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Managerial Ownership and Firms' Information Environment

Abstract

We examine the relation between managerial stock ownership and the firm's information environment. We focus on three dimensions of the information environment: total, public, and private information precision (Barron, Kim, Lim and Stevens 1998). Our results suggest that firms' total and public information precision are positively related to managerial ownership. In contrast, there is no clear pattern in private information precision across different levels of managerial ownership. We also observe that managerial ownership has a greater impact on the firm's public information environment after the implementation of Regulation Fair Disclosure, suggesting that the regulation was effective in improving the firms' public information flow for firms whose managers' interests are better aligned. Collectively, our findings suggest that one of the possible channels through which managerial ownership associates with earnings informativeness and firm value is the firms' public information precision and that managerial incentive alignment plays an important role in how managers respond to a new disclosure regulation.

Key words: *Managerial ownership, Information environment, Interest alignment*

JEL classification: *M40, M41, O16*

1. Introduction

The implications of managerial ownership level for managerial behavior are of considerable interest to researchers in accounting and finance. Managerial stock holdings affect agency problems between management and external shareholders, and these agency problems, in turn, affect managerial contracting, information quality and firm value (Berle and Means 1932; Jensen and Meckling 1976; Fama and Jensen 1983; Watts and Zimmerman 1986; Warfield, Warfield, and Wild 1995). Berle and Means (1932) and Jensen and Meckling (1976) note that managers' interests diverge from those of shareholders when managerial ownership is low; consequently, agency costs are high as managers may pursue non-value-maximizing objectives. As managerial ownership increases, managers' interests are better aligned with those of shareholders. This incentive alignment reduces agency costs as managers pursue value-maximizing objectives that benefit themselves and shareholders.[1]

Managerial incentive alignment has implications for managerial disclosure policies and, more generally, for the firm's information environment. When managers' incentives are aligned with the incentives of shareholders, they will be more committed to maximizing shareholder interest. This view suggests that managers are more likely to improve the firm's information environment as their stock ownership increases, reducing the agency cost of external financing and increasing stock price. When managers' and shareholders' interests are not aligned, managers will have incentives to

[1] However, others find that managers are more likely to engage in actions that serve their own interests but conflict with those of other shareholders, as managerial ownership increases (McConnell and Servaes 1990; Morck, Shleifer and Vishny 1988; Hermalin and Weisbach 1991).

expropriate other shareholders and to conceal those expropriations. An alternative view offered by Jensen and Meckling (1976) is that corporate disclosure decreases with managerial ownership, as the demand for information disclosure to monitor managers is higher when agency problems are greater (i.e., when managerial ownership is lower).

Empirical research provides evidence of a relation between the level of managerial ownership and earnings attributes (Warfield et al. 1995; Cheng and Warfield 2005), accounting conservatism (LaFond and Roychowdhury 2008), and firm value (Morck, Shleifer and Vishny 1988). Warfield et al. (1995) note that firms tend to have more stringent accounting-based constraints when managerial ownership is low (i.e., when interests are not aligned), inducing managers to respond to the contractual environment in their self-interest (including the selection and application of accounting procedures).[2] Consistent with the idea that more stringent accounting-based constraints for firms with lower managerial ownership impair the faithful determination of accounting numbers, Warfield et al. (1995) find that earnings informativeness increases and earnings management decreases with managerial ownership. In a similar vein, Morck et al. (1988) find that firm value generally increases with managerial ownership as managers are more committed to shareholder value maximization when their ownership level is high and thus their interests are aligned with those of shareholders.

In contrast, Cheng and Warfield (2005) note that managers with high equity incentives (e.g., stock-based compensation and stock ownership) are more likely to sell

[2] Agency theory predicts that when managers hold less equity in the corporation, incentives arise for them to pursue non-value-maximizing behavior such as shirking and perquisite taking. Accordingly, contracts often contain accounting-based covenants to restrict managers' value-reducing behavior when ownership and control are distinct.

shares in the future and this motivates these managers to engage in earnings management to increase the value of the shares to be sold.[3] LaFond and Roychowdhury (2008) document that accounting conservatism, as measured by the asymmetric timeliness of earnings, declines with managerial ownership, which proxies for the degree of separation between ownership and control.[4]

Taken together, extant evidence on the association between managerial stock ownership and financial reporting quality is mixed and little is known about the mechanism(s) through which managerial ownership relates to firm value. We fill this void in the literature by investigating whether managerial ownership relates to earnings attributes and firm value through the firm's information environment. In addition, we examine whether managerial incentive alignment explains how managers respond to Regulation Fair Disclosure (Reg FD) which aims to improve firms' information environment by making information more uniformly available to all classes of investors. An added feature of this analysis is that as Reg FD likely represents an exogenous shock in our context (i.e., the regulation is not directly driven by managerial stock holdings), it alleviates common concerns in ownership studies about the results being driven by endogeneity in managerial ownership.

Managers can improve the firm's information environment in various ways. For example, they can improve public disclosure quality by providing more detailed and

[3] Bergstresser and Philippon (2006) provide similar evidence, showing that CEO incentives relate to the level of earnings management.

[4] For instance, Ball (2001) notes that recognizing losses in a timelier manner induces managers to be timely in their decisions to terminate loss-making projects, which managers often prefer to keep otherwise because of the associated private benefits such as the prestige of overseeing larger firms.

credible financial information. In addition, they may choose to voluntarily provide additional information to the market through management forecasts (Baginski and Hassel 1997; Bamber and Cheon 1998), conference calls (Bowen, Davis, and Matsumoto 2002; Kimbrough 2005), earnings warnings (Kasznik and Lev 1995), and other such disclosures. While improvements in the firm's information environment can take place either separately or simultaneously through these various channels, they will eventually be reflected in the quality of information available to investors.

Unfortunately, we cannot directly observe the quality of the information available to investors. However, we can assess the characteristics of the information available to information intermediaries such as security analysts who collect and process information and make it available to investors. Barron, Kim, Lim and Stevens (1998) (BKLS hereafter) develop a framework that relates analysts' information environment to properties of their forecasts. We use their framework for measuring the precision of total, public and private information available to the capital market.[5]

Managers whose interests are aligned are more likely to improve the precision of total and public information than managers whose interests are not aligned, and therefore we expect the precision of total and public information to increase with managerial ownership. As public information precision increases with alignment of managers' and shareholders' interests, investors have less incentive to acquire private

[5] These information environment variables are summary measures of the three aspects of a firm's information environment, rather than individual dimensions, such as earnings informativeness, accrual quality or conservatism. Further, the BKLS model provides a richer setting for our purpose, compared to alternative measures of information asymmetry and risk such as bid-ask spread and probability of informed trading (PIN), in that it enables us to explicitly examine how managerial ownership relates to different aspects of a firm's information environment.

information (Kim and Verrecchia 1994), and hence the precision of private information is likely to decrease with incentive alignment.

Our empirical analysis indicates that total and public information precision increases with managerial ownership, consistent with the alignment hypothesis. In contrast, after controlling for the precision of public information, we do not find a systematic relation between the precision of private information and managerial ownership, consistent with the theory that analysts' public and private information precisions are not independent (BKLS 1998).[6] Finally, we observe a greater improvement in the public information environment of firms with higher managerial stock holdings after the implementation of Reg FD.

This study contributes to the line of literature that examines the role of managerial ownership in governing the conflict of interest between managers and outside shareholders in at least two ways. First, we document that managerial incentives associated with managerial stock ownership explain firms' overall information environment. The richer overall information environment of high managerial ownership firms is consistent with the higher earnings-response coefficients (Warfield et al. 1995) and high Tobin's Q (Morck et al. 1988) prior studies report.[7]

Second, our findings extend prior research that examines changes in firms' information environment subsequent to the introduction of Reg FD (e.g., Gintschel and

[6] For example, public disclosure reduces investors' incentives to acquire costly private information (King and Wallin 1991). We control for private (public) information precision in the public (private) information precision models because public and private information precision are positively correlated and failure to control can lead to an omitted correlated variables problem (Botosan et al. 2004).

[7] However, this finding contrasts with Cheng and Warfield (2005), who suggest that accrual quality declines with managerial ownership.

Markov 2004; Bushee, Matsumoto, and Miller 2004; Mohanram and Sunder 2006; Wang 2007). A key innovation of our study in this regard is that we condition firms' information environment change subsequent to Reg FD on managers' equity incentive, i.e., their stock holdings. The evidence shows that, subsequent to Reg FD, firms' public information environment improves more for firms with higher managerial stock holdings, suggesting that managerial incentive alignment plays an important role in how managers respond to the regulation.

The remainder of this paper is organized as follows. We discuss the background and develop empirically testable hypothesis in the next section,. We discuss the variable measurement and research design in Section 3 and describe the sample selection procedure and descriptive statistics in Section 4. We discuss the results in Section 5 and present our conclusions in Section 6.

2. Background and Hypotheses

2.1 Background

Theory does not yield a clear prediction on the relation between the level of managerial ownership and managers' commitment to improve shareholder wealth. On one hand, the alignment hypothesis suggests that managerial equity ownership has the potential of aligning the interests of managers with those of shareholders, thereby reducing the agency problem that arises from separation of ownership and control (Berle and Means 1932; Jensen and Meckling 1976; Warfield et al. 1995). As equity ownership increases, managers pay a larger share of the costs of deviating from value-

maximization and thus are less likely to squander corporate wealth. In our context, the alignment hypothesis predicts that managers will have an incentive to improve the firm's information environment as their ownership level increases in order to improve firm value.

Berle and Means (1932) argue that when managers hold little equity in the firm and shareholders are too dispersed to enforce value maximization, corporate assets may be deployed (e.g., through shirking and taking perquisites) to benefit managers rather than shareholders. Jensen and Meckling (1976) note that non-value-maximizing managerial decisions are less likely as managerial ownership rises. This is because as managers' stakes rise, they pay a larger share of these costs and so are less likely to squander corporate wealth (the alignment hypothesis).[8]

Consistent with the alignment hypothesis, Warfield et al. (1995) find that managerial ownership is positively associated with earnings' explanatory power for returns and inversely related to the magnitude of accounting accrual adjustments. They claim that lower managerial ownership is associated with increased contractual constraints that are often denominated in accounting numbers and, consequently, with greater managerial motivation to either relax restrictions or capitalize on incentives. Accordingly, earnings informativeness relates positively to managerial ownership because manager-determined accounting numbers better reflect economic performance than contractually-constrained ones.

[8] In contrast, Demsetz (1983) and Fama and Jensen (1983) recognize that, even when a manager owns only a small stake, market discipline (e.g., the managerial labor market (Fama 1980), the product market (Hart 1983), and the market for corporate control (Jensen and Ruback 1983)) may still force the manager toward value maximization.

On the other hand, at certain levels of managerial ownership (e.g., below a threshold level of managerial ownership), managers may pursue their personal benefit and make non-value-maximizing corporate decisions (McConnell and Servaes 1990; Hermalin and Weisbach 1991; Cheng and Warfield 2005; LaFond and Roychowdhury 2008).[9] Theory suggests that when managers do not have sufficient claims on the outcome from their business decisions, they are more likely to appropriate corporate resources in the form of perquisites (Jensen and Meckling 1976). Under this scenario, managers will have little incentive to expose their private control benefits to public scrutiny for the purpose of improving the firm's information environment and increasing firm value.

Cheng and Warfield (2005) find that equity incentives create incentives for earnings management. Specifically, using stock-based compensation and stock ownership data, they document that managers with high equity incentives are more likely to sell shares in the future and this motivates them to engage in earnings management to increase the value of the shares to be sold.[10] LaFond and Roychowdhury (2008) report that accounting conservatism as measured by the asymmetric timeliness of earnings declines with managerial ownership, suggesting that accounting earnings become less conservative as managerial ownership rises. They interpret this finding as being consistent with the view that conservative accounting plays the role of mitigating

[9] As in Warfield et al. (1995) and LaFond and Roychowdhury (2008), we assume a linear relation between managerial ownership and incentive alignment. In the empirical analysis, however, we control for possible non-linearity in the relation (e.g., Morck et al. 1988), and show that our results are not sensitive to this assumption.

[10] On a similar note, Bergstresser and Philippon (2006) find that the use of discretionary accruals to manipulate reported earnings is more pronounced at firms where the CEO's potential total compensation is more closely tied to the value of stock and option holdings.

agency problems. Lennox (2005) finds a significant, negative association between management ownership and audit firm size, suggesting that firms are less likely to subject themselves to stronger governance (i.e., higher quality external audit) when managerial ownership level is high.

Morck et al. (1988) find that Tobin's Q generally increases with ownership by the board of directors.[11] They report that there are levels of managerial stock holdings at which managers have an incentive to enhance firm value (the alignment hypothesis), but at extreme levels of ownership (either very low or very high) they have incentives to pursue non-value-maximizing behavior such as shirking or perquisite taking. Stultz (1988) shows that an increase in the fraction of voting rights controlled by management decreases the probability of a successful tender offer and increases the premium offered if a tender offer is made. In other words, depending on whether managerial control of voting rights is small or large, shareholders' wealth increases or falls when management strengthens its control of voting rights.

Botosan et al. (2004) indicate that the effects of increased public disclosure on analysts' information environment are not straightforward; managers' efforts to improve analysts' information precision and hence reduce information asymmetry can have opposite effects on firm value depending on how they affect public and/or private information precision. While greater public information reduces (increases) information asymmetry (firm value), greater private information increases (reduces) cost of equity

[11] Specifically, they find that Tobin's Q first increases, then decreases, and finally rises slightly as ownership by the board of directors rises. Other than the "information effect," the valuation effect could also be due to managers whose interests are aligned taking on more promising projects, which improve expected future cash flows of the firm.

(firm value) through greater information asymmetry.[12] They find that cost of equity capital decreases (increases) with the precision of public (private) information. This finding suggests that managers can increase firm value by improving the firm's public information precision.

2.2 Hypotheses Development

Prior research indicates that better disclosure reduces information asymmetry between investors and managers (Glosten and Milgrom, 1985; Dye 1988; Lang and Lundholm, 1993, 1996; Welker 1995; Verrecchia 2001) and that earnings management decreases with disclosure quality (Lobo and Zhou 2001). Firm value decreases with information asymmetry because investors demand compensation for the risk of adverse selection (i.e., trading with more informed parties) or for possibly higher transactions costs in an illiquid market. By improving the information environment, firms can reduce the agency cost of external financing and attract investors who would otherwise discount stocks with high information asymmetry and risk of minority expropriation.

Prior studies hypothesize and document that managerial stock holdings influence earnings informativeness and firm value. A possible explanation for these findings is that a firm's total information environment is richer when managerial ownership is high (the alignment hypothesis). As a firm's total information environment improves, its earnings informativeness increases as investors are better able to assess the

[12] Prior literature suggests that private information gives rise to greater information asymmetry and thus higher cost of capital, as investors need to be compensated for anticipated transactions costs arising from illiquidity or the risk of transacting with a more informed party, i.e., the risk of adverse selection (Diamond and Verrecchia 1991; Easley and O'Hara 2004).

implications of current earnings for future profitability. To the extent that improvement in a firm's total information environment reduces information risk, the firm's cost of capital will decrease and its value will increase (Easley and O'Hara 2004). However, no prior study establishes the link between managerial stock holding and earnings informativeness/firm value through its effect on the firm's information environment (both public and private).

Extant evidence on the association between managerial ownership and earnings quality (Warfield et al. 1995; Cheng and Warfield 2005; LaFond and Roychowdhury 2008) does not lead to a clear prediction on how managerial ownership will relate to the firm's information environment. On the one hand, Warfield et al.'s (1995) evidence that managers engage less in opportunistic earnings management when their ownership level is high suggests that the firm's information environment might be weaker when managerial ownership is low. On the other hand, Jensen and Meckling (1976) suggest that agency cost decreases with managerial ownership, which would reduce the demand for corporate disclosure. Consistent with this idea, Cheng and Warfield's (2005) and LaFond and Roychowdhury's (2008) findings show that the firm's information environment might be richer when managerial ownership is low.[13]

Improving a firm's information environment is not without cost to the manager. By improving the information environment and thus making the firm's operations more transparent, managers subject their managerial decisions to greater public scrutiny, which reduces their ability to extract private control benefits. Thus, a manager whose

[13] In addition, Gelb (2000) reports a negative relation between managerial stock ownership and AIMR disclosure scores.

interests are aligned with the rest of the shareholders is more likely to commit to improving the firm's information environment.[14] Managers whose interests are better aligned with those of outside shareholders are expected to be more committed to improving the information environment of the firm than managers whose interests are not aligned and who, therefore, have little incentive to improve the information environment.[15] We thus formulate our first hypothesis as follows.

H1: Total information precision relates positively to managerial ownership.

In light of Botosan et al. (2004), managers whose interests are aligned are more likely to be committed to improving the firm's public information environment, which would translate into higher public information precision. Hence, we predict that public information precision will relate positively to managerial ownership. However, the predicted association between managerial ownership and the precision of private information is less obvious. Theory suggests that it is in the best interest of "aligned" managers to make decisions that would reduce private information precision, because increased private information could adversely affect firm value. This view predicts a negative relation between private information precision and managerial ownership. However, the precision of private information at least in part depends on the precision

[14] Alternatively, to the extent that the information environment of low managerial ownership firms (Warfield et al. 1995) is weaker, financial analysts might have greater incentives to produce private information. This reasoning leads us to predict that analysts' private information precision will decrease with managerial ownership, ceteris paribus.

[15] However, this association is not entirely obvious from the information demand perspective, if the demand for more information disclosure is higher when agency problems are more severe, i.e., when managerial ownership is lower (Jensen and Meckling 1976).

of public information.[16] This reasoning suggests that private information might in fact relate positively to managerial ownership. Collectively, to the extent that public signals influence the precision of private signals, it is possible that managers' efforts to reduce the precision of private information might be cancelled out by their efforts to improve the precision of public information even when their interests are aligned. As a consequence, we are unable to form a directional prediction on the relation between managerial ownership and private information precision.

Taken together, the precision of public information is likely to be higher when there is alignment, but it is not clear how the precision of private information will vary with managerial ownership. Thus, we state the public (private) information precision hypothesis in its alternate (null) form as follows:

H2a: Public information precision relates positively to managerial ownership.

H2b: Private information precision does not relate to managerial ownership, after controlling for public information precision.

Next, we examine the effects of regulatory environment change (i.e., the introduction of Reg FD) on our inferences. Reg FD, which became effective Oct 23, 2000, prohibits firms from disclosing material information to select groups of market participants.[17] Specifically, it states that "when an issuer, or person acting on its behalf,

[16] Kim and Verrecchia (1994) show that public disclosures may be processed into private information by informed investors. Likewise, Kim and Verrecchia (1991) suggest that more informed investors increase the precision of their private information to a greater extent than less informed investors in response to an increase in the precision of public information.

[17] Conference calls, among others, have been frequently cited as a medium for selective disclosure (Levitt 1998).

discloses material nonpublic information to certain enumerated persons (in general, securities market professionals and holders of the issuer's securities who may trade on the basis of the information), the issuer must make public disclosure of that same information simultaneously (for intentional disclosures) or promptly (for non-intentional disclosures)" (SEC 2000).

The basic aim of this regulation is to diminish selective disclosure of material information, prohibiting private communication between corporate insiders (i.e., managers) and outsiders (e.g., financial analysts or large investors) and promoting public communication of important information. Hence, it is expected that the public (private) information environment of a firm improves (deteriorates) with implementation of this regulation. Consistent with this idea, Gintschel and Markov (2004) report that the absolute price impact of information disseminated by financial analysts is substantially lower in the post-Reg FD period, suggesting that the regulation has been effective in curtailing selective disclosure. Similarly, Mohanram and Sunder's evidence (2006) suggests that Reg FD has been successful in leveling the information playing field among market participants.

In contrast, Heflin, Subramanyam and Zhang (2003) and Bailey, Li, Mao and Zhong (2003) provide evidence suggesting that return volatility and the cost of equity capital are reduced, and both trading volume and informational efficiency improve after Reg FD. Herrmann, Hope and Thomas (2008) show, in a sample of multinational firms, that average analyst forecast bias decreases and that the positive relation between

forecast optimism and international diversification significantly declines in the post-Reg FD period.

However, there is a paucity of evidence on how managerial incentives relate to the way firms responded to the new disclosure regulation, i.e., how the relation between managerial incentives associated with managers' stock ownership and firms' public information environment changes after Reg FD. On the one hand, it is possible that the firm's public information environment improves more after Reg FD for firms whose managers are more committed to improving shareholder wealth by improving the information environment. This reasoning suggests managers with aligned interests will be more likely to respond proactively to the new regulation designed to protect outside shareholders and increase firm value.

On the other hand, it is plausible that the information environment of firms with better incentive alignment (i.e., high managerial ownership firms) was already superior to that of firms with less aligned interests even prior to Reg FD. In this case, firms with better aligned interests might not necessarily have responded more proactively to the new disclosure regulation. Taken together, the prediction that emerges is that the information environment of firms with more aligned interests either improved more (than that of firms with less aligned interests) or stayed similar to that of the other firms, subsequent to Reg FD. Based on this reasoning, we predict the following:

H3: The association between public information precision and managerial ownership changes after the introduction of Regulation Fair Disclosure.

3. Variable Measurement and Research Design

As noted earlier, we use the BKLS measures of analysts' information precision as proxies for the precisions of total, public and private information available to the capital market.[18] A major advantage of this approach for our study is that it enables us to operationalize various aspects of a firm's information environment using observable variables, i.e., analysts' earnings forecasts. Further, these measures allow us to isolate managerial incentives to improve analysts' public information precision from their effects on analysts' private information precision. However, we make the following assumptions in relying on the BKLS framework to address our research question. First, we assume that analysts' information environment is similar to that of informed investors. Second, we assume that information observed by more than one analyst is common to all analysts and that private information is unique to a given analyst.[19]

To measure analysts' information precision, BKLS derive a set of analyst information environment variables by combining observable attributes of analysts' earnings forecasts. Following BKLS, we measure the following three information environment related variables:[20]

[18] Several prior studies use the BKLS measures as proxies for investors' information environment. For example, Barron et al. (2008) show that investors trade around earnings announcements in a manner consistent with changes in the information environment.

[19] Similar assumptions are made in prior studies (e.g., Botosan et al. 2004).

[20] Alternatively, we measure the level of private information search activity by the precision of the private information *relative to* the precision of public information incorporated in analysts' earnings forecasts. Based onBKLS, this variable is defined as $D/[SE\text{-}D/N]$, where D is the variance of analysts' earnings forecasts, N is the number of analysts' earnings forecasts, and SE is the squared analysts' earnings forecasts errors, which are measured by subtracting analysts' mean earnings forecasts from the actual earnings. Our main results are not sensitive to this alternative measurement of the private information search level.

$$p = 1 \Big/ \left[\left(1 - \frac{1}{N} \right) \times D + SE \right] \quad (1)$$

$$h = (SE - \frac{D}{N}) \Big/ \left[\left(1 - \frac{1}{N} \right) \times D + SE \right]^2 \quad (2)$$

$$s = D \Big/ \left[\left(1 - \frac{1}{N} \right) \times D + SE \right]^2 \quad (3)$$

where p is the total information precision, the inverse of overall uncertainty (V) in BKLS; h is the precision of public information; s is the precision of private information; D is the variance of analysts' earnings forecasts; N is the number of analysts' earnings forecasts; SE is the squared analysts' earnings forecast error, which is measured by subtracting the analysts' mean earnings forecast from the actual earnings.

We collect earnings forecasts and actual earnings data from I/B/E/S and use these data to compute D, SE, and N. We limit our data to the most recent annual earnings forecasts before an earnings announcement. For a given year, we require a minimum of three forecasts for inclusion in the sample. Following prior studies, we use the fractional rank of public and private information within a year, as both rh and rs tend to have a highly skewed distribution (Botosan et al. 2004). We test our hypotheses of the effect of managerial ownership on the information environment by estimating the following regression equations.

$$\begin{aligned} INFO\_ENVIR = {} & \alpha_0 + \alpha_1 MO + \alpha_2 SIZE + \alpha_3 EVOL + \alpha_4 LOSS \\ & + \alpha_5 SGR + \alpha_6 INST + \alpha_7 BETA + \alpha_8 LNBM \\ & + Industry\_Dummies + Year\_Dummies + \varepsilon \end{aligned} \quad (4)$$

$$INFO\_ENVIR = \alpha_0 + \alpha_1 MO + \alpha_2 MO \times FD + \alpha_3 FD + \alpha_4 SIZE + \alpha_5 EVOL + \alpha_6 LOSS + \alpha_7 SGR + \alpha_8 INST + \alpha_9 BETA + \alpha_{10} LNBM + Industry\_Dummies + Year\_Dummies + \varepsilon \quad (5)$$

where:

INFO_ENVIR:	=	Information environment, measured as the fractional rank of total information precision (*rp*), public information precision (*rh*) or private information precision (*rs*)
MO	=	Total managerial ownership, defined as percentage shareholdings by top five executive officers
FD	=	Dummy variable for Post-Regulation Fair Disclosure (Reg-FD) period
SIZE	=	Natural logarithm of market value of equity
EVOL	=	Earnings Volatility for last five years
LOSS	=	Indicator variable for a loss firm
SGR	=	Sales growth
INST	=	Total institutional ownership
BETA	=	Market model beta
LNBM	=	Natural logarithm of book-to-market ratio

Equations (4) and (5) measure managerial ownership (*MO*) as a continuous variable.[21] We also use a dummy variable, *DMO*, which equals 1 when managerial ownership exceeds the median of managerial ownership in each year, and 0 otherwise in order to control for possible non-linearity in the relation between *MO* and *INFO_ENVIR*. We predict α_1 in Equation (4) to be positive when *INFO_ENVIR* is defined as total information precision (*rh*) or public information precision (*rp*). In Equation (5), we predict α_2 to be positive in the total and public information precision models. The models include several control variables that prior research indicates are related to the demand for analysts' information search.

[21] Consistent with LaFond and Roychowdhury (2008), we exclude shares granted in options. In the accounting conservatism setting, their evidence suggests that shares granted in options have potentially different incentive effects from shares directly owned.

Second, we control for private information precision (*rs*) in the public information precision (*rh*) model since *rh* is likely to be determined at least in part by *rs*, and vice versa for public information precision (*rh*) in the private information precision (*rs*) model. We expect the coefficient on *rs* (*rh*) in the *rh* (*rs*) model to be positive since *rh* and *rs* are complements. Third, we include institutional ownership (*INST*) to control for the effect of institutional monitoring activities on a firm's information environment. We expect the coefficient on *INST* in the *rp* and *rh* models to be positive. Whereas institutional investors' monitoring activities and demand for information increase the precision of public information, their effect on the precision of private information is unclear. Finally, we control for other factors that may influence the firm's information environment including market value of equity (*SIZE*), earnings volatility (*EVOL*), whether the firm has a loss (*LOSS*), sales growth (*SGR*), market beta (*BETA*), and book-to-market ratio (*LNBM*).

A logical next step after investigating the effect of managerial ownership on the information environment is to examine the relation between information precision and firm value. Doing so enables us to more directly test the role of managerial stock holdings in determining firm value. To accomplish this, we express firm value as a function of the information environment and control variables as follows:

$$Tobin\_Q = \alpha_0 + \alpha_1 rp + \alpha_2 SIZE + \alpha_3 LEV + \alpha_4 RND + \alpha_5 CEXP + \alpha_6 ADV + Industry\_Dummies + Year\_Dummies + \varepsilon \quad (6)$$

$$Tobin\_Q = \beta_0 + \beta_1 rh + \beta_2 rs + \beta_3 SIZE + \beta_4 LEV + \beta_5 RND + \beta_6 CEXP + \beta_7 ADV + Industry\_Dummies + Year\_Dummies + \varepsilon \quad (7)$$

where:

Tobin_Q	=	Firm value measured by industry-adjusted Tobin's Q
rp	=	Fractional rank of total information precision
rh	=	Fractional rank of public information precision
rs	=	Fractional rank of private information precision
SIZE	=	Natural logarithm of market value of equity
LEV	=	Leverage
RND	=	Natural logarithm of research and development to sales ratio
CEXP	=	Capital expenditure to assets
ADV	=	Advertising to sales ratio

Given that the information environment variables are endogenously determined by managerial ownership and other firm characteristics, we estimate Equation (6) and Equation (7) using two-stage least squares (2SLS), with Equation (4) as the first stage regression model (Himmelberg, Hubbard, and Palia 1999).[22] We use Tobin's Q, defined as the firm's market value (as a proxy for the present value of its future cash flows) divided by the replacement cost of its tangible assets, as a measure of firm value[23]. Following Kaplan and Zingales (1997), we use the log transformed industry-adjusted Tobin's Q (*Tobin_Q*) as the dependent variable.[24]

Since firm value is affected by the value of growth options, we include the ratio of R&D expenses to sales (*RND*), the ratio of capital expenditures to total assets (*CEXP*), and the ratio of advertising expenses to sales (*ADV*) in the model as well as risk factors such as firm size (*SIZE*) and leverage (*LEV*) to control for those options. We expect the coefficient on *rp* in Equation (6) to be positive because managers have incentives to

[22] For example, Himmelberg et al. (1999) find no evidence that managerial ownership is associated with greater entrenchment, after controlling for the endogeneity in managerial ownership.
[23] Prior studies commonly use Tobin's Q as a proxy for firm value (e.g., Lang and Stulz 1994; Servaes 1996).
[24] Industry adjustments are done by controlling 2-SIC industry median Tobin's Q. In order to control for the influence of outliers in estimating Tobin's Q, we also use the log transformed measure. The results are almost identical in all respects.

increase total information precision when their ownership is higher (the alignment effect). We expect the coefficient on *rh (rs)* in Equation (7) to be positive (negative) because information asymmetry will be lower (higher) when public (private) information is more precise, and information asymmetry leads to lower firm value.

4. Sample Selection and Descriptive Statistics

4.1 Sample Selection

Our primary analysis is conducted on 19,174 firm-year observations for the period 1996 to 2004. Data on managerial ownership is obtained from the Compact Disclosure database and institutional ownership is obtained from the Thomson Financial database. Accounting and stock price data are obtained from the 2006 Compustat Annual Industrial, Research, and Full coverage files, and the 2006 CRSP Monthly files. The sample consists of all firms with complete data for the variables used in the empirical analyses and we winsorize earnings volatility (*EVOL)* and sales growth (*SGR*) at the top and bottom one percent of observations in order to control for the influence of outliers in estimating our regression models.

4.2 Descriptive Statistics

Panel A of Table 2 presents descriptive statistics for the variables used in the empirical tests. The mean (median) managerial ownership (*MO*) is 12.85% (3.56%) which is comparable to prior studies (e.g., Warfield et al. 1995). Mean (median) firm size (*SIZE_MV*), beta (*BETA*), and sales growth (*SGR*) are 6.62 (6.46), 0.97 (0.85), and 0.28

(0.13), respectively, indicating that our sample consists of relatively larger, less risky firms with a skewed distribution.

Panel B of Table 2 reports Pearson correlations among selected variables. Our main dependent variables (*rp, rh, rs*) are all positively correlated with total managerial ownership (*MO)*. The association between total managerial ownership (*MO*) and firm size (*SIZE*) is negative (-0.2631, p-value < 0.01), indicating that smaller firms are more likely to have higher managerial ownership, while there is a negative relation between institutional ownership (*INST*) and *MO* (-0.2660, p-value < 0.01). As for variables related to the information environment, both public and private information precision relate positively to overall information precision (0.8158 and 0.7557, respectively, p-value < 0.01 for both variables). This indicates that both public and private information precision increase the overall precision, while firm value is significantly more positively related to the precision of public information (0.2600, p-value < 0.01) than to the precision of private information (0.1326, p-value < 0.01).

5. Multivariate Results

5.1 Information environment and managerial ownership

First, we examine the association between the information environment and managerial ownership. The results from estimating Equations (4) and (5) are reported in Table 3. Consistent with our prediction in H1, the coefficients on *MO* are positive and highly significant in both model 1 (without non-linearity control) and model 2 (with

non-linearity control) (t-stat = 7.77 and 7.55, respectively).[25] In order to further address the non-linearity issue, we divide our sample into two groups, observations with managerial ownership (*MO*) above and below the median, and examine whether the relations between the information environment variables and managerial ownership differ across these two groups.[26] The results are shown in the first four columns of Panel A in Table 3. They indicate that the relation between *rp* and *MO* is positive for both the low managerial ownership group (t-stat = 7.28) and the high managerial ownership group (t-stat = 3.05) but the magnitude of the coefficient is smaller for high managerial ownership.

Next, in panels B & C of Table 3, we show *MO* is significantly positively related to public information precision (t-stat = 6.53 and 5.36 in model 1 and model 2, respectively). In addition, the positive relation between *MO* and *rh* is stronger for low managerial ownership levels (1.37 versus 0.03). In contrast, we do not observe a significant relation between *rs* and *MO*. In summary, these results confirm our hypothesis H2 that managers whose interests are aligned with shareholders are likely to be committed to improving the firm's public information precision but they do not necessarily take actions that would result in an increase in private information precision, which has an adverse effect on the firm value.

[25] Morck et al. (1998) report a non-linear relationship between managerial ownership and firm value. Hence, we examine whether our inference is sensitive to potential non-linearity.

[26] We also try two alternative approaches to address the non-linearity issue. Firstly, we try different cut-off points such as 75 percentile (17.18% in MO) and 80 percentile (22.29% in MO) of the sample. Second, we repeat the analyses using an indicator variable to rule out the possibility that a few outliers drive the result. The results are virtually the same.

The last two columns of Table 3 provide the results for our hypothesis H3. We classify firm-years up to 2000 (inclusive) as the pre-Reg FD period and years starting 2001 as the post-Reg FD period.[27] To the extent that the regulation was effective, one would expect the firm's public (private) information environment to improve (deteriorate) after the regulation, although the effect of the regulation on private information precision is less straightforward as it is affected by the public information precision. In other words, if the beneficial impact of increased public disclosure dominates any detrimental effect of lower guidance to analysts subsequent to the regulation, then one would observe an increase in the precision of public information. Alternatively, one would observe a decrease in the precision of public information after the regulation if firms did not increase public disclosure in response to Reg FD or if the detrimental effect of reduced interactions between firms and analysts dominates any increase in disclosure (Mohanram and Sunder 2006)

Consistent with prior studies (Heflin et al. 2003; Agrawal et al. 2006; Mohanram and Sunder 2006), the main effect on Reg FD (i.e., the *FD* coefficient) is negative (coeff. = -0.0193 and -0.0203, t-stat = 2.45 and 2.41, respectively), suggesting that analysts' information environment on average deteriorated after Reg FD presumably due to less private communication to analysts (Mohanram and Sunder 2006). The *MO* main effect is positive and significant in the *rp* and *rh* models, suggesting that even prior to Reg FD, high *MO* firms had a richer information environment. In contrast, the interaction effect (i.e., the *FD***MO* coefficient) is positive in the *rp* and *rh* models, suggesting that the

[27] Later we exclude year 2000 and re-run the tests. The inference does not change. This issue is further discussed in the Section 5.3.5 of the paper.

firm's overall and public information environments improved after Reg FD. These results are consistent with the premise of Reg FD, which is to block private information flow and instead to encourage public communication of material information, and suggest that "aligned" managers' incentives to improve the firm's public information flow are reinforced by the regulation.[28]

These findings extend extant evidence, which shows that analysts' overall information environment has unconditionally deteriorated after Reg FD (Gintschel and Markov 2004; Mohanram and Sunder 2006), by showing that despite the on average decline of analysts' information environment after Reg FD, the overall and public information environments of firms with high managerial ownership (i.e., firms whose managers' interests are aligned) increased after Reg FD, suggesting that managers with aligned interest have been more responsive to the regulation.

5.2 Information environment and firm value

Table 4 reports the results of estimating Equations (6) and (7). We use two-stage least squares estimation. We use the fitted values of *rp* (*rh, rs*) from Equations (4) and (5) for estimating the relation between Tobin's Q and the precision of total, public and private information using Equations (6) and (7). We find a significant, positive relation between total information precision and Tobin's Q (coeff. = 2.5568, t-stat = 37.12). We also find that this relation is more pronounced for the low managerial ownership group

[28] Taken together, it appears that the negative main effect is driven by firms with low managerial ownership. This result is intuitive given that firms with little incentive to improve the information environment in the first place (i.e., low managerial ownership firms) have even less reason to do so after Reg FD, when making certain types of disclosures might be viewed as "selective."

(coeff. = 2.6332, t-stat = 26.66) than for the high managerial ownership group (coeff. = 1.9420, t-stat = 22.12) and the difference is statistically significant (p-value < 0.01).

Our results also show that the precision of public information (*rh*) is significantly positively associated with Tobin's Q (coeff. = 13.1744, t-stat = 6.93) and this association holds for both the low and high managerial ownership groups. In contrast, the precision of private information is significantly negatively related to Tobin's Q (coeff. = -14.9887, t-stat = 5.49). Together with the estimation results for Equation (4), this suggests that improving the quality of public information (for example through conference calls and management earnings forecasts) increases firm value while more precise private information increases information asymmetry and lowers firm value.

Taken together, the results in Tables 3 and 4 suggest that managers whose incentives are aligned with shareholders through share ownership have greater incentives to improve the information environment. However, no clear relation between managerial ownership and precision of private information is observed because managers' efforts to reduce the precision of private information might be offset by their efforts to improve the precision of public information.

5.3 Robustness Checks

5.3.1 Measurement error in Tobin's Q

As prior studies note, our firm value measure, Tobin's Q is subject to measurement error. Tobin's Q is theoretically defined as the ratio of market value of the firm to the replacement cost of its assets. Operationalizing this concept is not

straightforward, especially because of the difficulty in measuring replacement cost. The most frequently used measure is the book value of assets from the balance sheet. However, as Gompers et al. (2007) note, the book value of some intangible assets is different from their true replacement cost. Although the measurement errors in the dependent variable may not introduce any systematic bias in the coefficient estimates, they influence the residuals and standard errors. To alleviate this measurement error problem, we transform Tobin's Q using the inverse function as follows:

$$Tobin\_Q' = -\left[\frac{1}{Q} - \frac{1}{industry\_Q}\right] \qquad (7)$$

Since the measurement error is in the numerator of this measure, it induces much less noise than our main measure. The results in Table 5 that use this transformed measure are consistent with those discussed earlier.

5.3.2 Non-linearity

Prior studies show that greater voting rights misalign managers' incentives so that they have more scope for opportunism (Morck et al. 1988; Gompers et al. 2007). To the extent this managerial interest misalignment affects the hypothesized relation in the opposite direction the coefficient estimates from the linear model could be biased. Following prior literature, we try two alternative non-linear specifications. First, following Morck et al (1988), we employ a piecewise regression model using 5 and 25

percent ownership as cut-off points.[29] Second, we control for the non-linearity by adding the squared ownership term (MO^2) in our regression model. The result is shown in Table 6. We find the overall precision (*rp*) and public information precision (*rh*) first increase, then stay constant, and finally rise slightly as managerial ownership increases. In contrast, this pattern is not observed for private information precision (*rs*). This result suggests that, although we observe a weak misalignment effect between 5 and 25 percent of ownership, the effect of managerial ownership on the precision of total and public information is generally positive. When we control for this non-linearity by using a quadratic model, we find a significantly positive coefficient on managerial ownership (*MO*) only in the total and public information precision regressions, which confirms our previous findings.[30]

5.3.3 Cross-sectional and Time-series Dependence

In a pooled cross-sectional regression, the error term could be correlated in cross-sections as well as in time-series. This will cause standard errors from OLS regressions to be downward biased. We use two approaches to correct for this interdependency problem. First, Thompson (2006) proposes a "double-clustering" technique to calculate standard errors that are robust to simultaneous correlation across both firms and time. Panel A of Table 7 gives the results when the double-clustering technique is used to

[29] One criticism of this method is that the thresholds (5% and 25%) are arbitrary. We try different cut-offs (3-20 and 50-75 percentile) and the result is qualitatively the same.

[30] According to the result from the regression with the quadratic ownership term, the alignment effect might be limited to below 59% (67%) managerial ownership level for the total (public) information precision model. However, we couldn't find any evidence of a significant negative association between total and public information precision and managerial ownership over the predicted thresholds and in any of the managerial ownership ranges in our sample.

calculate the standard errors for Equations (4) - (7). The results are very similar in all respects to those discussed in prior sections. Second, the commonly used Fama-MacBeth" approach which estimates year-by-year regressions and tests the significance of coefficient estimates using Newey-West standard errors. As shown in Panel B of Table 7, the result is virtually the same when the models are re-estimated by the Fama-MacBeth approach.

5.3.4 Equity Incentives and Earnings Management

One alternative explanation for our empirical result is that managers with high equity incentives use their accounting discretion to affect reported earnings (Cheng and Warfield 2005). As managers with high equity ownership are likely to gain more from meeting or beating analysts' earnings forecasts, the hypothesized relation between the precision of information and managerial ownership may not be driven by the improvement of the information environment by incentive-aligned managers, but by earnings management to meet the target set by analysts. In order to rule out this possibility, we partition our sample into high and low earnings management samples and re-estimate the regressions. If the precision increases with earnings management, we expect that the positive relation will be stronger for the high earnings management group than the low earnings management group. The result is provided in Table 8. Our results are inconsistent with this earnings management hypothesis; the positive relation between information precision and managerial ownership is not more pronounced for the low earnings management group. This evidence suggests that earnings management

is not likely a main driver of our result. Rather, managers' equity incentives likely drive the improvement in information environment, a possible channel that leads to higher firm value.

5.3.5 The implementation of Reg FD

Although Reg FD was proposed in August and became effective in October of 2000, the exact date of implementation of Reg FD cannot be easily determined. Following prior studies, we exclude calendar year 2000 in order to avoid this complication (Ke, Patroni, and Yu, 2008). As shown in Table 9, the results from the smaller sample of 16,917 observations are similar to those reported for the full sample in Table 3.

6. Conclusion

The economic consequences of managerial stock holdings constitute some of the most fundamental questions in modern corporations, where separation of ownership and control is prevalent. The question is particularly relevant in the wake of the series of corporate scandals around the turn of the century, where corporate managers have often been criticized for their fraudulent behavior. Theoretical perspectives on the effects of managerial stock holdings on shareholder wealth are mixed, and there is little empirical guidance on how managerial ownership relates to firms' information environment. This question is important because it offers a possible explanation for the previously documented association between managerial stock holdings and firm value.

Our evidence on this issue, inferred from the information environments of financial analysts, suggests that firms' information environments on average improve with managerial stock holdings, consistent with the alignment view of managerial ownership. This finding contributes to the literature by providing the "information link" between managerial ownership and earnings informativeness/firm value (Warfield et al. 1995; Morck et al. 1988). In light of recent research on the possible effects of public information precision on social welfare (Morris and Shin 2002), our results also suggest that managerial incentive alignment might play an important role in enhancing social welfare through public information precision.

The results also show that the improvement in a firm's public information environment after the implementation of Reg FD was greater for firms with higher managerial stock holdings. This suggests that Reg FD was more effective for firms with greater managerial incentive alignment in the sense that the firm's overall and public information precision improved after the regulation, as managers with aligned interest likely responded more proactively to the regulation. To the extent that Reg FD represents an 'exogeneous shock' to the financial reporting system, the Reg FD analysis results alleviate concerns regarding our earlier inference being driven by the endogeneity in managerial ownership. This finding adds on to prior studies that examine economic consequences of Reg FD (e.g., Gintschel and Markov 2004; Bushee, Matsumoto, and Miller 2004; Mohanram and Sunder 2006; Wang 2007)

However, readers should bear in mind that our inference is based on association tests (and thus the causal relationship can only be inferred) and that the validity of our

findings is conditional on the construct validity of the theoretical framework we adopt.[31] In addition, as in any ownership study, we cannot rule out the possibility that managerial stock ownership and the firm's information environment are jointly determined, although the effect of such simultaneity on our inference is difficult to assess at this point. We leave these issues for future research.

[31] For instance, as Botosan et al. (2004) note, analysts' herding behavior is inconsistent with the assumption that analysts' information sets consist of a public signal and an analyst specific private signal. For instance, herding behavior could severely dampen dispersion and magnify the mean squared forecast error causing the precision of public information to increase relative to the precision of private information. However, this works against our finding as it inhibits our ability to document separable effects for public and private information precision.

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[Table 1] Variable Definition

VARIABLE	DEFINITION
MO	Managerial ownership, defined as percentage shareholdings by top five executive officers
DMO	Dummy variable for managerial ownership that equals one (zero) if the managerial owne rship is above (below) the median
rp	Overall precision
rh	Public information precision
rs	Private information precision
SIZE_MV	Market value of common equity (#25*#199)
EVOL	Earnings volatility – standard deviation of income before extra ordinary items for last fiv e years (#18)
LOSS	Indicator variable for loss (#172)
SGR	Sales growth (#12)
INST	Institutional ownership
BETA	Beta
LNBM	Natural log of book to market ratio (#60/(#25*#199))
Tobin_Q	Industry adjusted Tobin's Q
LEV	Leverage (#34+#9)/#6
RND	Natural log of R&D expense to sales (#46/#12)
CEXP	Capital expenditure (#128/#6)
ADV	Advertisement expense (#45/#12)
FD	Indicator variable for Post-Regulation Fair Disclosure period (year 2001 or later)

[Table 2] Descriptive Statistics

Panel A: Summary Statistics

VARIABLE	N	MEAN	s.d.	25%	50%	75%
MO	19,174	0.1285	0.1945	0.0058	0.0356	0.1718
DMO	19,174	0.4995	0.5000	0.0000	0.0000	1.0000
rp	19,174	0.5000	0.2887	0.2500	0.5000	0.7500
rh	19,174	0.5000	0.2887	0.2500	0.5000	0.7500
rs	19,174	0.4998	0.2889	0.2500	0.5000	0.7500
SIZE_MV	19,174	6.6154	1.7298	5.4058	6.4644	7.6799
EVOL	19,174	2.0516	5.0677	0.3209	0.6610	1.5064
LOSS	19,174	0.2703	0.4441	0.0000	0.0000	1.0000
SGR	19,174	0.2781	0.6137	0.0169	0.1286	0.3230
INST	19,174	0.5186	0.2486	0.3333	0.5417	0.7178
BETA	19,174	0.9667	0.6392	0.5111	0.8500	1.2966
LNBM	19,174	-0.9395	0.7987	-1.3947	-0.8716	-0.4168
Tobin_Q	19,174	0.1361	0.5414	-0.2010	0.0474	0.4119
LEV	19,174	0.2108	0.1891	0.0194	0.1891	0.3452
LNRND	19,174	0.1050	0.3357	0.0000	0.0027	0.0908
CEXP	19,174	0.0679	0.0717	0.0256	0.0473	0.0837
ADV	19,174	0.0150	0.1838	0.0000	0.0000	0.0042
FD	19,174	0.4312	0.4953	0.0000	0.0000	1.0000

Panel B: Correlation Matrix

	MO	*DMO*	*rp*	*rh*	*rs*	*SIZE*	*EVOL*	*LOSS*	*SGR*	*INST*	*BETA*	*LNBM*	*Tobin_Q*	*LEV*	*LNRND*	*CEXP*	*ADV*
DMO	0.6131	1.0000															
	0.0000																
rp	0.0268	0.0302	1.0000														
	0.0002	0.0000															
rh	0.0195	0.0185	0.8158	1.0000													
	0.0070	0.0103	0.0000														
rs	0.0209	0.0345	0.7557	0.4573	1.0000												
	0.0038	0.0000	0.0000	0.0000													
SIZE	-0.2631	-0.3720	0.1600	0.1854	0.0422	1.0000											
	0.0000	0.0000	0.0000	0.0000	0.0000												
EVOL	0.0089	0.0111	-0.0872	-0.0788	-0.0533	-0.0861	1.0000										
	0.2189	0.1252	0.0000	0.0000	0.0000	0.0000											
LOSS	0.0750	0.1073	-0.2893	-0.2713	-0.1665	-0.2904	0.1593	1.0000									
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000										
SGR	0.1369	0.1368	-0.0069	0.0028	-0.0277	-0.0269	-0.0199	0.1173	1.0000								
	0.0000	0.0000	0.3384	0.6946	0.0001	0.0002	0.0058	0.0000									
INST	-0.2660	-0.1653	0.1702	0.1775	0.0818	0.3002	-0.0093	-0.1871	-0.1014	1.0000							
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2002	0.0000	0.0000								
BETA	0.0145	0.0456	0.0232	0.0301	0.0095	0.1079	0.0632	0.2302	0.1874	0.1233	1.0000						
	0.0440	0.0000	0.0013	0.0000	0.1899	0.0000	0.0000	0.0000	0.0000	0.0000							
LNBM	-0.0361	-0.0132	-0.2363	-0.2379	-0.1079	-0.4021	0.0611	0.0897	-0.2048	-0.1047	-0.2155	1.0000					
	0.0000	0.0678	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Tobin_Q	0.0600	0.0414	0.2630	0.2600	0.1326	0.3376	-0.0729	-0.1641	0.1854	0.0979	0.1960	-0.7748	1.0000				
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000					
LEV	-0.0923	-0.1223	-0.1400	-0.1183	-0.0957	0.1020	0.0137	-0.0276	-0.0744	0.0376	-0.2584	0.1113	-0.2515	1.0000			
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0573	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000				
LNRND	0.0190	0.0679	-0.0845	-0.0881	-0.0380	-0.1136	-0.0196	0.3454	0.1376	-0.0829	0.2058	-0.1362	0.0195	-0.1636	1.0000		
	0.0085	0.0000	0.0000	0.0000	0.0000	0.0000	0.0068	0.0000	0.0000	0.0000	0.0000	0.0000	0.0070	0.0000			
CEXP	0.0720	0.0488	-0.0169	-0.0120	-0.0145	-0.0419	-0.0027	-0.0489	0.0637	-0.0754	-0.0929	0.0014	0.0456	0.1055	-0.1064	1.0000	
	0.0000	0.0000	0.0195	0.0957	0.0451	0.0000	0.7068	0.0000	0.0000	0.0000	0.0000	0.8469	0.0000	0.0000	0.0000		
ADV	0.0262	0.0164	-0.0263	-0.0251	-0.0168	-0.0100	-0.0069	0.0489	0.1009	-0.0285	0.0311	-0.0359	0.0145	-0.0154	0.0486	0.0033	1.0000
	0.0003	0.0231	0.0003	0.0005	0.0198	0.1662	0.3392	0.0000	0.0000	0.0001	0.0000	0.0000	0.0439	0.0334	0.0000	0.6454	
FD	-0.1377	-0.1271	0.0321	0.0253	0.0366	0.1399	0.0434	0.0750	-0.1473	0.2282	0.2155	0.0457	-0.0566	-0.0406	0.0623	-0.1601	-0.0151
	0.0000	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0360

[Table 3] Managerial Ownership and Information Environment

Panel A: Overall Precision (*rp*)

Variable	Full Model (1)	Full Model (2)	Low MO	High MO	Reg FD	
MO	0.0847		2.1903	0.0417	0.0847	0.0630
	[7.77]**		[7.28]**	[3.05]**	[7.77]**	[4.87]**
DMO		0.0346				
		[8.16]**				
SIZE_MV	0.0074	0.0092	0.0090	0.0179	0.0074	0.0074
	[5.00]**	[6.00]**	[4.41]**	[7.17]**	[5.00]**	[5.00]**
EVOL	-0.0019	-0.0019	-0.0021	-0.0017	-0.0019	-0.0019
	[5.10]**	[5.00]**	[3.68]**	[3.27]**	[5.10]**	[5.09]**
LOSS	-0.1634	-0.1636	-0.1363	-0.1849	-0.1634	-0.1636
	[32.76]**	[32.77]**	[18.52]**	[26.82]**	[32.76]**	[32.82]**
SGR	-0.0016	-0.0017	0.0002	-0.0008	-0.0016	-0.0010
	[0.47]	[0.50]	[0.04]	[0.19]	[0.47]	[0.29]
INST	0.1180	0.1084	0.1115	0.0635	0.1180	0.1171
	[13.19]**	[12.38]**	[9.21]**	[4.33]**	[13.19]**	[13.08]**
BETA	-0.0013	-0.0022	-0.0112	0.0023	-0.0013	-0.0012
	[0.33]	[0.57]	[1.94]	[0.42]	[0.33]	[0.32]
LNBM	-0.0567	-0.0561	-0.0652	-0.0432	-0.0567	-0.0568
	[18.37]**	[18.12]**	[14.46]**	[10.01]**	[18.37]**	[18.40]**
FD					-0.0377	-0.0444
					[4.47]**	[5.08]**
MO*FD						0.0647
						[3.03]**
Constant	0.2498	0.2395	0.1944	0.2613	0.2498	0.2545
	[5.59]**	[5.37]**	[2.67]**	[4.73]**	[5.59]**	[5.69]**
Observations	19,174	19,174	9,596	9,578	19,174	19,174
R-squared	0.1920	0.1921	0.1895	0.2166	0.1920	0.1924

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

Panel B: Public Information Precision (*rh*)

Variable	Full Model (1)	Full Model (2)	Low MO	High MO	Reg FD	
MO	0.0653		1.3743	0.0347	0.0653	0.0516
	[6.53]**		[4.92]**	[2.77]**	[6.53]**	[4.42]**
DMO		0.0251				
		[6.38]**				
rs	0.3854	0.3851	0.3929	0.3693	0.3854	0.3852
	[52.43]**	[52.41]**	[38.07]**	[35.08]**	[52.43]**	[52.41]**
SIZE_MV	0.0158	0.0170	0.0167	0.0233	0.0158	0.0158
	[12.02]**	[12.53]**	[9.16]**	[10.25]**	[12.02]**	[12.02]**
EVOL	-0.0010	-0.0010	-0.0006	-0.0013	-0.0010	-0.0010
	[2.98]**	[2.89]**	[1.27]	[2.60]**	[2.98]**	[2.96]**
LOSS	-0.1004	-0.1006	-0.0877	-0.1124	-0.1004	-0.1006
	[22.43]**	[22.46]**	[13.49]**	[17.75]**	[22.43]**	[22.47]**
SGR	0.0046	0.0046	0.0035	0.0063	0.0046	0.0050
	[1.57]	[1.56]	[0.67]	[1.72]	[1.57]	[1.70]
INST	0.1004	0.0928	0.0924	0.0674	0.1004	0.0998
	[12.61]**	[11.87]**	[8.70]**	[5.02]**	[12.61]**	[12.54]**
BETA	0.0003	-0.0004	-0.0008	-0.0021	0.0003	0.0003
	[0.07]	[0.11]	[0.14]	[0.43]	[0.07]	[0.08]
LNBM	-0.0406	-0.0403	-0.0444	-0.0336	-0.0406	-0.0407
	[14.99]**	[14.88]**	[11.21]**	[8.84]**	[14.99]**	[15.01]**
FD					-0.0203	-0.0245
					[2.58]**	[3.03]**
MO*FD						0.0411
						[2.08]*
Constant	0.0156	0.0098	-0.0296	0.0354	0.0156	0.0187
	[0.34]	[0.22]	[0.45]	[0.57]	[0.34]	[0.41]
Observations	19,174	19,174	9,596	9,578	19,174	19,174
R-squared	0.3220	0.3219	0.3286	0.3256	0.3220	0.3222

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

Panel C: Private Information Precision (*rs*)

Variable	Full Model (1)	Full Model (2)	Low MO	High MO	Reg FD	
MO	0.0086		0.7051	0.0008	0.0086	0.0034
	[0.82]		[2.34]*	[0.06]	[0.82]	[0.27]
DMO		0.0074				
		[1.76]				
rh	0.4410	0.4406	0.4538	0.4217	0.4410	0.4409
	[49.50]**	[49.47]**	[35.81]**	[33.22]**	[49.50]**	[49.48]**
SIZE_MV	-0.0115	-0.0109	-0.0114	-0.0074	-0.0115	-0.0115
	[8.13]**	[7.45]**	[5.83]**	[3.01]**	[8.13]**	[8.13]**
EVOL	-0.0008	-0.0008	-0.0010	-0.0006	-0.0008	-0.0008
	[2.14]*	[2.11]*	[2.03]*	[1.06]	[2.14]*	[2.13]*
LOSS	-0.0478	-0.0478	-0.0354	-0.0584	-0.0478	-0.0479
	[9.79]**	[9.79]**	[4.99]**	[8.49]**	[9.79]**	[9.80]**
SGR	-0.0093	-0.0095	-0.0073	-0.0100	-0.0093	-0.0091
	[2.93]**	[3.00]**	[1.31]	[2.53]*	[2.93]**	[2.88]**
INST	0.0045	0.0041	-0.0013	-0.0047	0.0045	0.0043
	[0.54]	[0.50]	[0.12]	[0.33]	[0.54]	[0.51]
BETA	0.0008	0.0006	-0.0075	0.0061	0.0008	0.0008
	[0.22]	[0.15]	[1.36]	[1.20]	[0.22]	[0.23]
LNBM	-0.0083	-0.0080	-0.0107	-0.0035	-0.0083	-0.0084
	[2.88]**	[2.74]**	[2.51]*	[0.85]	[2.88]**	[2.89]**
FD					-0.0208	-0.0224
					[2.47]*	[2.59]**
MO*FD						0.0157
						[0.76]
Constant	0.3591	0.0098	0.3134	0.3836	0.3591	0.3603
	[7.92]**	[0.22]	[3.94]**	[7.48]**	[7.92]**	[7.94]**
Observations	19,174	19,174	9,596	9,578	19,174	19,174
R-squared	0.2256	0.3219	0.2338	0.2226	0.2256	0.2256

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 4] Information Environment and Firm Value

Variable	Firm Value (Tobin's Q)					
	Full Model	**Low MO**	**High MO**	**Full Model**	**Low MO**	**High MO**
rp	2.5568	2.6332	1.9420			
	[37.12]**	[26.66]**	[22.12]**			
rh				13.1744	6.8045	17.0431
				[6.93]**	[5.23]**	[5.15]**
rs				-14.9887	-5.9153	-20.0411
				[5.49]**	[3.06]**	[4.56]**
SIZE_MV	0.0497	0.0352	0.1055	-0.2066	-0.0771	-0.2878
	[11.76]**	[6.13]**	[15.62]**	[4.29]**	[2.31]*	[2.92]**
LEV	-0.2981	-0.2173	-0.4724	-0.6256	-0.1726	-1.2208
	[7.73]**	[3.80]**	[10.36]**	[3.06]**	[1.31]	[3.10]**
LNRND	0.3293	0.3038	0.2922	0.3422	0.1538	0.6810
	[12.93]**	[7.29]**	[10.06]**	[3.28]**	[1.83]	[3.28]**
CEXP	0.4452	0.6110	0.3839	0.3387	0.8181	-0.1089
	[4.46]**	[3.64]**	[3.57]**	[0.68]	[2.14]*	[0.13]
ADV	0.1027	0.1243	0.0597	0.1196	0.1968	-0.1011
	[2.27]*	[2.24]*	[1.20]	[0.73]	[3.58]**	[0.60]
Constant	-0.7999	-0.7081	-0.8666	3.8276	1.1083	5.5527
	[5.77]**	[2.77]**	[7.04]**	[3.39]**	[1.43]	[2.94]**
Observations	19,174	9,596	9,578	19,174	9,596	9,578
R-squared	0.4109	0.4383	0.4043	0.5020	0.4641	0.5645

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 5] Robustness Check 1 – Alternative Tobin's Q

Variable	Firm Value (Tobin's Q')					
	Full Model	**Low MO**	**High MO**	**Full Model**	**Low MO**	**High MO**
rp	1.5146	1.5229	1.2464			
	[36.36]**	[26.35]**	[22.78]**			
rh				5.9573	3.2563	7.8924
				[7.33]**	[5.48]**	[5.38]**
rs				-6.2076	-2.4052	-8.7435
				[5.31]**	[2.73]**	[4.48]**
SIZE_MV	0.0238	0.0168	0.0474	-0.0861	-0.0321	-0.1291
	[9.84]**	[5.16]**	[12.20]**	[4.18]**	[2.10]*	[2.95]**
LEV	-0.0501	-0.0311	-0.1219	-0.1945	-0.0173	-0.4565
	[2.22]*	[0.95]	[4.44]**	[2.22]*	[0.29]	[2.60]**
LNRND	0.1587	0.1494	0.1399	0.1648	0.0835	0.3147
	[11.83]**	[6.63]**	[9.11]**	[3.64]**	[2.13]*	[3.38]**
CEXP	0.2192	0.3452	0.1625	0.1626	0.4387	-0.0747
	[3.90]**	[3.68]**	[2.59]**	[0.77]	[2.52]*	[0.20]
ADV	0.0369	0.0600	0.0080	0.0446	0.0913	-0.0623
	[2.31]*	[2.32]*	[0.35]	[0.66]	[4.00]**	[0.91]
Constant	-0.4951	-0.4237	-0.5322	1.4408	0.3442	2.2786
	[6.26]**	[3.00]**	[7.11]**	[2.97]**	[0.97]	[2.71]**
Observations	19,174	9,596	9,578	19,174	9,596	9,578
R-squared	0.4215	0.4596	0.4054	0.4791	0.4748	0.5130

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 6] Robustness Check 2 – Non-linearity

Variable	Overall Precision (*rp*)		Public Info. Precision (*rh*)		Private Info. Precision (*rs*)	
MO_L	1.0113		0.7089		0.3059	
	[7.43]**		[5.69]**		[2.31]*	
MO_M	0.0218		0.0122		-0.0162	
	[0.54]		[0.32]		[0.41]	
MO_H	0.0321		0.0342		-0.0055	
	[1.61]		[1.91]		[0.29]	
MO		0.2101		0.1383		0.0448
		[7.55]**		[5.36]**		[1.62]
MO2		-0.1756		-0.1021		-0.0506
		[4.84]**		[3.10]**		[1.44]
rs			0.3840	0.3849		
			[52.25]**	[52.39]**		
rh					0.4401	0.4407
					[49.32]**	[49.44]**
SIZE_MV	0.0114	0.0089	0.0185	0.0167	-0.0103	-0.0111
	[7.30]**	[5.89]**	[13.35]**	[12.41]**	[6.86]**	[7.65]**
EVOL	-0.0019	-0.0019	-0.0009	-0.0010	-0.0008	-0.0008
	[4.90]**	[5.05]**	[2.82]**	[2.94]**	[2.07]*	[2.12]*
LOSS	-0.1633	-0.1633	-0.1005	-0.1004	-0.0480	-0.0479
	[32.75]**	[32.75]**	[22.44]**	[22.43]**	[9.81]**	[9.79]**
SGR	-0.0023	-0.0026	0.0042	0.0040	-0.0095	-0.0096
	[0.68]	[0.77]	[1.42]	[1.36]	[2.98]**	[3.02]**
INST	0.1065	0.1187	0.0923	0.1008	0.0009	0.0048
	[11.66]**	[13.29]**	[11.35]**	[12.67]**	[0.11]	[0.57]
BETA	-0.0032	-0.0021	-0.0010	-0.0002	0.0002	0.0006
	[0.82]	[0.54]	[0.29]	[0.06]	[0.06]	[0.16]
LNBM	-0.0544	-0.0555	-0.0391	-0.0399	-0.0077	-0.0080
	[17.52]**	[17.90]**	[14.40]**	[14.69]**	[2.64]**	[2.76]**
Constant	0.2126	0.2349	-0.0086	0.0072	0.3479	0.3549
	[4.77]**	[5.24]**	[0.19]	[0.16]	[7.63]**	[7.82]**
Observations	19,174	19,174	19,174	19,174	19,174	19,174
R-squared	0.1946	0.1930	0.3232	0.3224	0.2258	0.2256

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 7] Robustness Check 3 – Cross-sectional & Time-series Dependence

Panel A: Thompson (2006)'s Double-Clustering Technique

Variable	Information Environment			Firm Value (Tobin's Q)					
				Overall Precision (*rp*)			Public & Private Info. Precision (*rh* and *rs*)		
	rp	*rh*	*rs*	Full Model	Low MO	High MO	Full Model	Low MO	High MO
MO	0.0847	0.0653	0.0086						
	[6.32]**	[5.63]**	[0.79]						
rp				2.5793	2.6332	1.9420			
				[30.21]**	[21.16]**	[19.22]**			
rs		0.3854					-14.9508	-5.9153	-20.0411
		[50.41]**					[5.47]**	[3.06]**	[4.56]**
rh			0.4410				13.1569	6.8045	17.0431
			[47.81]**				[6.93]**	[5.23]**	[5.15]**
Observations	19,174	19,174	19,174	19,174	9,596	9,578	19,174	9,596	9,578
R-squared	0.1920	0.3220	0.2256	0.4109	0.4383	0.4043	0.5020	0.4641	0.5645

Panel B: Fama-MacBeth Type Regression

Variable	Information Environment			Firm Value (Tobin's Q)					
				Overall Precision (*rp*)			Public & Private Info. Precision (*rh* and *rs*)		
	rp	*rh*	*rs*	Full Model	Low MO	High MO	Full Model	Low MO	High MO
MO	0.0831	0.0651	0.0110						
	[5.48]**	[3.91]**	[1.60]						
rp				2.5565	2.4124	2.2881			
				[10.11]**	[16.65]**	[5.46]**			
rs		0.3773					-5.7375	-0.4028	-5.4903
		[31.63]**					[2.33]*	[0.32]	[2.05]*
rh			0.4356				6.7154	2.7631	6.6071
			[25.64]**				[3.91]**	[3.13]**	[3.89]**
Avg Obs.	2,130	2,130	2,130	2,130	1,066	1,064	2,130	1,066	1,064
R-squared	0.2212	0.3405	0.2470	0.4413	0.4778	0.4390	0.5274	0.5012	0.5969

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 8] Robustness Check 4 – Earnings Management

Variable	Overall Precision (*rp*)		Public Info. Precision (*rh*)		Private Info. Precision (*rs*)	
	Low |DA|	High |DA|	Low |DA|	High |DA|	Low |DA|	High |DA|
MO	0.1025	0.0691	0.0713	0.0576	0.0156	0.0038
	[6.10]**	[4.77]**	[4.74]**	[4.27]**	[0.98]	[0.26]
rs			0.3847	0.3825		
			[36.93]**	[36.22]**		
rh					0.4383	0.4409
					[34.65]**	[34.29]**
SIZE_MV	0.0059	0.0093	0.0149	0.0179	-0.0121	-0.0120
	[2.79]**	[4.31]**	[7.92]**	[9.29]**	[6.00]**	[5.79]**
EVOL	-0.0018	-0.0020	-0.0005	-0.0014	-0.0014	-0.0002
	[3.37]**	[3.73]**	[1.05]	[3.05]**	[2.64]**	[0.43]
LOSS	-0.1494	-0.1748	-0.0884	-0.1114	-0.0492	-0.0470
	[20.20]**	[25.43]**	[13.28]**	[17.91]**	[6.86]**	[6.87]**
SGR	0.0122	-0.0037	0.0202	0.0024	-0.0175	-0.0069
	[2.02]*	[0.87]	[3.35]**	[0.67]	[2.78]**	[1.83]
INST	0.1230	0.0980	0.1035	0.0822	0.0075	0.0034
	[9.53]**	[7.59]**	[9.04]**	[7.13]**	[0.62]	[0.28]
BETA	-0.0083	0.0059	-0.0021	0.0032	-0.0035	0.0041
	[1.37]	[1.15]	[0.37]	[0.69]	[0.61]	[0.84]
LNBM	-0.0659	-0.0508	-0.0466	-0.0369	-0.0102	-0.0076
	[14.07]**	[12.03]**	[11.35]**	[9.86]**	[2.33]*	[1.93]
Constant	0.2047	0.3122	-0.0180	0.0493	0.3582	0.3868
	[3.56]**	[4.59]**	[0.32]	[0.67]	[5.52]**	[5.92]**
Observations	9,424	9,424	9,424	9,424	9,424	9,424
R-squared	0.1883	0.2025	0.3164	0.3315	0.2250	0.2270

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.

[Table 9] Robustness Check 4 – Reg FD without 2000 data

Variable	Overall Precision (*rp*)		Public Info. Precision (*rh*)		Private Info. Precision (*rs*)	
MO	0.0895	0.0650	0.0702	0.0546	0.0099	0.0041
	[7.66]**	[4.52]**	[6.47]**	[4.14]**	[0.87]	[0.29]
rs			0.3782	0.3781		
			[48.17]**	[48.15]**		
rh					0.4305	0.4304
					[45.17]**	[45.15]**
SIZE_MV	0.0081	0.0081	0.0167	0.0167	-0.0117	-0.0117
	[5.16]**	[5.16]**	[11.81]**	[11.81]**	[7.70]**	[7.70]**
EVOL	-0.0016	-0.0016	-0.0008	-0.0008	-0.0006	-0.0006
	[3.98]**	[3.95]**	[2.38]*	[2.35]*	[1.53]	[1.52]
LOSS	-0.1648	-0.1652	-0.1030	-0.1032	-0.0481	-0.0482
	[31.05]**	[31.12]**	[21.49]**	[21.55]**	[9.18]**	[9.20]**
SGR	0.0026	0.0031	0.0083	0.0087	-0.0087	-0.0086
	[0.65]	[0.79]	[2.41]*	[2.51]*	[2.39]*	[2.35]*
INST	0.1147	0.1137	0.1022	0.1016	0.0012	0.0009
	[12.00]**	[11.89]**	[11.94]**	[11.87]**	[0.13]	[0.10]
BETA	0.0011	0.0010	0.0019	0.0019	0.0008	0.0008
	[0.25]	[0.23]	[0.50]	[0.48]	[0.20]	[0.19]
LNBM	-0.0570	-0.0573	-0.0393	-0.0395	-0.0099	-0.0099
	[16.74]**	[16.80]**	[13.08]**	[13.13]**	[3.09]**	[3.11]**
FD	-0.0387	-0.0453	-0.0221	-0.0264	-0.0201	-0.0217
	[4.55]**	[5.14]**	[2.79]**	[3.23]**	[2.38]*	[2.48]*
MO*FD		0.0635		0.0404		0.0151
		[2.87]**		[1.96]*		[0.70]
Constant	0.2413	0.2462	-0.0122	-0.0090	0.3890	0.3902
	[4.91]**	[4.99]**	[0.24]	[0.18]	[7.58]**	[7.59]**
Observations	16,917	16,917	16,917	16,917	16,917	16,917
R-squared	0.1870	0.1874	0.3110	0.3111	0.2162	0.2162

** and * indicate significance at 1% and 5% levels (two-tailed), respectively.