10.5%		24.3%	

Table 1.13
Regression estimates from two pairs of cross-sectional regressions of the following form:

$$\text{logSpreadRat}_j = \beta S_0 + \beta S_1 \text{ logShareVolRat}_j + \beta S_2 \text{ logPriceRat}_j + \beta S_3 \text{ logRetVarianceRat}_j + \varepsilon S_j$$
and
$$\text{logDepthRat}_j = \beta D_0 + \beta D_1 \text{ logShareVolRat}_j + \beta D_2 \text{ logPriceRat}_j + \beta D_3 \text{ logRetVarianceRat}_j + \varepsilon D_j$$

where logSpreadRat_j is the natural logarithm of one plus the ratio of the relative effective bid-ask spread in the 20-trading-day period starting seven days after the release of the 1998 10-K to the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. logShareVolRat_j, logPriceRat_j, $\text{logRetVarianceRat}_j$ and logDepthRat_j are the corresponding natural logarithms of the ratios for daily share volume, price per share, variance of returns, and depth, respectively. Results are shown for the Change and Control firms samples separately in the first two regressions, followed by the full sample at the far right. A dummy variable as well as interaction terms are included for Group in the full sample regression, where Change and Control observations are given values of 1 and 0, respectively. The high spread sample for which results are shown includes only stocks whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.14 Relation between Changes in Liquidity and Order Flow, Price and Volatility for Small Stocks

Dependent Variables	Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat	
Sample	Control firms, n = 31				Change firms, n = 34				All Firms, n = 65			
Independent Variables												
Intercept	0.606	*	1.632	*	1.039	**	1.024	**	0.809	**	1.649	**
	(0.0007)		(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)	
logShareVolRat	0.017		0.084		-0.019		0.054	*	-0.003		0.064	*
	(0.5219)		(0.0501)		(0.2584)		(0.0402)		(0.8622)		(0.0054)	
log PriceRat	-0.219	*	-0.437	*	-0.320	**	-0.138		-0.276	**	-0.434	*
	(0.0307)		(0.0062)		(0.0001)		(0.2290)		(0.0001)		(0.0025)	
log RetVarianceRat	0.424	*	-0.817	*	-0.003		-0.389		0.251	*	-0.815	**
	(0.0038)		(0.0004)		(0.9842)		(0.0748)		(0.0118)		(0.0001)	
Group Dummy									-0.009		-0.649	
									(0.5923)		(0.0545)	
log PriceRat x Group											0.295	
											(0.1194)	
log RetVarianceRat x Group											0.442	
											(0.1542)	
Model R-square	24.1%		21.6%		23.2%		9.1%		22.9%		16.5%	

Table 1.14
Regression estimates from two pairs of cross-sectional regressions of the following form:

$$\text{logSpreadRat}_j = \beta S_0 + \beta S_1 \text{ logShareVolRat}_j + \beta S_2 \text{ logPriceRat}_j + \beta S_3 \text{ logRetVarianceRat}_j + \varepsilon S_j$$
and
$$\text{logDepthRat}_j = \beta D_0 + \beta D_1 \text{ logShareVolRat}_j + \beta D_2 \text{ logPriceRat}_j + \beta D_3 \text{ logRetVarianceRat}_j + \varepsilon D_j$$

where logSpreadRat_j is the natural logarithm of one plus the ratio of the relative effective bid-ask spread in the 20-trading-day period starting seven days after the release of the 1998 10-K to the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. logShareVolRat_j, logPriceRat_j, $\text{logRetVarianceRat}_j$ and logDepthRat_j are the corresponding natural logarithms of the ratios for daily share volume, price per share, variance of returns, and depth, respectively. Results are shown for the Change and Control firms samples separately in the first two regressions, followed by the full sample at the far right. A dummy variable as well as interaction terms are included for Group in the full sample regression, where Change and Control observations are given values of 1 and 0, respectively. The small firms sample for which results are shown includes stocks of firms whose market capitalization falls below the lower 25th percentile in terms of market capitalization of the full sample as of December 1997. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.15 Relatio between Changes in Liquidity and Share Volume, Price and Variance of Returns for Large Stocks

Dependent Variables	Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat		Log Effect SpreadRat		Log DepthRat	
Sample	Control firms, n = 28				Change firms, n = 37				All Firms, n = 65			
Independent Variables												
Intercept	0.780	*	2.304	**	0.645	*	1.434	**	0.771	**	1.566	**
	(0.0068)		(0.0001)		(0.0013)		(0.0001)		(0.0001)		(0.0001)	
logShareVolRat	-0.044		0.060	*	0.091	*	0.128	**	0.000		0.236	**
	(0.1152)		(0.0149)		(0.0014)		(0.0002)		(0.9918)		(0.0001)	
log PriceRat	-0.300	*	-0.729	**	-0.308	**	-0.500	**	-0.286	**	-0.684	**
	(0.0097)		(0.0001)		(0.0006)		(0.0001)		(0.0001)		(0.0001)	
log RetVarianceRat	0.398		-1.315	*	0.396	*	-0.524	*	0.310		-0.708	**
	(0.1748)		(0.0001)		(0.0336)		(0.0184)		(0.0636)		(0.0001)	
Group Dummy									0.014		-0.244	*
									(0.4692)		(0.0227)	
log PriceRat x Group											0.189	
											(0.1355)	
log RetVarianceRat x Group											0.108	*
											(0.0234)	
Model R-square	20.2%		55.6%		31.2%		33.8%		19.6%		45.9%	

Table 1.15
Regression estimates from two pairs of cross-sectional regressions of the following form:

$$\text{logSpreadRat}_j = \beta S_0 + \beta S_1 \text{ logShareVolRat}_j + \beta S_2 \text{ logPriceRat}_j + \beta S_3 \text{ logRetVarianceRat}_j + \varepsilon S_j$$
and
$$\text{logDepthRat}_j = \beta D_0 + \beta D_1 \text{ logShareVolRat}_j + \beta D_2 \text{ logPriceRat}_j + \beta D_3 \text{ logRetVarianceRat}_j + \varepsilon D_j$$

where logSpreadRat_j is the natural logarithm of one plus the ratio of the relative effective bid-ask spread in the 20-trading-day period starting seven days after the release of the 1998 10-K to the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. logShareVolRat_j, logPriceRat_j, $\text{logRetVarianceRat}_j$ and logDepthRat_j are the corresponding natural logarithms of the ratios for daily share volume, price per share, variance of returns, and depth, respectively. Results are shown for the Change and Control firms samples separately in the first two regressions, followed by the full sample at the far right. A dummy variable as well as interaction terms are included for Group in the full sample regression, where Change and Control observations are given values of 1 and 0, respectively. The large firms sample for which results are shown includes stocks of firms whose market capitalization falls above the 75th percentile in terms of market capitalization of the full sample as of December 1997. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.16 Relation between Changes in Adverse Selection Costs and Order Flow, Price and Volatility for all stocks and high-spread stocks

Dependent Variable	AdverseRat	AdverseRat	AdverseRat	AdverseRat
Sample	All	All	High Spread	High Spread
N	261	261	88	88
Independent Variables				
Intercept	-0.599 **	-0.187	-1.481 **	-0.472
	(0.0009)	(0.3791)	(0.0002)	(0.3349)
log TradeFreqRat	-0.055	0.037	-0.096	0.054
	(0.1426)	(0.4903)	(0.1551)	(0.5504)
log TradeSzRat	0.206 *	-0.028	0.538 *	-0.090
	(0.0205)	(0.8302)	(0.0139)	(0.7647)
log PriceRat	0.776 **	0.486 **	1.127 **	0.554 *
	(0.0001)	(0.0001)	(0.0001)	(0.0306)
log RetVarianceRat	1.071 **	0.994 **	1.578 **	1.336 **
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Group Dummy	-0.011	-0.597 *	-0.012	-1.250 *
	(0.6115)	(0.0048)	(0.8233)	(0.0080)
log TradeFreqRat x Group		-0.149 *		-0.194
		(0.0478)		(0.1592)
log TradeSzRat x Group		0.340		0.826 *
		(0.0511)		(0.0490)
log PriceRat x Group		0.492 *		0.847 *
		(0.0010)		(0.0129)
Model R-square	27.6%	30.6%	35.6%	41.1%

Table 1.16
Regression estimate from a cross-sectional regression of the following basic form:

$$\log AdverseRat_j = \beta A_0 + \beta A_1 \log TradeFreq_j + \beta A_2 \log TradeSzRat_j + \beta A_3 PriceRat_j + \beta A_4 \log RetVarianceRat_j + Group_j + \varepsilon S_j$$

where $\log AdverseRat_j$ represents one plus the natural logarithm of the ratio of the adverse selection component of the bid-ask spread for the 20-trading-day period starting seven days after the release of the 1998 10-K to the same value for the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. $\log TradeFreqRat_j$, $\log TradeSzRat_j$, $\log PriceRat_j$, $\log VolatilityRat_j$ and $\log DepthRat_j$ are the corresponding natural logarithms of the ratios for trading frequency per day, trade size in shares, price per share, volatility of returns, and depth, respectively. For each stock, the adverse selection component of the bid-ask spread is estimated following Lin, Sanger, Booth (1995) using a regression of the following form:

$$\Delta M_{t+1} = \lambda z_t + \varepsilon_{t+1}$$

where ΔM is the natural log of the midpoint of the quoted bid-ask spread at time $t + 1$ less the natural log of the quote midpoint of the preceding transaction, and $z_t = P_t - M_t$ is the natural log of the price of a transaction at time t less the natural log of the prevailing quote midpoint. The slope coefficient of z_t from the regression, denoted by λ, is the estimated adverse selection component of the bid-ask spread. Results are shown for the full sample of firms on the left half of table 15; results for the high-spread sample are shown on the right. The high-spread sample includes only stocks whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Regressions shown include a dummy and interaction terms for group (Change, Control) where Change and Control observations are given values of 1 and 0, respectively. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.17 Relation between Changes in Adverse Selection Costs and Order Flow, Price and Volatility for small and large stocks

Dependent Variable	AdverseRat	AdverseRat	AdverseRat	AdverseRat
Sample	Small	Small	Large	Large
N	65	65	65	65
Independent Variables				
Intercept	-0.350	-0.708	0.379	0.646 *
	(0.3665)	(0.1289)	(0.0664)	(0.0271)
log TradeFreqRat	0.135	0.261 *	-0.159	-0.373 *
	(0.0666)	(0.0185)	(0.0859)	(0.0171)
log TradeSzRat	0.021	0.182	-0.148	-0.163
	(0.9205)	(0.5072)	(0.1114)	(0.2989)
log PriceRat	0.483 *	0.620 *	0.366 **	0.341 **
	(0.0282)	(0.0358)	(0.0001)	(0.0003)
log RetVarianceRat	1.020 **	0.983 **	0.782 **	0.773 **
	(0.0001)	(0.0001)	(0.0002)	(0.0003)
Group Dummy	-0.047	0.668	-0.029	-0.384
	(0.3266)	(0.2185)	(0.1172)	(0.1378)
log TradeFreqRat x Group		-0.212		0.324
		(0.1445)		(0.0985)
log TradeSzRat x Group		-0.387		-0.032
		(0.3143)		(0.8651)
log PriceRat x Group		-0.196		0.037
		(0.6242)		(0.7856)
Model R-square	29.0%	31.2%	38.5%	38.9%

Table 1.17
Regression estimate from a cross-sectional regression of the following basic form:

$$\text{logAdverseRat}_j = \beta A_0 + \beta A_1 \text{ logTradeFreqRat}_j + \beta A_2 \text{ logTradeSzRat}_j + \beta A_3 \text{ PriceRat}_j + \beta A_4 \text{ logRetVarianceRat}_j + \text{Group}_j + \varepsilon S_j$$

where logAdverseRat_j represents one plus the natural logarithm of the ratio of the adverse selection component of the bid-ask spread for the 20-trading-day period starting seven days after the release of the 1998 10-K to the same value for the 20-trading-day period ending seven days prior to the release of the 1998 10-K for stock j. logTradeFreqRat_j, logTradeSzRat_j, logPriceRat_j, $\text{logVolatilityRat}_j$ and logDepthRat_j are the corresponding natural logarithms of the ratios for trading frequency per day, trade size in shares, price per share, volatility of returns, and depth, respectively. For each stock, the adverse selection component of the bid-ask spread is estimated following Lin, Sanger, Booth (1995) using a regression of the following form:

$$\Delta M_{t+1} = \lambda z_t + \varepsilon_{t+1}$$

where ΔM is the natural log of the midpoint of the quoted bid-ask spread at time $t + 1$ less the natural log of the quote midpoint of the preceding transaction, and $z_t = P_t - M_t$ is the natural log of the price of a transaction at time t less the natural log of the prevailing quote midpoint. The slope coefficient of z_t from the regression, denoted by λ, is the estimated adverse selection component of the bid-ask spread. Results are shown for the sample of small (large) firms on the left (right) half of table 15; the small (large) firms sample includes stocks of firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997. Regressions shown include a dummy and interaction terms for group (Change, Control) where Change and Control observations are given values of 1 and 0, respectively. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K compared to the prior year, while Control firms reported the same number of segments in both 1998 and 1997.

Table 1.18 Impact of SFAS No. 131 on the Adverse Selection Component of the bid-ask spread

	β_0	β_1	β_2	β_3	Adj. R^2
All stocks					
Control	-0.001	0.636 **	0.000	-0.015	23.55%
(n = 236)	(0.3202)	(0.0001)	(0.8380)	(0.5553)	
Change	0.000	0.480 **	0.000	0.053 *	25.10%
(n = 286)	(0.6689)	(0.0001)	(0.1746)	(0.0324)	
High spread stocks					
Control	0.000	0.674 **	0.000	-0.019	34.05%
(n = 90)	(0.8157)	(0.0001)	(0.9206)	(0.7086)	
Change	0.001	0.392 **	-0.001	0.106 *	32.61%
(n = 86)	(0.4542)	(0.0002)	(0.1633)	(0.0103)	

	β_0	β_1	β_2	β_3	Adj. R^2
Large stocks					
Control	-0.001	0.648 **	0.000	-0.004	27.71%
(n = 68)	(0.7666)	(0.0003)	(0.9810)	(0.9487)	
Change	0.001	0.398 *	-0.001	0.113	27.92%
(n = 62)	(0.5915)	(0.0379)	(0.3261)	(0.1317)	
Small stocks					
Control	0.000	0.512 *	0.000	0.005	29.59%
(n = 52)	(0.7939)	(0.0143)	(0.9054)	(0.9473)	
Change	0.000	0.550 **	0.000	-0.034	27.16%
(n = 78)	(0.6518)	(0.0005)	(0.5476)	(0.5672)	

Table 1.18
Estimates of the order processing component of the bid-ask spread following George, Kaul, Nimalendran (1991).

For each firm, two median figures for the effective bid-ask spread are calculated, one from the 20-consecutive-trading-day period ending seven days before the release of the 1998 10-K, and one for the analogous period beginning seven days after the release of the 1998 10-K. In the same manner, the median quoted bid-ask spread is calculated twice for each firm. Note that the value for n is therefore twice the number of stocks included in the regression. Order processing costs for each firm are estimated as follows:

$$\text{logEffSpread}_j = \beta_0 + \beta_1 \text{ logQtdSpread}_j + \beta_2 \text{ Period}_j + \beta_3 (\text{QtdSpread x Period})_j + \varepsilon_j$$

The coefficient β_1 represents the order processing component of the effective bid-ask spread; the remainder of the spread represents the adverse selection component. Period takes on a value of 0 prior to the release of the 1998 10-K and 1 after. A significant coefficient for the QtdSpread x Period interaction term is consistent with a change in order processing costs from before, to after, the release of the 1998 10-K. The regression equations are estimated separately for Control and Change firms. Additional sub-samples include high-spread firms, small and large firms. High-spread firms are defined as firms whose effective bid-ask spreads exceeded the median effective bid-ask spread of the full sample in the period following the release of the 1997 10-K. Small (large) firms are defined as firms whose market capitalization falls below (above) the median market capitalization of the full sample as of December 1997. All stocks had daily transactions data listed on the NYSE Trade and Quote (TAQ) database for the sample periods under study and did not split during the sample periods. The p-value for a one-tailed test of the null hypothesis that the coefficient is zero is shown below each coefficient. All sample firms reported multiple line-of-business segments in the 1998 10-K. Change firms reported additional line-of-business segments in the 1998 10-K

Table 2.1 Sample Selection Criteria

Firms on the Compustat Segments File in 1997 and 1998		1,805
Financial Service Firms or Public Utilities	317	
Firms with Sales < $20 Million	142	
Firms Delisting or Undergoing Mergers, Divestitures, Etc.	539	
Firms with Insufficient Data to Compute Tax Incentive Variables[1]	218	
Firms with Insufficient Segment Level Data[2]	295	1,511
Sample Firms		294

Table 2.1
Selection criteria applied to arrive at final number of sample firms.
[1] Firms without three-year historical financial data available on Compustat. For the calculation of the foreign and domestic tax rates, a three-year average of these values for the years 1994 through 1996 is used. Firms lacking this data are excluded from analysis
[2] Insufficient data on Compustat segment file. For example, firms must report a minimum of two valid segments in each year, so a two-segment firm with one segment that is discovered to be invalid, for example because of a missing SIC code at segment level or missing sales will be invalidated in its entirety in both years.

Table 2.2 Distribution of Firms and Segments by Industry

Panel A Distribution of sample firms by industry

SIC Code	Industry	Total N	Total %
0000 - 1000	Agriculture	0	0.0%
1000 - 1999	Mining/construction	9	3.1%
2000 - 2999	Manufacturing	82	27.9%
3000 - 3999	Manufacturing	148	50.3%
4000 - 4999	Regulated Utilities	6	2.0%
5000 - 5999	Wholesale/retail	22	7.5%
6000 - 6999	Financial services	0	0.0%
7000 - 7999	Services	22	7.5%
8000 - 8999	Services	5	1.7%
9000 - 9999	Government	0	0.0%
		294	100.0%

Panel B Distribution of sample segments by industry

SIC Code	Industry	Total N	Total %
N/A	Headquarters	21	2.6%
0000 - 1000	Agriculture	0	0.0%
1000 - 1999	Mining/construction	29	3.7%
2000 - 2999	Manufacturing	205	25.9%
3000 - 3999	Manufacturing	363	45.8%
4000 - 4999	Regulated Utilities	27	3.4%
5000 - 5999	Wholesale/retail	45	5.7%
6000 - 6999	Financial services	32	4.0%
7000 - 7999	Services	54	6.8%
8000 - 8999	Services	17	2.1%
9000 - 9999	Government	0	0.0%
		793	100.0%

Table 2.2
Panel A shows the distribution of sample firms among Standard Industrial Classification (SIC) codes by firm and by segment. Firms classified under codes 4950 - 4999, 6000 - 6999, and 9000 - 9999, representing regulated utilities, financial services firms, and government entities, respectively, were eliminated from the sample.

Table 2.3 Firm and Segment Level Descriptive Statistics

	1998 Mean	1998 Median	1997 Mean	1997 Median
Firm-level statistics				
Common equity ($MM)	9,198.75	1,893.05	8,136.02	2,077.80
Sales ($MM)	5,575.41	1,596.86	5,557.33	1,437.39
Number of operating segments	2.72	2.00	2.01	1.00
New operating segments in 1998	0.71	-	-	-
Domestic tax rate (%)	23.44	28.66	-	-
Foreign tax rate (%)	50.12	35.01	-	-
Foreign proportion of total earnings (%)	26.57	21.58	-	-
Firms (n = 294)				
Segment-level statistics				
Relative segment sales (%)				
Existing segments	46.69	36.21		
New segments	27.28	21.04		
All segments			49.80	40.32
Sales per segment ($MM)				
Existing segments	2,405.11	915.90		
New segments	1,727.24	541.22		
All segments			2,768.78	820.00
Average traceable assets ($MM)				
Existing segments	2,330.69	656.41		
New segments	1,988.00	509.47		
All segments			2,854.77	824.00
Operating profit per segment ($MM)				
Existing segments	202.09	68.00		
New segments	248.38	59.11		
All segments			297.96	82.73
	New segments (n = 387)			
	Existing segments (n = 406)		All segments (n = 591)	

Descriptive statistics for 1998 ad 1997 (except as noted) for a sample of publicly-traded U.S. firms reporting multiple operating segments in 1998.

Firm-level variables
Common equity is the market value of common equity as of the last trading day of the calendar year. Sales is total firm sales for the year. The remaining three firm-level variables do not have 1997 values because they reflect three-year averages (medians) for 1994 through 1996, inclusive. Domestic (foreign) tax rate is equal to U.S. (foreign) taxes paid, divided by U.S. (foreign) pre-tax income. Foreign proportion of total earnings is equal to foreign after-tax earnings divided by global after-tax earnings.

Segment-level variables
Relative segment sales is equal to segment sales divided by total firm sales. Sales per segment are equal to total sales at the segment level. Traceable assets are equal to assets controlled at the segment level. Operating profit per segment in 1997 is calculated under the methods set forth in SFAS No. 14. Operating profiti per segment in 1998 is equal to profit calculated by whatever method the firm itself uses to evaluate segment operations, in accodance with SFAS No. 131.

Table 2.4 Univariate Tests for Differences Between Newly-Reported and Existing Segments

All 1998 segments - Newly-disclosed, n = 386 Existing, n = 406	
Variable description	**Z statistic** (p value)
Segment sales relative to firm sales	-7.5658 *** (0.0000)
Segment sales	-2.3302 ** (0.0198)
Identifiable segment assets	-1.8370 (0.0662)
Segment operating profits	-1.1672 (0.2431)

Results of Mann-Whitney U test in which the null hypothesis is that observations from the group of existing, versus newly-reported segments are equally distributed. Existing segments are reported in both 1997 and 1998, while newly-reported segments first appear in the 1998 segment disclosures. Segment sales relative to firm sales are calculated as segment sales divided by total firm sales for 1998. Segment sales are equal to the total sales reported by each segment in 1998. Identifiable segment assets is equal to the net book value of assets reported by each segment in 1998. Segment operating profits are equal to the net operating profits reported by each segment in accordance with SFAS No. 131 for 1998.

Table 2.5 Distribution of Segments in the Same Versus Different 2-Digit SIC Codes as Another Segment of the Same Firm and Results of Chi-square Analysis

Frequency Percent of total Percent of row total Percent of column total	Existing Segment	New Segment	Total
Sole segment reporting in 2-digit SIC code	324 40.91 60.00 79.80	216 27.27 40.00 55.96	540 68.18
Not the sole segment reporting in 2-digit SIC code	82 10.35 32.54 20.20	171 21.46 67.46 44.04	253 31.82
Total	406 51.26	387 48.74	793 100.00

Statistic	Value	Probability	
Chi-square	51.8582	(0.0000)	***

Table 2.5
Results shown are of chi-square tests for the likelihood that newly-reported segments (shown on the horizontal axis) are equally likely to operate in the same 2-digit industry as existing segments. In each quadrant, the first number shown at the top is equal to the number of observations. The three successive numbers beneath that are the percentage of total observations, the percentage of the observations in the row, and the percentage of the observations in the column, that are comprised by the number of observations in the quadrant.

Table 2.6 Tests of the Association between Firm Size and Measures of Disaggregation

Panel A: All sample firms	DisaggEquity	DisaggSales	DisaggDivSIC
Firm equity	11.51% **	-6.88%	0.87%
(n = 294)	(0.0486)	(0.2394)	(0.8886)
Panel B: Firms reporting additional segments in 1998	**DisaggEquity**	**DisaggSales**	**DisaggDivSIC**
Firm equity	20.36% **	14.79%	-8.07%
(n = 110)	(0.0329)	(0.1231)	(0.4422)

Table 2.6
Tests of the association between firm size and three measures of disaggregation. Coefficients shown are Spearman rank correlation coefficients, assessing the probability of a monotonic relation between each pair of variables shown. Results shown in Panel A are for the full sample of 294 firms. Panel B includes results for firms increasing the number of segments reported in 1998. Firm equity is the natural log of common equity for each firm at year end 1997. DisaggEquity is the change in average natural log of common equity per reported segment from 1997 to 1998, standardized by the natural log of average common equity per reported segment in 1997. DisaggSales is the corresponding figure for total firm sales. DisaggDivSIC is the percentage change in the average diversity of primary and secondary SIC codes reported per segment for each firm. Specifically, DisaggDivSIC is computed for each firm as the sum of the absolute differences between the primary and secondary four-digit SIC codes for all segments reported by a firm, divided by the number of reported segments. The 1997 value is subtracted from the corresponding value for 1998, and the result is standardized by the 1997 value in order to express the measure as a percentage change. A negative result is consistent with a decline in the diversity of operations included by the firm in each segment.

Table 2.7 Relation between Tax Incentives and Segment Reporting

Frequency Percent of total Percent of row total Percent of column total	Foreign tax rate exceeds domestic	Domestic tax rate exceeds foreign	Total
Firm reported no additional segments	57 19.39 30.98 66.28	127 43.2 69.02 61.06	184 62.59
Firm reported one or more additional segments	29 9.86 26.36 33.72	81 27.55 73.64 38.94	110 37.41
Total	86 29.25	208 70.75	294 100.00

Statistic	Value	Probability
Chi-square	0.706	0.4008

Table 2.7
Results shown are of chi-square tests for the likelihood that the availability of tax benefits from shifting foreign income into the U.S. has no influence on the decision to disaggregate segment reports. Distribution shown is of firms reporting one or more additional segments in 1998 versus those reporting only exisiting segments. In each quadrant, the first number shown at the top is equal to the number of observations. The three successive numbers beneath that are the percentage of total observations, the percentage of the observations in the row, and the percentage of the observations in the column, that are comprised by the number of observations shown.

Table 2.8 Multivariate Logit Regression Analysis on Managers' Segment Reporting Decisions

$$NewSeg_{it} = \propto_0 + \beta_1 SegSalesProp_{it} + \beta_2 2DigitSIC_{it-1} + \beta_3 LnCEquity_{it} + \beta_4 DifSIC_{it-1} + \beta_5 FTRdif_{it} + \beta_6 FTC_{it-1} \times FTRdif_{it} + \varepsilon$$

	Coefficient	p-value	
Intercept	-1.30120	0.0008	**
SegSalesProp	-1.95600	0.0001	**
2DigitSIC	0.46980	0.0001	**
LnCEquity	0.00510	0.8862	
DifSIC	0.15390	0.0590	
FTRDif	-2.03150	0.0676	
FTC x FTRDif	1.93650	0.0820	
FTCint	0.56660	0.0059	*
Observations			
Newly-reported segments	387		
Existing segments	406		
Total	793		
Pseudo R-square	14.06%		

Table 2.7
Regression results of the logit model shown above.
The dependent variable, NewSeg, is an indicator variable with the value of one (zero) if the segmet is a newly-reported (existing) segment. A segment is classifieid as a newly-reported segment if it was not reported as a separate line-of-business segment under SFAS No. 14 in 1997. A segment is classifieid as an existing segment if it was reported as a separate line-of-business segment in both 1998 (under SFAS No 131) and in 1997 (under SFAS No. 14).
Independent variables are as follow:
SegSalesProp = the segment's sales as a percentage of total firm sales.
2DigitSIC = an indicator variable equal to 1 if the segment's primary SIC code matches that of the parent, 0 otherwise.
LnCEquity = the natural log of common equity reported by the firm to which the segment belongs.
DifSIC = the absolute difference between the primary and secondary SIC codes reported by the segment, scaled by the average difference for all segments in the sample.
FTRDif = the difference between the foreign and domestic tax rates for the firm to which the segment belongs
FTCint = an indicator variable equal to 1 if the foreign tax rate of the firm exceeds the domestic tax rate, 0 otherwise.
FTC x FTRDif = an interaction term.