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Industry concentration, analysts' earnings forecasts, and bid-ask spread

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Abstract: We use industry concentration as a proxy for the informativeness of disclosures (Bamber and Cheon 1998; and Harris 1998) to examine the economic consequences of disclosure for US firms. This approach allows us to circumvent endogeniety problems inherent in such examinations carried out by prior studies using analyst ratings as a proxy for the level of disclosures. Specifically, firm performance may simultaneously affect disclosure and analyst behavior/market liquidity (Healy et al. 1999; Miller 2002), making it difficult to isolate the impact of disclosure on analyst behavior/market liquidity. We document that firms operating in more concentrated industries have lower analyst following, more dispersion in analysts' earnings forecasts, higher analyst forecast errors, more volatility in forecast revisions, and wider bid-ask spreads. These results help validate the conclusion of prior studies based on analyst ratings (see, e.g., Welker 1995; Lang and Lundholm 1996; and Healy et al. 1999) that greater disclosures are likely to lead to greater analyst interest, investors having more accurate beliefs about future performance, and investors having less asymmetry in their beliefs about future performance, which in turn will lead to less adverse selection problem and therefore greater market liquidity.

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1. Introduction

Several prior studies examine the effect of voluntary disclosures on analysts' behavior and stock market liquidity. Lang and Lundholm (1996) and Healy et al. (1999) show that firms with more informative disclosures have larger analysts following. They argue that greater disclosure makes it less costly for analysts to acquire information and it also enables them to create superior forecasts and buy/sell recommendations. Thus, they find it more attractive to follow these firms. Lang and Lundholm (1996) also show that analysts' forecasts of firms with greater disclosures are more accurate, have less dispersion, and revisions are less volatile. They argue that these results suggest that firms can increase investor accuracy about future performance, reduce asymmetry across investors in their beliefs about future performance and limit the magnitude of market surprises by increasing disclosure. Finally, Welker (1995) and Healy et al. (1999) show that greater disclosure is associated with improved market liquidity as measured by bid-ask spread; a result consistent with the Diamond and Verrecchia (1991) argument that disclosure reduces information asymmetries among informed and uninformed investors.

All of the above studies use the same measure of voluntary disclosure, analysts' rating of firms' disclosures based on the AIMR annual surveys. Healy and Palepu (2001) and Core (2001) point out that the use of this measure introduces an important endogeniety problem. They argue that disclosure changes are likely to coincide with changes in firm performance (Miller 2002), which in turn may drive the relationship between analyst ratings and the economic consequences of interest. Healy et al. (1999) attempt to control for this problem, but acknowledge that in the absence of a reliable model of how disclosure is related to performance, it would be difficult to isolate the impact of disclosure.

In this paper, we attempt to address the above concerns related to analysts' rating of disclosures by using an alternative proxy for corporate disclosure, namely, industry concentration of product market share. Specifically, the greater the concentration of the product market share, the less corporate disclosures are the firms in those industries likely to make. Bamber and Cheon (1998) document that managers of firms in concentrated industries are less specific in their earnings forecasts. Harris (1998) documents that firms are less likely to disclose operations in more concentrated industries as business segments. Both these studies argue that firms with product market concentration have strategic competitive advantage and to protect their abnormal profits and market share, these firms are less willing to disclose information. This proxy of disclosure level is less likely to suffer from the type of endogeniety problem associated with analyst ratings. If at all, industry concentration is expected to *increase* with firm performance and so the confounding effect of performance would introduce a conservative bias in when using industry concentration to examine the economic effect of the level of corporate disclosures. This conjecture is based on prior evidence that an increase in performance increases disclosure level (Healy et al. (1999) and Miler (2002)).

In our analysis we use industry concentration data provided by the US Census Bureau for 343 different manufacturing industry groups. Our sample consists of about 10,000 firm year observations over the 1993-2001 period in the manufacturing sector. We find that industry concentration is negatively related to analyst coverage. We also document that in more concentrated industries there is less accuracy in analysts' forecasts, less consensus in analysts' forecasts, and more volatility in forecast revisions. These results are not sensitive to controlling for previously identified determinants of analysts converge and analyst forecast properties. The results are also not sensitive to alternative measures of industry concentration, namely, Herfindahl-Hirschman index, the four-firm concentration ratio, or the eight-firm concentration ratio.

The primary contribution of the study is that by using industry concentration as a proxy for disclosure, we likely address the endogeniety problems associated with analyst ratings. Given that our results are consistent with the conclusions of the prior studies, we validate their conclusions on the effect of disclosures on analyst following, forecast accuracy, forecast dispersion, volatility of forecast revision, and bid-ask spread. Also analyst ratings data are not available for small firms with limited analyst following. This data availability issue is likely to systematically exclude firms with low disclosure levels from the sample, thereby limiting the variation in disclosure levels in the sample. Industry concentration measure does not suffer from this data limitation and hence a broader sample of firms with greater variation in disclosure level can be used in the analysis. Thus for more powerful tests of the effect of disclosures, future studies should consider industry concentration in place of analyst ratings as a proxy for disclosure.

The results in our study along with that of Hou and Robinson (2003) suggest that industry concentration is an important correlated omitted variable in prior studies that have examined the relation between disclosure levels and the cost of equity capital. Our results show that industry concentration is associated with market participants having less accurate information, greater asymmetry in their beliefs about firm performance and consequently less market liquidity (Diamond and Verrecchia (1991). These factors should contribute to increasing the cost of equity capital of firms in concentrated industries. Hou and Robinson (2003) argue that the less competitive environment in which high industry concentration firms compete insulates them from shocks that lead to economic distress. The lower level of risk borne by these firms should lead to lower returns. They find that firms in concentrated industries do earn lower stock returns. These findings imply that even though firms in concentrated industries disclose less, due to the presence of other risk factors, their cost of capital is lower than firms in competitive industries. Prior studies, such as Botosan (1997) and Botosan and Plumlee (2002), examine the relation between disclosure levels and the cost of equity capital. In their analyses, they control for only beta and firm size as other risk factors affecting cost of capital. By not controlling for the financial distress factor associated with industry concentration, they might have introduced a bias against finding a negative association between disclosure level and the cost of equity capital. As such their results on the association between disclosure level and cost of capital are mixed.[1]

The next section reviews some of the related literature. Section 3 discusses our sample and methodological issues. Section 4 provides our empirical findings. Finally, Section 5 concludes.

2. Related literature

Bhushan (1989) shows that in equilibrium the number of analysts covering a firm is determined by the aggregate demand and supply curves for analyst services for the

[1] Botosan and Plumlee (2002) find that cost of capital is negatively related to analyst ratings of annual report disclosures, but is positively related to ratings of quarterly disclosures, and is not associated with ratings of investor relations activities. Cohen (2003) is another recent study that fails to find a negative

firm. However, Lang and Lundholm (1996) posit that it is not clear how the informativeness of a firm's disclosure policy affects its analyst coverage. Although a more informative corporate disclosure policy increases the aggregate supply of analyst services due to lowered information costs, the effect on aggregate demand depends on the role of analysts. If analysts are primarily information intermediaries then an increase in the informativeness of a firm's disclosure policy provides analysts with more valuable reports to sell and encourages a greater number of analysts to follow the firm. On the other hand, if analysts are primarily information providers then an increase in firm-provided information substitutes for analysts' services and reduces both aggregate demand for these services and analyst coverage. Lang and Lundholm (1996) document that analyst coverage is positively associated with the level of information in firm-provided disclosures. This result implies that information intermediation is an important role performed by analysts.

Lang and Lundholm (1996) also investigate the relationship between dispersion in analysts' forecasts and the informativeness of a firm's disclosure policy. They posit that if such a relationship exists it is an empirical issue whether it is a positive or a negative one. They explain that the influence of increased disclosure on dispersion in analysts' forecasts depends on whether dispersion is the result of analysts' having different levels of private information or the result of analysts using different forecasting models to draw conclusions from firm-provided disclosures. If analysts differ with respect to their private information but use similar forecasting models then as the informativeness of the disclosure provided by a firm increases, analysts place less weight on their private

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association between his measure of disclosure level and the cost of capital. This study also do not control for the distress factor associated with industry concentration.

information and this results in increased consensus in analysts' forecasts. Conversely, if analysts have similar private information but use different forecasting models to process firm-provided disclosures then as the quality of disclosure increases so does dispersion in analysts' forecasts. Lang and Lundholm (1996) document a negative relation between measures of the informativeness of a firm's disclosure policy and dispersion in analysts' forecasts. Consequently, they argue that this indicates analysts use similar forecasting models to make predictions about firm disclosures. Also, they propose that their evidence suggests that firms reduce asymmetry in investor beliefs about their earnings by increasing the quality of their disclosures.

Finally, Lang and Lundholm (1996) examine the association between the level of firm-provided disclosure and the accuracy of analysts' earnings forecasts and the volatility of revisions in their forecasts. They contend that the predictions on these associations should be quite clear as more informative and more timely disclosures should systematically improve analyst forecast accuracy and also result in less extreme revisions. Consistent with this prediction, they find that the level of firm-provided disclosure increases the accuracy of earnings forecasts made by analysts and decreases volatility in forecast revisions.

Welker (1995) and Healy et al. (1999) document a negative relation between the levels of voluntary disclosure and bid-ask spread. They conclude that greater disclosure reduces information asymmetry among market participants, thereby reducing adverse selection problem and increasing market liquidity.

3. Data, model specifications, and variable definitions

3.1. Product market competition measures

Recent work such as Bamber and Cheon (1998), Harris (1998) and DeFond and Park (1999) that links accounting issues with the level of industry competitiveness use Herfindahl-Hirschman index or the four-firm concentration ratio to measure industry competition. Thus, in our analysis we use the Herfindahl-Hirschman index and the four-, and eight-firm concentration ratios to measure industry competition.

We obtain our concentration ratios from *Concentration Ratios in Manufacturing*, which was published as part of the 1997 U.S. Economic Census. An advantage to using these concentration ratios is that they are constructed using sales data for all public and private firms in a particular industry. Consequently, the ratios should more accurately reflect the level of competition in a firm's industry than would ratios constructed with data from the Compustat database, which is comprised almost entirely of publicly-traded firms. The concentration ratios are calculated at the six-digit NAICS level. Thus, for our analysis a firm's industry is defined by its six-digit NAICS code.

3.2. Sample

Since our product market level data is for the manufacturing sector and because concentration ratios are calculated for 6-digit NAICS industries the initial criterion for inclusion in our sample is that a firm is included in the Compustat database during the 1993-2001 period and that it has a 6-digit NAICS code between 311111-339999. This initial sample criteria results in the inclusion of 31,643 firm years. Next, we require that sample firms be included in the CRSP and IBES databases. This leaves us with observations for 20,402 firm years. For our examination of the relation between industry concentration and properties of analysts' forecasts we remove firm years that do not have all the required data items for our analysis. This leaves us with a final sample of 10,517 firm years spread out over 343 six-digit NAICS industries in the manufacturing sector. For the examination of the relation between industry concentration and stock liquidity we require that firms are included on Compact Disclosure CDs from 1993-2001 from which we collect data on the percentage of outstanding shares owned by insiders and we also remove firm years that do not have all the required data items for this analysis. For this analysis we have a final sample of 8816 firm years in 290 six-digit NAICS industries.

3.3. Model specifications and variable definitions

In order to investigate whether our industry concentration measures are associated with analyst coverage, analyst earnings forecast accuracy, dispersion in individual analyst forecasts, and volatility in forecast revisions we use four different models. These models are similar to those in Lang and Lundohlm (1996) except that to proxy for disclosure we replace analyst rating variable with the industry concentration variables, and we also include additional control variables specified by recent papers. Furthermore, for the variables that are common between Lang and Lundholm and our study, we use the same definitions. The model of analyst coverage is as follows.

$$COV_{it} = a_0 + a_1 INDCONC_{it} + a_2 LSIZE_{it} + a_3 STDROE_{it} + a_4 CORR_{it} \quad (1)$$

$$+ a_5 INVPRICE_{it} + a_6 RETVAR_{it} + a_7 RD_{\mathrm{it}} + a_8 EFFORT_{\mathrm{it}} + a_9 BROKER_{\mathrm{it}} + e_{it},$$

The dependent variable analyst coverage, *COV*, is defined as the 12-month average of the number of analysts who issued annual earnings forecasts in IBES. Our main independent variable of interest, industry concentration denoted by *INDCONC*, is defined as either the Herfindahl-Hirschman index, or the four-, or eight-firm concentration ratio. The Herfindahl-Hirschmann index is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. The four- and eight-firm concentration ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. We also include the following control variables, *LSIZE, STDROE*, *CORR*, *INVPRICE, RETVAR*, *RD, EFFORT,* and *BROKER*. *LSIZE* and *STDROE*, are defined respectively as the natural logarithm of market value and the standard deviation of return-on-equity during the preceding 10-year period. We include these two control variables since both Bhushan (1989) and Brennan and Hughes (1991) show that analyst coverage is positively associated with firm size and performance variability. Also, Lang and Lundholm (1996) use these control variables in their model to explain analyst coverage. Since it may be easier to predict future stock price for firms with a high return-earnings correlation, analyst coverage is likely to be positively associated with a firm's correlation between its earnings and stock returns. Consequently, as in Lang and Lundholm (1996), we include the return-earnings correlation as a control variable in our model. *CORR*, the return-earnings correlation variable, is defined as the Pearson correlation between ROE and annual stock return in the preceding 10-year period. As in Brennan and Hughes (1991), we also control for the inverse of stock price at the beginning of the year, *INVPRICE,* and daily stock return variance, *RETVAR*. The inverse of stock price proxies for the rate of the brokerage commission which may determine analyst coverage while stock return variance is an additional measure of performance variability. Since Barth, Kasznik, and McNichols (2001) show that analyst following may vary with the level of intangible assets, we also include *RD*, the lagged research and development expense scaled by lagged book assets as a control variable. Finally, Barth et al. (2001) show that in determining analyst coverage it is important to control for analyst effort. Fewer analysts are expected to cover firms that require greater effort. This variable helps rule out the possibility that if analysts coverage is found to be increasing in the level of disclosure, it is not because of less effort analysts need to spend to acquire information for high disclosure firms. We include two variables that are meant to control for analyst effort, *EFFORT* and *BROKER.* These variables are calculated as in Barth et al. (2001). *EFFORT* is the negative of the average number of firms followed by the firm's analysts in a particular year divided by the number of analysts covering the firm in that year. This variable captures the notion that if a particular firm requires more effort to cover it, then the firm's analysts will cover fewer firms. *BROKER* is the average number of analysts employed by the brokerage houses that employ the firm's analysts. Larger brokerage houses have greater resources and can therefore follow more firms. The inclusion of *BROKER* in the model controls for cross-sectional difference in *EFFORT* that is related to the size of the brokerage houses, thereby making the *EFFORT* variable more effective.

In order to investigate whether industry concentration is associated with dispersion in analysts' earnings forecasts, analyst forecast accuracy, and volatility in forecast revisions we use the following models.

$$DISP_{it} = a_0 + a_1 INDCONC_{it} + a_2 LSIZE_{it} + a_3 STDROE_{it} + a_4 CORR_{it} + a_5 CHEPS_{it} + a_6 NEW_{it} + a_7 RD_{\mathrm{it}} + e_{it}, \quad (2)$$

$$FERROR_{it} = a_0 + a_1 INDCONC_{it} + a_2 LSIZE_{it} + a_3 STDROE_{it} + a_4 CORR_{it} + a_5 CHEPS_{it} + a_6 NEW_{it} + a_7 RD_{\mathrm{it}} + e_{it}, \quad (3)$$

$$REVISION_{it} = a_0 + a_1 INDCONC_{it} + a_2 LSIZE_{it} + a_3 STDROE_{it} + a_4 CORR_{it} + a_5 CHEPS_{it} + a_6 NEW_{it} + a_7 RD_{\mathrm{it}} + e_{it}, \quad (4)$$

In model (2), the dependent variable, *DISP*, is dispersion in individual analyst earnings forecasts and is defined as the standard deviation of analysts' forecasts. In model (3), the dependent variable, *FERROR*, is analyst forecast error defined as actual earnings minus median forecast. For both *DISP* and *FERROR*, we compute simple average across the twelve monthly periods corresponding to the firm's fiscal year. We also deflate both the variables with the beginning of fiscal year stock price. In model (4), the dependent variable, *REVISION*, is volatility in forecast revisions and is defined as the standard deviation of monthly forecast revisions over the fiscal year, deflated by the beginning of the fiscal year price, where forecast revision is defined as current month median forecast minus previous month median forecast. In models 2 to 4, we include *LSIZE*, *STDROE*, and *CORR* as control variables. As discussed before these variables represent factors that affect analysts' incentives related to information collection and are therefore likely to affect the properties of their forecasts. In these models, we also include control variables, *CHEPS* and *NEW*. *CHEPS* is defined as the absolute value of annual change in earnings per share deflated by the beginning of fiscal year price. This variable is meant to control for the fact that dispersion in individual analysts' earnings forecasts, analyst forecast errors, and volatility in forecast revisions are likely to be substantially affected by the magnitude of earnings information that is to be disclosed. *NEW* is defined as the proportion of new forecasts included in the monthly forecast variable in the IBES database. This variable helps to mitigate biases which could result from stale IBES forecasts.

Finally, to examine the relation between bid-ask spreads and industry concentration, we use the following model.

$$SPREAD_{it} = a_0 + a_1 INDCONC_{it} + a_2 LPRICE_{it} + a_3 LTURNOVER_{it} \quad (5)$$

$$+ a_3 LPRICE_{it} + a_4 INS_{it} + e_{it},$$

The above model is similar to the one used in Healy et al. (1999), except that we replace their analyst rating variable with industry concentration variable and include an additional control variable. *SPREAD* is defined as the annual average of daily closing bid-ask spread as a percentage of daily closing price. We include control variables *LSIZE* and *LTURNOVER* to control for the possibility that bid-ask spreads are narrower for larger firms or for firms whose shares are traded more often. *LSIZE* and *LTURNOVER* are defined respectively as the natural logarithm of beginning of year market value and the annual median value of daily trading volume divided by total shares outstanding. We also include *LPRICE*, the natural logarithm of beginning of year stock price, as a control variable since fixed order costs are likely to be spread across more dollars in stocks that have a higher price and consequently percentage spread is likely to be lower for these stocks (Stoll (1978)). Finally, since dealers may widen the bid-ask spread to protect themselves from informed trades executed by corporate insiders we include in model (5) the control variable *INS*, which is the percentage ownership of outstanding shares by corporate insiders for the year (Chiang and Venkatesh (1988)).

4. Empirical findings

Table 1 provides descriptive statistics for industry concentration, analysts' behavior, market liquidity and other variables used as controls in our models. From Panel A we see that the mean and median values of industry concentration variables are similar, suggesting that these variables are reasonably symmetrically distributed. Also, the data indicate that varying degrees of concentration exist across industries. For instance, the median total market shares of the top four firms in an industry is 38.1%, with the first and third quartile being 27.2% and 50.7%, respectively. It is useful to note that our data are for all of the United States but that there are likely to be regional markets in which groups of individual manufacturing firms within specific manufacturing industries compete. Hence, the manufacturing industries that we study may actually be even less competitive than the national numbers make them appear to be since it is possible that in many regional markets, manufacturing firms do not compete with all of the other firms in the United States in their six-digit NAICS manufacturing industry.

Panel B documents that the mean and median values for analyst coverage for our sample firms are 6.6 and 3.9, respectively. This is substantially lower than the corresponding statistics from studies that require sample firms to have disclosure ratings data. For instance, the corresponding mean and median values reported by Lang and Lundholm (1996) are 17.6 and 16.7. Due to the requirement of Financial Analyst Federation data, the Lang and Lundholm's (1996) sample firms are likely to be relatively large and widely followed by analysts. In contrast, there is likely to be a greater heterogeneity in our sample firms with respect to analyst coverage. Consequently, our tests for whether industry concentration is likely to drive analyst coverage are likely to have more power.

Table 2 provides information on concentration ratios and industry distribution for industry groups within the manufacturing sector. For each 3-digit NAICS industry group within the manufacturing sector, we report the median value for the four-firm concentration ratio for the 6-digit NAICS industries within a particular 3-digit NAICS industry. There is considerable heterogeneity in industry concentration across the industries that make up the manufacturing sector. For instance, whereas the median four-firm concentration ratios are respectively only 19.8%, 22.6%, and 22.9% for the wood products, apparel, and the fabricated metal products industries the median four-firm concentration ratios for the chemicals, transportation equipment, and beverage and tobacco products industries are 54.2%, 59.6%, and 59.8%, respectively. Table 2 also shows that the industry distribution of our sample is remarkably similar to that of the Compustat population. Consequently, the results of our tests are unlikely to be driven by sample biases that could potentially occur due to our need for particular data items, such as those from the IBES database. Also, the similarities between the industry distribution of our sample firms and those of the general Compustat population suggest that inferences from our tests are generalizable to at least the Compustat firm population.

Table 3 provides the results of Fama-MacBeth regressions of the model of analyst coverage. The coefficients on *HH-INDEX*, *FOUR-FIRM*, and *EIGHT-FIRM* are respectively -0.043 (t = -6.38), -1.389 (t = -6.08), and -1.040 (t = -4.81). These results are consistent with lower level of disclosures by firms in concentrated industries leading to smaller analysts following. We obtain these results even after controlling for analyst effort. Thus, our result that smaller analyst following is associated with less disclosure is unlikely to be driven by greater analyst effort needed to acquire information for less disclosure firms. Note that Lang and Lundholm (1996) do not control for analysts effort in their examination of the effect of disclosures on analyst following, hence the alternative explanation cannot be ruled out based on their results. The coefficients on the control variables for analyst effort, *EFFORT* and *BROKER*, are negative and significant which is consistent with Barth et al. (2002) and which suggests analyst coverage is higher the less effort an analyst needs to expend in covering a firm.

From Table 3 we also see that except for *STDROE*, the signs of the coefficients on the other control variables are as expected. The coefficients on *LSIZE* and *RETVAR* are significant and positive which is consistent with prior findings that analyst following is growing in firm size and performance volatility. The coefficients on *CORR* are positive and significant which suggests that analysts prefer to cover firms with a high returns-earnings correlation for which it easier to predict future earnings from stock price. Also, the positive coefficients on *INVPRICE* supports the notion that since brokerage commissions are more important for firms with lower stock prices, analyst coverage is inversely related to stock price. Finally, the positive coefficient on *RD*, albeit statistically insignificant, is consistent with the Barth et al. (2001) findings. They infer from this result that firms with greater intangible assets are likely to have less informative prices, providing greater incentives for analysts to cover such firms.

Overall the results in table 3 indicate that analyst following is not greater for firms in concentrated industries, which suggests that analyst activities are unlikely to mitigate the difference in the information availability that may exist across firms in more versus less concentrated industries due to the difference in these firms corporate disclosure levels. Instead, analysts' preference to cover firms in less concentrated industries is likely to add to the difference.

Table 4 presents the results of Fama-MacBeth regressions of the model of dispersion in analysts' earnings forecasts. Greater dispersion in analysts' earnings forecasts is likely to occur when the proportion of private information to public information is greater in a firm's information environment, leading analysts to place greater weight on their own idiosyncratic information in their earnings forecasts. The coefficients on *HH-INDEX*, *FOUR-FIRM*, and *EIGHT-FIRM* are respectively 0.009 (t = 3.42), 0.172 (t = 1.54), and 0.291 (t = 2.51). These results are consistent with the notion that less informative corporate disclosures in more concentrated industries lead to an information environment where the proportion of private to public information is greater. Table 4 also documents that the coefficients on the control variables are significant with the expected signs, except for the coefficient on *CORR*, which has the right sign but is only marginally significant. The coefficient on *LSIZE* is significantly negative while those on *STDROE* and *CHEPS* are significantly positive. Thus, consistent with prior work we find that dispersion in analysts' earnings forecasts is decreasing in firm size, but increasing in variability of firm performance and in earnings surprises. Finally, Table 4 shows that the coefficient on *RD* is significantly positive. This supports the Barron et al. (2002) findings that analyst consensus is lower for firms with significant research and development expenditures.

Table 5 shows the Fama-MacBeth regression results of the model of analyst forecast accuracy. Irrespective of the industry concentration measure used, analyst forecast error is positively associated with industry concentration. The coefficients on *HH-INDEX*, *FOUR-FIRM*, and *EIGHT-FIRM* are respectively 0.035 (t = 5.44), 1.150 (t = 6.81), and 1.246 (t = 8.00). This supports the notion that in more concentrated industries there is more uncertainty about future earnings. Presumably, this uncertainty arises due to the less informative disclosure policies existing in these industries. Table 4 also shows that the coefficients on the control variables are significant with the expected signs except for the coefficients on *CORR* and *RD*. The coefficients on *LSIZE* are significantly negative while those on *STDROE* and *CHEPS* are significantly positive. Thus, consistent with prior work we show that analyst forecast accuracy of corporate earnings is more precise for larger firms, less precise for firms that have more variability in their performance, and less precise foe firms that experience a large change in reported earnings.

Table 6 presents Fama-MacBeth regression results of the model of volatility in forecast revisions. The results show that volatility in forecast revisions is positively associated with industry concentration. The coefficients on *HH-INDEX, FOUR-FIRM*, and *EIGHT-FIRM* are respectively 0.008 (t = 2.66), 2.554 (t = 2.77), and 0.281 (t = 3.13).

This is consistent with the proposition that if for competitive reasons, firms in more concentrated industries do not disclose new information as it becomes available but instead wait and disclose all new information at a later date, e.g., when a mandatory disclosure is required, this behavior leads to higher volatility in forecast revisions.

Table 6 also shows that the coefficients on the control variables are significant with the expected sign for all the variables except *CORR*. The coefficients on *LSIZE* are significantly negative; consistent with larger firms disclosing information in a more timely manner. The coefficients on *STDROE* are significantly positive, consistent with firms with more variable earnings experiencing more extreme forecast revisions. Finally, the coefficient on *RD* is positive and significant, consistent with greater uncertainty associated with high R&D firms.

The results presented in Tables 3 to 6 are consistent with the notion that less informative corporate disclosures by firms in concentrated industries leads to greater information asymmetry and adverse selection problems among their investors. Kyle (1985) and Glosten and Milgrom (1985) suggest that such problems are likely to impose liquidity costs on a firm. Consequently, we examine whether firms in more concentrated industries experience decreased stock liquidity, as measured by bid-ask spreads. Table 7 provides the results of this analysis. We find that industry concentration is positively related with bid-ask spread. The coefficients on *HH-INDEX*, *FOUR-FIRM*, and *EIGHT-FIRM* are respectively 0.005 (t = 2.32), 0.205 (t = 2.68), and 0.318 (t = 3.66). We also find that the coefficients on control variables are significant with the expected signs, except for *INS*. The coefficients on *LSIZE*, *LTURNOVER*, and *LPRICE* are significantly negative, suggesting that the spread is greater for firms that are larger, thinly traded and have lower stock price. Overall, Table 7 results are consistent with our earlier findings that information asymmetry problems are likely to be larger in more concentrated industries. Furthermore, these results provide evidence that in these industries such problems lead to greater liquidity costs.

5. Conclusion

We use industry concentration as a proxy for the informativeness of disclosures (Bamber and Cheon 1998; and Harris 1998) to examine the economic consequences of disclosure for US firms. This approach allows us to circumvent the endogeniety problems inherent in such examinations carried out by prior studies using analyst disclosure ratings as a proxy for the level of disclosures. Specifically, firm performance may simultaneously affect disclosure and analyst behavior/market liquidity (Healy et al. 1999; Miller 2002), making it difficult to isolate the impact of disclosure on analyst behavior and market liquidity. We document that firms operating in more concentrated industries have lower analyst following, more dispersion in analysts' earnings forecasts, higher analyst forecast errors, more volatility in forecast revisions, and wider bid-ask spreads. These results help validate the conclusion of prior studies based on analyst ratings (see, e.g., Welker 1995; Lang and Lundholm 1996; and Healy et al. 1999) that greater disclosures are likely to lead to greater analyst interest, investors having more accurate beliefs about future performance, and investors having less asymmetry in their beliefs about future performance, which in turn will lead to less adverse selection problem and therefore greater market liquidity.

Finally, given that firms in concentrated industries have lower cost of capital (Hou and Robinson 2003), prior studies examining the relation between disclosure level and cost of capital (Botosan, 1997; Botosan and Plumlee 2002) suffer from an important correlated omitted variable in their analyses, and this problem is likely to bias against finding the negative relation between disclosure and cost of capital. As such these studies obtain mixed results.

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Table 1: Descriptive Statistics

	Mean	*Q1*	*Median*	*Q3*
Panel A: Competition Variables				
HH-INDEX	652.615	277.000	526.000	971.900
FOUR-FIRM	39.243	27.200	38.100	50.700
EIGHT-FIRM	52.764	39.100	52.700	64.000
Panel B: Analysts' Behavior				
COV	6.599	1.769	3.909	8.750
DISP	0.823	0.146	0.333	0.787
FERR	2.497	0.248	0.822	2.397
REVISION	0.765	0.101	0.296	0.783
Panel C: Control Variables				
LSIZE	5.881	4.481	5.599	7.072
STDROE	0.184	0.069	0.124	0.233
CORR	0.236	-0.007	0.306	0.545
INVPRICE	0.103	0.032	0.059	0.118
RETVAR	0.002	0.001	0.001	0.002
RD	0.074	0.001	0.029	0.092
EFFORT	-16.918	-12.667	-16.544	-20.500
BROKER	46.785	20.414	40.143	63.530
CHEPS	0.077	0.014	0.033	0.077
NEW	0.245	0.167	0.250	0.326
SPREAD	4.256	1.761	3.221	5.527
TURNOVER	0.005	0.001	0.003	0.006
LPRICE	2.287	1.682	2.339	2.944
INS	0.211	0.037	0.139	0.315

FOUR-FIRM and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *COV* is 12-month average of number of analysts who issued annual earnings forecasts in IBES. *FERROR* is the absolute value of 12-month average of forecast errors defined as actual earnings minus median forecast, deflated by beginning of year stock price. *DISP* is 12-month average of standard deviation of analysts' forecasts, deflated by beginning of year stock price. *REVISION* is the standard deviation of forecast revisions deflated by beginning of year price, where forecast revision is defined as current month median forecast minus previous month median forecast. *LSIZE* is the natural logarithm of market value. *STDROE* is the standard deviation of ROE in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CORR* is the Pearson correlation between ROE and annual stock return in the preceding 10-year period. The calculation requires a minimum of 3 observations. *INVPRICE* is the inverse of stock price at the beginning of the year. *RETVAR* is daily stock return variance estimated over the 200 days prior to the year end. *RD* is lagged research and development expense deflated by lagged assets. *EFFORT* is the negative of the average number of firms followed by the firm's analysts in a particular year divided by the number of analysts covering the firm in that year. *BROKER* is the average number of analysts employed by the brokerage houses that employ the firm's analysts. *CHEPS* is the annual change in earnings per share deflated by lag prices. *NEW* is the proportion of new forecasts included in the monthly forecast variable in the IBES summary tape. *SPREAD* is the average annual value of daily closing bid-ask spread as a percentage of daily closing price. *TURNOVER* is the median annual value of daily trading volume divided by total shares outstanding. LPRICE is the natural logarithm of beginning of year stock price. *INS* is fractional insider ownership of outstanding shares.

Table 2: Industry characteristics

3-Digit NAICS code	Industry name	Median four-firm concentration ratio	Sample industry distribution	Compustat industry distribution
321	Wood products	19.8	1.07	0.90
315	Apparel	22.6	1.21	1.34
332	Fabricated Metal Products	22.9	3.71	3.49
337	Furniture and Related Products	28.6	1.83	1.51
313	Textile Mills	28.8	1.25	0.80
333	Machinery	30.1	9.9	9.43
339	Miscellaneous	31.1	6.37	7.58
323	Printing and Related Support	31.9	0.96	1.00
326	Plastics and Rubber Products	32.3	2.39	2.60
331	Primary Metal	32.7	4.08	3.02
324	Petroleum and Coal Products	34.2	2.28	1.52
314	Textile Product Mills	38.3	0.40	0.31
327	Nonmetallic Mineral Products	40.4	1.57	1.57
322	Paper	41.5	2.75	2.39
335	Electrical Equipment, Appliances, and Components	43.1	3.34	3.57
311	Food	43.7	3.72	3.43
334	Computer and Electronic Products	44.0	27.79	30.45
316	Leather and Allied Products	49.7	0.74	0.69
325	Chemicals	54.2	17.45	17.86
336	Transportation Equipment	59.6	5.82	5.20
312	Beverage and Tobacco Products	59.8	1.39	1.70

Median four-firm concentration ratio refers to the median value for the four-firm concentration ratio for the 6-digit NAICS industries within a particular 3-digit NAICS industry This ratio is measured using the market shares of the largest four firms in a 6-digit NAICS industry as defined by firm sales. Sample industry distribution and Compustat industry distribution refer to the percentage of firms in each 3-digit NAICS code in the manufacturing sector included in the sample and in the Compustat database.

Table 3: Fama-MacBeth regression estimates of models explaining analyst coverage. Dependent variable = COV. Sample period: 1993 to 2001.

Variable	Predicted Sign			
Intercept	?	-14.632	-14.281	-14.370
		(-25.65)***	(-25.31)***	(-25.63)***
HH-INDEX	?	-0.043		
		(-6.38)***		
FOUR-FIRM	?		-1.389	
			(-6.08)***	
EIGHT-FIRM	?			-1.040
				(-4.81)***
LSIZE	+	3.648	3.623	3.638
		(27.37)***	(27.38)***	(27.36)***
STDROE	+	-0.421	-0.408	-0.429
		(-2.03)**	(-1.77)	(-1.89)*
CORR	+	0.665	0.638	0.656
		(6.89)***	(6.75)***	(6.74)***
INVPRICE	+	7.408	7.256	7.427
		(12.02)***	(11.72)***	(11.68)***
RETVAR	+	228.707	232.000	230.274
		(3.78)***	(3.78)***	(3.72)***
RD	+	1.059	1.177	1.207
		(1.66)	(1.75)	(1.74)
EFFORT	-	-0.024	-0.027	-0.027
		(-2.72)**	(-3.02)**	(-3.07)**
BROKER	-	-0.033	-0.033	-0.033
		(-7.11)***	(-7.03)***	(-6.94)***
N		1109	1128	1122
Adjusted R-square		0.657	0.658	0.660

***, **, and * represent significance level at 1%, 5%, and 10%. *COV* is 12-month average of number of analysts who issued annual earnings forecasts in IBES. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *FOUR-FIRM* and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *LSIZE* is the natural logarithm of beginning of year market value. *STDROE* is the standard deviation of ROE in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CORR* is the Pearson correlation between ROE and annual stock return in the preceding 10-year period. The calculation requires a minimum of 3 observations. *INVPRICE* is the inverse of stock price at the beginning of the year. *RETVAR* is daily stock return variance estimated over the 200 days prior to the year end. *RD* is lagged research and development expense deflated by lagged assets. *EFFORT* is the negative of the average number of firms followed by the firm's analysts in a particular year divided by the number of analysts covering the firm in that year. *BROKER* is the average number of analysts employed by the brokerage houses that employ the firm's analysts.

Table 4: Fama-MacBeth regression estimates of models explaining dispersion in analysts' earnings forecasts. Dependent variable = DISP. Sample period: 1993 to 2001.

Variable	Predicted Sign			
Intercept	?	1.442 (10.73)***	1.402 (10.02)***	1.355 (10.07)***
HH-INDEX	+	0.009 (3.42)***		
FOUR-FIRM	+		0.172 (1.54)	
EIGHT-FIRM	+			0.291 (2.51)**
LSIZE	-	-0.162 (-11.73)***	-0.158 (-11.87)***	-0.163 (-12.22)***
STDROE	+	0.685 (3.92)***	0.664 (3.83)***	0.651 (3.68)***
CORR	-	-0.089 (-1.75)	-0.087 (-1.83)	-0.086 (-1.76)
CHEPS	+	3.443 (8.82)***	3.486 (9.47)***	3.457 (9.31)***
NEW	?	-0.497 (-1.70)	-0.486 (-1.68)	-0.504 (-1.78)
RD	+	1.840 (5.11)***	1.858 (5.08)***	1.855 (5.01)***
N		963	981	975
Adjusted R-square		0.145	0.148	0.150

***, **, and * represent significance level at 1%, 5%, and 10%. *DISP* is 12-month average of standard deviation of analysts' forecasts, deflated by beginning of year stock price. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *FOUR-FIRM* and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *LSIZE* is the natural logarithm of beginning of year market value. *STDROE* is the standard deviation of ROE in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CORR* is the Pearson correlation between ROE and annual stock return in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CHEPS* is the annual change in earnings per share deflated by lag prices. *NEW* is the proportion of new forecasts included in the monthly forecast variable in IBES. *RD* is lagged research and development expense deflated by lagged assets.

Table 5: Fama-MacBeth regression estimates of models explaining analyst forecast accuracy. Dependent variable = FERROR. Sample period: 1993 to 2001.

Variable	Predicted Sign			
Intercept	?	4.907 (9.84)***	4.680 (9.34)***	4.535 (8.93)***
HH-INDEX	+	0.035 (5.44)***		
FOUR-FIRM	+		1.150 (6.81)***	
EIGHT-FIRM	+			1.246 (8.00)***
LSIZE	-	-0.624 (-15.24)***	-0.619 (-15.96)***	-0.628 (-16.51)***
STDROE	+	1.197 (3.53)***	1.119 (3.49)***	1.089 (3.42)***
CORR	-	0.227 (1.54)	0.227 (1.57)	0.231 (1.61)
CHEPS	+	11.619 (11.16)***	11.792 (11.36)***	11.755 (11.31)***
NEW	?	-0.220 (-0.31)	-0.231 (-0.33)	-0.247 (-0.35)
RD	+	-0.965 (-1.55)	-1.026 (-1.67)	-1.082 (-1.77)
N		1148	1169	1163
Adjusted R-square		0.204	0.206	0.207

***, **, and * represent significance level at 1%, 5%, and 10%. *FERROR* is the absolute value of 12-month average of forecast errors defined as actual earnings minus median forecast, deflated by beginning of year stock price. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *FOUR-FIRM* and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *LSIZE* is the natural logarithm of beginning of year market value. *STDROE* is the standard deviation of ROE in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CORR* is the Pearson correlation between ROE and annual stock return in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CHEPS* is the annual change in earnings per share deflated by lag prices. *NEW* is the proportion of new forecasts included in the monthly forecast variable in IBES. *RD* is lagged research and development expense deflated by lagged assets.

Table 6: Fama-MacBeth regression estimates of models explaining forecast revision. Dependent variable = REVISION. Sample period: 1993 to 2001.

Variable	Predicted Sign			
Intercept	?	1.052 (5.67)***	0.986 (5.60)***	0.954 (5.65)***
HH-INDEX	+	0.008 (2.66)**		
FOUR-FIRM	+		2.554 (2.77)**	
EIGHT-FIRM	+			0.281 (3.13)**
LSIZE	-	-0.195 (-8.25)***	-0.192 (-8.26)***	-0.194 (-8.32)***
STDROE	+	0.412 (3.77)***	0.390 (3.61)***	0.382 (3.48)***
CORR	-	-0.005 (-0.13)	-0.001 (-0.02)	0.000 (-0.00)
CHEPS	+	3.359 (8.08)***	3.395 (8.60)***	3.385 (8.55)***
NEW	?	1.808 (11.38)***	1.802 (11.45)***	1.815 (11.42)***
RD	+	0.756 (2.97)**	0.760 (2.94)**	0.751 (2.90)**
N		1127	1147	1141
Adjusted R-square		0.196	0.199	0.199

***, **, and * represent significance level at 1%, 5%, and 10%. *REVISION* is the standard deviation of forecast revisions deflated by beginning of year price, where forecast revision is defined as current month median forecast minus previous month median forecast. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *FOUR-FIRM* and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *LSIZE* is the natural logarithm of beginning of year market value. *STDROE* is the standard deviation of ROE in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CORR* is the Pearson correlation between ROE and annual stock return in the preceding 10-year period. The calculation requires a minimum of 3 observations. *CHEPS* is the annual change in earnings per share deflated by lag prices. *NEW* is the proportion of new forecasts included in the monthly forecast variable in IBES. *RD* is lagged research and development expense deflated by lagged assets.

Table 7: Fama-MacBeth regression estimates of models explaining bid-ask spread. Dependent variable = SPREAD. Sample period: 1993 to 2001.

Variable	Predicted Sign			
Intercept	?	3.162 (5.29)***	3.142 (5.11)***	3.040 (5.15)***
HH-INDEX	+	0.005 (2.32)**		
FOUR-FIRM	+		0.205 (2.68)**	
EIGHT-FIRM	+			0.318 (3.66)**
LSIZE	-	-0.557 (-8.43)***	-0.561 (-8.42)***	-0.566 (-8.32)***
LTURNOVER	-	-0.949 (-13.59)***	-0.945 (-13.79)***	-0.949 (-13.67)***
LPRICE	-	-1.061 (-6.09) ***	-1.058 (-6.12) ***	-1.051 (-6.17) ***
INS	+	-0.004 (-0.044)	0.026 (0.250)	0.031 (0.301)
N		965	980	979
Adjusted R-square		0.621	0.622	0.622

***, **, and * represent significance level at 1%, 5%, and 10%. *SPREAD* is the average annual value of daily closing bid-ask spread as a percentage of daily closing price. *HH-INDEX* refers to the Herfindahl-Herschmann index and is calculated by summing the squares of the individual company market shares for the 50 largest companies in a 6-digit NAICS industry or all the companies in the industry, whichever is lower. *FOUR-FIRM* and *EIGHT-FIRM* refer to the four-firm and eight-firm concentration ratios. These ratios are measured using the market shares of the largest four and eight firms in a 6-digit NAICS industry as defined by firm sales. *LSIZE* is the natural logarithm of beginning of year market value. *LTURNOVER* is the median annual value of daily trading volume divided by total shares outstanding. *LPRICE* is the natural logarithm of beginning of year stock price. *INS* is fractional insider ownership of outstanding shares.