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Institutional Blockholders and Voluntary Disclosure

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Abstract We study how institutional blockholdings affect firm voluntary disclosure. We document that concentrated institutional ownership reduces firms' voluntary disclosure measured by the propensity to issue management forecasts, comprehensiveness of guidance, propensity to engage in conference calls, and the number of 8-K filings. We identify two channels through which institutional blockholders affect firms' voluntary disclosure. First, blockholders have easier access to managers and substitute private for public information acquisition. Second, a higher proportion of non-monitoring blockholders with low demand for voluntary disclosure, such as passive blockholders, reduces the firm's incentive to provide voluntary disclosure. The results are robust to endogeneity and reverse causality concerns. Our study identifies an important effect that concentrated ownership has on firm corporate disclosure.

Keywords: Passive ownership; Institutional investors; Blockholder; Voluntary disclosure

JEL codes: G23; G32; G34; G12; G14

1. Introduction

Previous studies document a positive relation between institutional ownership and firm voluntary disclosure (e.g., Abramova et al., 2017; Ajinkya et al., 2005; Basu et al., 2019; Boone & White, 2015; Bushee et al., 2003; Bushee & Noe, 2000; Healy et al., 1999; Karamanou & Vafeas, 2005). This result is frequently attributed to the monitoring role of institutional investors – institutional investors demand more public disclosure to facilitate managerial monitoring as private information acquisition is costly. One would naturally assume a similar positive association for concentrated institutional holdings as (i) blockholders face similar monitoring concerns and (ii) the benefits of monitoring increase with ownership concentration as idiosyncratic shocks have a larger effect on concentrated holdings (Almazan et al., 2005).[1] Contrary to this prediction, we propose that institutional blockholders reduce firm voluntary disclosure.

There are two reasons for a negative association between institutional blockholdings and voluntary disclosure. First, blockholders have more direct access to firms' management (Agrawal

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[1]In empirical tests, we define institutional blockholders as institutional investors who hold at least 5% of the firm's outstanding common shares. We also show our conclusions are robust to other definitions of blockholdings.

& Mandelker, 1990; Porter, 1992), which can provide them with more timely and tailored information that substitutes public information acquisition (the *private for public information substitution* hypothesis). This substitution lowers blockholder demand for public disclosure, which in turn reduces managerial incentives to provide costly public disclosure.[2]

Second, previous studies document that not all institutional investors actively monitor firm management because of differences in monitoring costs. Almazan et al. (2005) argue that monitoring costs vary with the skills and resources an institution can devote to collect and analyze information. They find that, for these reasons, bank trusts and insurance companies face higher monitoring costs compared to investment advisers and investment companies. Thus, as the fraction of shares held by non-monitoring blockholding institutions increases, such as by passive index funds, managers face less pressure to engage in costly public disclosure (the *inactive monitoring* hypothesis). Non-monitoring blockholders may also encourage less public disclosure as they bear a disproportionally high cost of voluntary disclosure (Shleifer & Vishny, 1986). Lower public disclosure can lower stock liquidity, however, lower marginal return due to higher trading cost is offset by blockholders' large volume of trades (Edmans, 2014; Maug, 1998). This effect contrasts with non-monitoring non-blockholders who prefer more transparency that promotes higher stock liquidity (Boone & White, 2015; Heflin & Shaw, 2000). This study empirically examines the effect institutional blockholdings have on voluntary disclosure and tests the two channels through which blockholdings can affect corporate communication.

To establish the importance of our research question, we first examine the prevalence of blockholdings for a sample of Compustat firms over the period 2001–2015. We find that the average proportion of shares held by blockholders in a firm increases from around 12% in 2001 to 20% in 2015, a 67% increase. For comparison, He and Huang (2017) report average blockholdings of 10.2% over the period 1980–2010. Further, we find that the proportion of Compustat firms with at least one blockholder increases from 60% in 2001 to 79% in 2015. Thus, in recent years, a substantial proportion of outstanding shares are held by blockholders.

Next, we examine the effect blockholdings have on voluntary disclosure. Empirical tests show a negative association between blockholdings and the likelihood of quarterly management forecasts and the effect is economically significant. A one standard deviation increase in blockholdings leads to a 16.6% lower propensity to provide guidance. Consistent with previous studies (e.g., Ajinkya et al., 2005; Boone & White, 2015; Bushee & Noe, 2000), we find a positive effect of average institutional ownership on the likelihood of guidance. When we jointly include blockholdings and average institutional holdings, the latter captures the effect of non-blockholding institutional ownership, i.e., institutional ownership below 5% of outstanding common shares. We confirm that the positive effect average institutional ownership has on managerial guidance is driven by institutional non-blockholdings.

To address the concern our results may be driven by a specific measure of blockholding, we re-do the analysis using the Herfindahl measure of ownership concentration. We continue to find a negative effect of concentrated ownership on voluntary disclosure. We find similar results using the number of blockholders in a stock. Thus, our conclusions are not sensitive to the measure of blockholding.

To ensure our conclusions are not sensitive to the measure of voluntary disclosure, we perform three robustness tests. First, we measure the comprehensiveness of voluntary disclosure by the number of items included in the management forecast. This test helps us differentiate between

[2]Public voluntary disclosure costs include the actual costs of making the disclosure e.g., costs of holding a conference call or distributing a press release, and also the consequential costs resulting from the proprietary nature of the information when disclosure reveals proprietary information e.g., to competitors in product markets, labour unions, or regulators (Beyer et al., 2010).

firms that issue one compared to multiple forecasts. While a single forecast can reflect opportunistic guidance, e.g., to lower the stock price before option grant dates (Aboody & Kasznik, 2000; Cheng & Lo, 2006; Nagar et al., 2003), comprehensive guidance is more likely to capture disclosure that is part of the firm's corporate communication (Ajinkya et al., 2005). We find that on average managers disclose two income statement items, with the most common items including forecasts of earnings and revenue. Using Poisson regressions, we find a negative effect blockholdings have on the number of items disclosed, which supports our main results. Second, we examine the likelihood of conference calls hosted by management. Conference calls allow managers to build a narrative for firm performance and outlook complementing quantitative guidance. Qualitative information can provide incremental information to investors (Arslan-Ayaydin et al., 2016; Cho et al., 2010, 2012). We find that blockholdings reduce a firm's propensity to host conference calls. Third, we follow Guay et al. (2016), Segal and Segal (2016), Bourveau et al. (2018), Cadman et al. (2019), and Bao et al. (2019) and use the number of 8-K filings to measure voluntary disclosure. We confirm that higher blockholdings reduce the number of voluntary 8-K filings. Thus, our conclusions are not affected by the choice of voluntary disclosure measure.

We address the endogeneity concern in six ways. First, we control for time-invariant unobserved firm characteristics by controlling for firm-fixed effects. Second, we build on the psychology literature documenting that busyness harms performance (Fich & Shivdasani, 2006; Gunny & Hermis, 2020; López & Peters, 2012; Tanyi & Smith, 2015). We exploit this feature and argue that managers are particularly busy close to the fiscal year-end as their attention is devoted to preparing and assessing the accuracy of the annual statements. 10-K filings and annual reports need to be audited and are more comprehensive in contrast to 10-Qs, which are unaudited and shorter. Limited managerial time and resources close to fiscal year-end means managers are less able to respond to blockholders pressure for private communication, thus the blockholder effect on voluntary disclosure should be weaker around fiscal year-end. We use this exogenous variation in *managerial ability* to respond to blockholders to contrast the disclosure effect of blockholders in the fourth compared to the other three fiscal quarters. Consistent with our prediction, the blockholder effect is weaker in the fourth quarter.

Third, we use cross-sectional variation in *managerial incentives* to respond to blockholder pressure as identification. Specifically, we argue that analysts use public guidance to improve the quality and informativeness of their reports and are more likely to follow companies that provide guidance (Feng & McVay, 2010; Givoly & Lakonishok, 1979; Lys & Sohn, 1990; Stickel, 1991). Managers may be reluctant to cut guidance if this will negatively affect their relationship with analysts and risk losing coverage. Thus, the blockholder effect on voluntary disclosure should be weaker in the presence of analyst coverage, a result we confirm. Fourth, we expect blockholders' incentives to monitor and gain private information to reduce with portfolio diversification. This effect is driven by limited blockholder ability to monitor an increasing number of securities in a portfolio and a comparatively lower effect idiosyncratic shocks have on wealth (Faccio et al., 2011). Consistently, we find a diminishing effect of blockholdings on voluntary disclosure as blockholders' portfolio diversification increases. Fifth, our results could capture the reverse association between voluntary disclosure where blockholders choose to invest in infrequent voluntary disclosure firms. To address this concern, we first run a Granger-type lead-lag approach test similar to Ajinkya et al. (2005) which rejects this prediction.

Finally, we use an instrumental variable approach to address the endogeneity concern. We make use of the Russell index assignments and use the inclusion into the Russell 3000 index as an instrument for blockholding.[3] A stock addition to the index generates an exogenous change to

[3]Our instrumental variable estimation is similar to Appel et al. (2016). The main difference is that Appel et al. (2016) use the reconstitution of Russell indices as an exogenous variation to passive ownership, and our paper uses addition to

blockholdings through an increase in the number of institutional investors holding the stock and a decrease in institutional blockholding after conditioning on the total institutional ownership (Appel et al., 2016; Boone & White, 2015). Because index assignment is determined by an arbitrary rule on the market capitalization of the 3,000th largest firm, the variation in blockholder ownership prompted by the index inclusion is plausibly exogenous, after conditioning on the firms' market capitalization, which helps the identification. The instrumental variable estimation confirms our main result.

Our final tests examine the two channels through which blockholding can affect voluntary disclosure. First, we argue that blockholders substitute private for public information acquisition. Obtaining private information is less costly if blockholders hold board seats (Cohen et al., 2008). Consistently, we find that the effect we document is stronger when blockholders hold board seats. To sharpen this analysis, we also count the number of board seats by blockholders and find that a larger presence on the board has an incrementally stronger negative effect on the propensity to provide management forecasts. This result reflects that the likelihood of private information acquisition increases with the number of potential interactions with managers (Hermalin & Weisbach, 1998; Raheja, 2005; Song & Thakor, 2006).

To test the prediction that an increasing proportion of non-monitoring blockholders reduces managerial incentives to provide voluntary disclosure, the *non-monitoring blockholder* hypothesis, we exploit heterogeneity in blockholder composition to examine the effect among blockholders with higher monitoring costs. Almazan et al. (2005) argue that passive institutional investors have higher monitoring costs as their low fee structure limits their ability to attract skilled managers and devote resources to active monitoring. Using mutual fund classification, we classify firms as either passive or active to identify funds with different monitoring costs and incentives.[4] Regression results confirm the negative effect of passive mutual funds on voluntary disclosure is higher compared to active mutual funds. This result is consistent with the prediction that when block ownership by investors with low monitoring incentives increases, managers have less incentive to engage in costly voluntary public disclosure.

Our study offers an important contribution to the accounting literature. We document a significant negative effect institutional blockholdings have on voluntary disclosure, which contrasts the positive association between average institutional ownership and the likelihood of managerial forecasts documented in earlier research (Ajinkya et al., 2005; Basu et al., 2019; Boone & White, 2015; Bushee et al., 2003; Bushee & Noe, 2000; Healy et al., 1999; Karamanou & Vafeas, 2005 and Abramova et al., 2017). As the proportion of stocks with at least one institutional blockholder reached 79% in 2015, our results identify an important institutional factor shaping today's corporate disclosure. Our results complement several literature streams. We expand the evidence on the association between family ownership and firm's disclosure (Ali et al., 2007; Chen, Chen, et al., 2008) and firm's ownership structure and disclosures in annual reports (Garcia-Meca & Sanchez-Ballesta, 2010). Further, our results complement research that shows that the likelihood of managerial forecasts increases with demand for information by other external parties, such as analysts and independent boards (Ajinkya et al., 2005; Chapman & Green, 2018; Karamanou & Vafeas, 2005). The study also adds to the growing literature on the effects blockholders have in capital markets (Bertrand & Mullainathan, 2000; Bhojraj & Sengupta, 2003; Brav et al., 2008; Faccio et al., 2011; Fich et al., 2015).

Russell 3000 index to induce an exogenous variation in institutional blockholding. A discussion of different approaches using Russell index assignments for identification can be found in Appel et al. (2020).

[4]The alternative way to classify passive institutions would be Bushee's (1998) classification of quasi-indexers. We use mutual fund classification because Bushee's (1998) classification of quasi-indexers includes not only pure index-tracking passive institutions, but also actively managed institutions whose portfolio holdings mimic a passive institution. These institutions may be quite active in governance and demand information in different ways from index-tracking institutions.

Importantly, we identify two channels through which blockholders affect voluntary disclosure – private for public substitution and inactive monitoring by passive blockholders. We find support for both channels affecting voluntary disclosure, which advances the knowledge of how a firm's information environment develops.[5] Our paper also complements Boone and White (2015), who find that passive institutional ownership promotes more voluntary disclosure. We show that when passive institutional ownership is concentrated, as captured by passive mutual funds holdings, the effect on voluntary disclosure is negative.

2. Previous Literature

The primary focus of our analysis is on institutional blockholders as previous studies suggest they can exert substantial pressure on managers. Brav et al. (2008) find that hedge fund blockholdings lead to higher returns and operating performance. Faccio et al. (2011) report that firms with diversified large shareholders undertake riskier investments. Bertrand and Mullainathan (2000) document that firms with more blockholders can better distinguish between a CEO's effort and luck. Fich et al. (2015) find that acquisitions where targets have significant blockholding have higher completion rates, higher premiums, and lower acquirer returns. Bhojraj and Sengupta (2003) report that bond ratings have a negative association with average institutional ownership, but a positive association with ownership concentration.

Blockholders can influence managerial behavior through direct intervention within a firm, for example, they can submit a public shareholder proposal suggesting a desired course of action, and by privately pressuring managers (Admati et al., 1994; Gillan & Starks, 1998; Grossman & Hart, 1980; Kahn & Winton, 1998; Karpoff, 2001; Shleifer & Vishny, 1986). They can also vote against directors if the firm's actions do not align with blockholders expectations. Further, blockholders can trade in the company's shares and their trades can exert downward stock price pressure hurting managerial wealth and position. Consistently, Parrino et al. (2003), Gopalan (2008), Gallagher et al. (2013), Chen and Swan (2011) and Bharath et al. (2013) find that institutional stock sales significantly increase the probability of forced CEO turnover. Large institutional owners with common ownership in competing firms may also reduce product market competition (Azar et al., 2018). We expect that managers will adjust the firm's voluntary disclosure policy to conform to the informational needs of blockholders because blockholders can more directly affect managerial behavior compared to non-blockholders.

Blockholders can also affect firm's voluntary disclosure because of their low demand for information. Bebchuk and Hirst (2019) argue that passive blockholders do not actively engage in monitoring behavior, but instead are more deferential to management, thus associate with reduced managerial oversight. Heath et al. (2020) show that index funds are less-effective monitors than actively managed funds. Low monitoring incentives should associate with low information demand, which in turn can reduce managerial incentives to provide costly voluntary disclosure.

Our study builds on the literature that examines the association between the firm's ownership structure and annual report disclosures. A meta-analysis in Garcia-Meca and Sanchez-Ballesta (2010) highlights substantial variations in previous findings: 7 out of 18 studies they review find

[5]Our evidence on private communication between managers and large investors is consistent with anecdotal evidence. For example, Fortune (2016) article 'Why Big Investors Like to Meet Privately With CEOs' highlights that 'Tech billionaire Elon Musk's acknowledgement that, over the years, he had 'bandied about' with some of his biggest shareholders the idea of combining Tesla Motors (TSLA) and SolarCity (SCTY) is rare public recognition of the access and insights large investors get.' And that 'Big investors, through their private meetings with company bosses, get insights that can give them an advantage over smaller shareholders.'

no significant association between ownership concentration and the annual report content and three studies report a positive correlation.[6] A potential reason for these mixed findings is that studies that look at firm choices within an annual report suffer from an identification problem as they cannot clearly delineate between the mandatory and voluntary components of an annual report as there is no template on what a standard report should include. Thus, differences in content and presentation do not necessarily capture differences in type and informativeness of reports but may reflect presentational choices (e.g., studies often score longer reports as of better quality) and corporate marketing preferences (e.g., some studies score higher annual reports that include the photo of the CEO). There is no such ambiguity in our setting that focuses on voluntary disclosure as the benchmark case is clear – no guidance, thus we can more confidently identify the impact ownership composition has on voluntary disclosure.

Further, we build on the literature that examines the association between family ownership and firm corporate communication. Ali et al. (2007) examine 177 family firms that are S&P500 constituents between 1998 and 2002, defined as firms where members of the founding family hold positions in top management, are on the board, or are blockholders. They find family firms have a similar unconditional propensity to issue management forecasts as non-family firms. Chen, Chen, et al. (2008) report that controlling for average institutional ownership, concentrated institutional ownership does not affect the likelihood of management forecasts in family firms that are part of S&P1500 between 1996 and 2000.[7]

In contrast to previous studies that center on disclosures in annual reports, we focus on voluntary disclosure because it is an important component of the firm's corporate communication (Healy & Palepu, 2001), and it is a channel through which managers communicate their private information (Coller & Yohn, 1997; Hirst et al., 2008; Wang et al., 2013). Beyer et al. (2010) find that management forecasts account for most of the quarterly return variance compared to earnings announcements, earnings pre-announcements, analyst forecasts, and SEC filings. Studies document a significant association between voluntary communication and information asymmetry (Coller & Yohn, 1997; Diamond & Verrecchia, 1991; Williams, 1996), share price performance (Graham et al., 2005; Haggard et al., 2008), litigation risk (Kasznik, 1999; Soffer et al., 2000), cost of capital (Botosan, 1997), and analyst coverage (Healy et al., 1999). We measure voluntary disclosure by the propensity to issue management forecasts and comprehensiveness of forecasts, which captures the number of forecasted items. In sensitivity tests, we also examine the firm's propensity to host conference calls and to file voluntary 8-K filings because guidance can reflect other considerations than disseminating private information, such as expectations management (Bartov et al., 2002; Matsumoto, 2002; Richardson et al., 2004).[8]

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[6]The studies reviewed in Garcia-Meca and Sanchez-Ballesta (2010) examine the association between firm ownership and (1) disclosure quality in annual reports (Adams & Hossain, 1998; Adrem, 1999; Chau & Gray, 2002; Hannifa & Cooke, 2002; Barako, Hancock, & Izan, 2006, Eng and Mak, 2003; Hossain, Tan, & Adams, 1994; Lakhal, 2005; Lim, Matolcsy, & Chow, 2007; Mangena & Tauringana, 2007; Patelli & Prencipe, 2007, Raffournier, 1995; Patelli & Prencipe, 2007; Raffournier, 1995), (2) annual report environmental disclosure (Brammer & Pavelin, 2006; Cormier, Magnan, & Van Velthoven, 2005), (3) intellectual capital disclosures in the annual report (Cerbioni & Parbonetti, 2007; Li, Pike, & Hannifa, 2008), (4) oil and gas reserves disclosure in the annual report (Craswell & Taylor, 1992), and (5) segment information disclosures in the annual report (McKinnon & Dalimunthe, 1993; Mitchell, Chia, & Loh, 1995). Thus, they focus on only one form of corporate communication, the annual report.

[7]Chen, Doogar, et al. (2008, p. 503) highlight that 'in our sample, family firms have lower institutional holdings, lower analyst coverage, and fewer issuances of public debt and equity than other firms.' Thus, at low levels of institutional holdings, institutional ownership concertation may not associate with voluntary disclosure. This result points to family firms being different from other firms with concentrated holdings, which further motivates our study.

[8]Managers have been called to stop providing guidance (CFA Institute 2006, U.S. Chamber of Commerce 2007) to avoid myopic behavior related to meeting earnings benchmarks, such as boosting short-term profitability (Fuller & Jensen, 2002; Jensen et al., 2004; Chen et al., 2011).

Our paper also relates to recent literature on the monitoring role of passive investors. Our evidence on passive blockholders' low demand for voluntary public disclosure is consistent with Schmidt and Fahlenbrach (2017), who question the monitoring role of passive investors documented in Appel et al. (2016). Specifically, Schmidt and Fahlenbrach (2017) report that exogenous increases in passive ownership reduce the quality of the firm's corporate governance and promote mergers and acquisitions with poorer outcomes. Schmidt and Fahlenbrach (2017, p. 301) argue that 'passive institutional investors may not have the capacity for high-cost governance activities that require continuous monitoring such as, for example, the M&A activity of corporations,' though they can engage in 'low-cost governance activities such as consistently voting according to a pre-defined program at annual meetings or endorsing the removal of poison pills and staggered boards' as in Appel et al. (2016). Almazan et al. (2005) also highlight that passive institutional investors have higher monitoring costs as their low fee structure limits their ability to attract skilled managers and devote resources to active monitoring. Limited monitoring activity is consistent with low information demand.

Previous studies such as Ajinkya et al. (2005) and Bushee and Noe (2000) also examine the relation between institutional investors, ownership concentration and voluntary disclosures, but our paper differs from them in important ways. Ajinkya et al. (2005) study the association between properties of management forecasts and outside directors and average institutional ownership between 1997 and 2002. Thus, their focus is different from ours. As part of their sensitivity tests, they include an interaction between ownership concentration and Regulation Fair Disclosure (Reg FD) indicator to test the effect this regulation had on voluntary disclosure by various institutional investor groups. Because they do not report an average effect ownership concentration has on the propensity to issue management forecasts, it is impossible to make directional conclusions based on their analysis. Further, they do not include an interaction between average institutional ownership and reg FD indicator and the effect of ownership concentration in post-reg FD setting can be driven by an association between non-blockholders and guidance. Thus, their results do not answer if and, importantly, why ownership concentration associates on average with lower voluntary disclosure. This further motivates our focused analysis on the association between blockholdings and voluntary disclosure.

Bushee and Noe (2000) study how a firms' corporate disclosure, as captured by the Association for Investment Management and Research (AIMR) ratings, affects institutional holdings. They report that transient and quasi-indexers invest more in firms with higher disclosure ratings, whereas dedicated investors show no sensitivity to disclosure rating levels or changes. Thus, their focus and findings are different from ours and their research design that relies on AIMR ranking does not speak to the extent voluntary disclosure affect institutional ownership as it combines scores of (1) annual report/10-K disclosures, (2) interim report/10-Q disclosures, and (3) investor relations activities. Also, in contrast to Bushee and Noe (2000) finding that quasi-indexers favor companies with higher disclosure, we show that quasi-indexer investors have a negative effect on voluntary disclosure when they become blockholders in a firm.

3. Data and Research Design

The starting point of our sample are institutional 13-F holdings reported between 2001 and 2015, which we merge with quarterly management forecast data from the I/B/E/S Guidance database. We use Compustat, CRSP and BoardEx to obtain accounting, market, and corporate governance data to create control variables. The resulting sample for our baseline analysis consists of 104,765 firm-year-quarters.

3.1. Research Methods

We estimate the effect of the cumulative institutional blockholder ownership on firm voluntary disclosure using the following logit model

$$P(MF\_occur_{it+1}) = \alpha_0 + \alpha_1 Block_{it} + \alpha_2 IO_{it} + B\text{Controls}_{it} + \omega_i + \tau_t + \varepsilon_{it} \quad (1)$$

where MF_occur_{it+1} is an indicator variable equal to 1 if firm i issued any management forecast during a calendar quarter $t+1$, and 0 otherwise. We follow Brickley et al. (1988), Agrawal and Mandelker (1990), and Baysinger et al. (1991) and define blockholdings, $Block_{it}$, as the cumulative holdings by institutional blockholders. We define institutional blockholders as institutional investors who hold at least 5% of the firm's outstanding common shares.[9] IO_{it} is the percentage of institutional ownership, and captures the effect of non-blockholding institutional investors. Including a measure of institutional blockholdings together with a measure of total institutional holdings disaggregates total institutional ownership into blockholdings and non-blockholding (i.e., diversified ownership). Thus, the coefficient on blockholdings captures how a higher proportion of blockholdings in total ownership affects a firm's voluntary disclosure. $Controls_{it}$ is a vector of control variables. ω_i are industry dummies based on 2-digit SIC code classification, and τ_t are 56 quarter-year time dummies. ε_{it} represents the error term. Standard errors are clustered at the firm level.

MF_occur_{it+1} does not distinguish between firms that provide single vs. multiple forecasts. A single forecast may reflect managerial opportunism rather than a deliberate strategy to disclose private information (Ajinkya et al., 2005). We expect that blockholdings will affect both the propensity to report forecasts and the number of forecasted items. To capture the latter effect, we define comprehensiveness of guidance, MF_items_{it}, which measures the number of items disclosed in management forecasts during a calendar quarter. Although earnings per share (EPS) is the most common item provided in management forecasts, managers frequently disclosed other forecasts such as revenue and cash flows (Chen, Doogar, et al., 2008; Han & Wild, 1991; Hirst et al., 2008; Lansford et al., 2013). Since MF_items_{it} is a count variable, we use Poisson regression to estimate model (1) when MF_items_{it} is the dependent variable.

We follow prior literature on voluntary disclosure to include control variables that might influence firms' management forecast decisions (Ajinkya et al., 2005; Boone & White, 2015; Bushee & Noe, 2000; Chapman & Green, 2018; Karamanou & Vafeas, 2005). These include firms' market value of equity, leverage ratio, market to book ratio, return on assets, stock return during the quarter, stock return volatility, special items, changes in earnings per share, the number of analysts following a firm, board size, board independence, CEO turnover, and business complexity. We winsorize all continuous variables at 0.1% and 99.9% percentiles. The definitions of all variables can be found in Appendix A.

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[9]We follow previous literature in using 5% as the cut-off to identify blockholdings (Shleifer & Vishny, 1986; Chen et al., 2007; Kang et al., 2018). The literature typically defines a blockholder as a 5% shareholder because this level triggers disclosure requirements in the United States (Edmans, 2014). Our conclusions are robust to using other cut-offs. Our measure of blockholdings has important advantage over Bushee (1998) and Bushee and Noe (2000) classification of institutional investors into transient, quasi-indexers and dedicated. Specifically, we use a more granular measure of ownership concentration that is calculated at the firm level, which helps with a clear identification of the association between blockholdings in a firm and that firm's voluntary disclosure. Bushee (1998, p. 316) calculate percentage ownership by the three groups of institutions using 'factor analysis and cluster analysis to assign institutions into groups based on their past investment behavior.' Thus, a dedicated investor may not necessarily be considered a blockholder for a particular firm. Thus, conceptually, our approach is more sound than using Bushee's classification to address our research question.

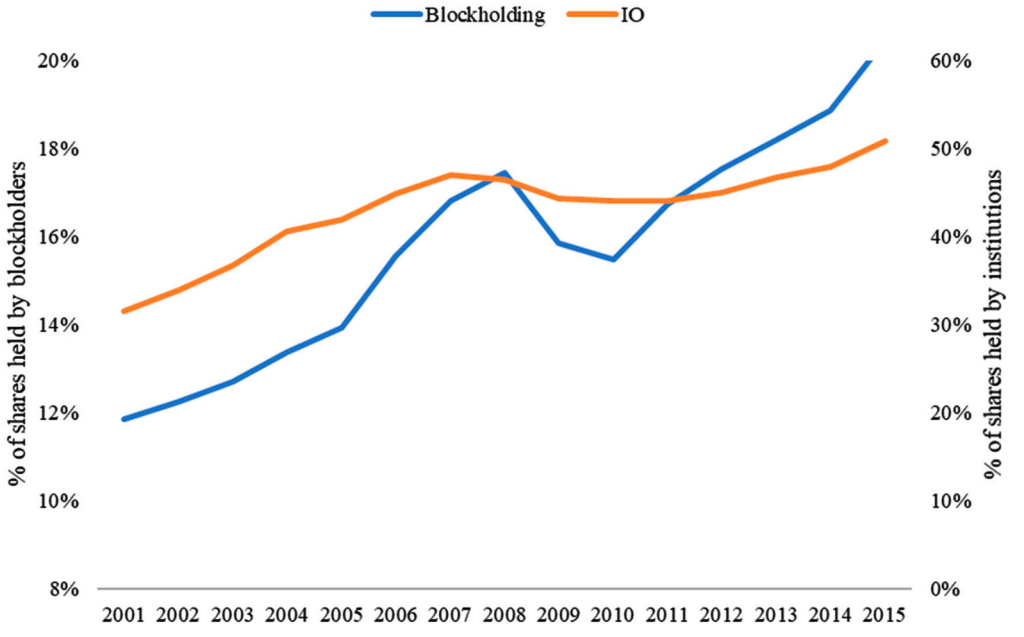

Figure 1. Average annual ownership by institutional blockholders and institutional investors. Blockholders are defined as investors holding a minimum of 5% of the firm's stock

4. Institutional Blockholdings and Voluntary Disclosure: Empirical Analysis

4.1. Descriptive Evidence

Our first test looks at the prevalence of institutional block ownership to establish the importance of the effect we examine. If block ownership is sparse, it is hard to argue it will have an economically meaningful effect on voluntary disclosure. Figure 1 reports that the average proportion of shares held by institutional blockholders almost doubles over the sample period, increasing from 12% in 2001 to 20% in 2015. Thus, a considerable proportion of outstanding equity is held by institutional blockholders in recent years. For comparison, we present the percentage of institutional holdings, which increase from 32% in 2001 to 51% in 2015, a 59% increase. This evidence suggests a faster pace with which blockholders' ownership increases over our sample period compared to the growth in average institutional ownership.

To sharpen the analysis, Figure 2 presents the proportion of firms with at least one blockholder. We run this test because blockholdings may concentrate in a few stocks limiting the generalizability of the effect we study. The proportion of firms with at least one blockholder increases from 60% in 2001 to 79% in 2015. Thus, in recent years, most firms have institutional blockholder ownership. Jointly, Figures 1 and 2 suggest institutional blockholding is a staple element of the ownership structure, which justifies the need to examine its effects on corporate disclosure.

Table 1 Panel A presents descriptive statistics for variables from equation (1). On average 49.9% of firms provide quarterly forecasts with an average of 2.403 items disclosed by managers. Institutional investors hold on average 58.3% of shares in sample firms with 18.8% of shares held by blockholders. Our descriptive statistics are comparable with Boone and White (2015), who report an average institutional ownership of 43.5% for Russell 1000 stocks over the period 1996–2006 and that 40.4% of firms in their sample issued management guidance.

Panel B of Table 1 reports the descriptive statistics by terciles of block ownership and the last column reports the difference in means between the high and low terciles. Firms with high block

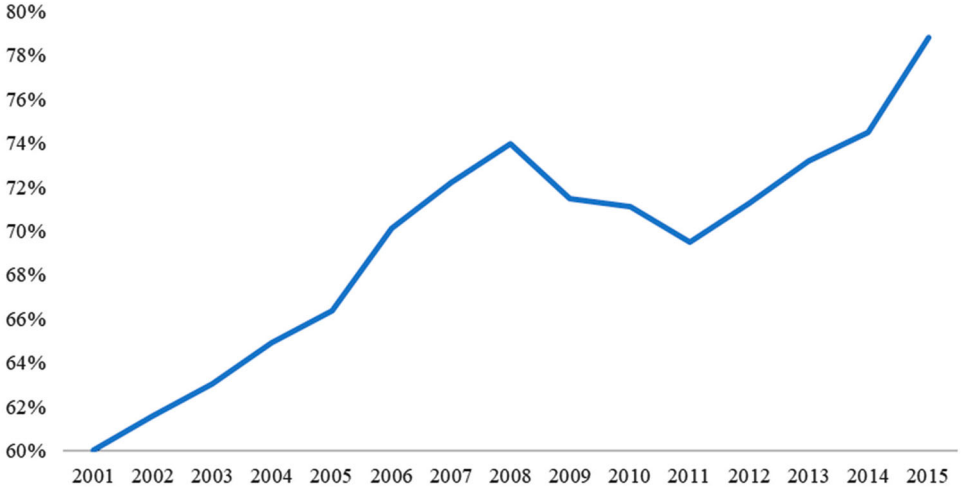

Figure 2. The annual proportion of firms with at least one institutional blockholder over the period 2001–2015

ownership have a higher level of institutional ownership, firm size, leverage, return on asset, analyst coverage, board size, board independence, and CEO turnover compared to firms with low block ownership. They also have a lower market to book ratio, special items, stock returns, volatility and segment income diversification. These results suggest that firms with higher blockholdings are unlikely to be distressed or of, broadly defined, 'lower quality,' which could explain their lower propensity to issue management guidance.

Panel C reports Pearson correlations between *MF_occur* and average institutional holdings, *IO*, and average blockholdings, *Block*. Because *IO* and *Block* are highly correlated, we report the correlations for *IO* quartiles. For each quartile, we find a consistent positive correlation between *IO* and the indicator variable for management guidance. In contrast, blockholdings have a consistent negative association with the indicator for management guidance. These results provide preliminary support for our hypothesis. Panel D reports correlations between the control variables, which are consistent with earlier evidence (e.g., Boone & White, 2015; Bushee & Noe, 2000).

4.2. Institutional Blockholders and Management Forecasts

Panel A of Table 2 shows the regression results for equation (1). Model (1) reports logit regression results that exclude blockholdings to estimate the average effect institutional holdings have on the occurrence of management forecasts. We confirm earlier findings that higher institutional ownership is associated with a higher likelihood of management forecasts (Ajinkya et al., 2005; Boone & White, 2015; Bushee & Noe, 2000). The economic magnitude of the institutional ownership effect is comparable with earlier studies. Ajinkya et al. (2005) report that a one standard deviation increase in institutional ownership associates with a 22% increase in the likelihood of managerial guidance, which compares with our evidence of a 21% likelihood increase.

Model (2) reports the full specification of equation (1) and we find a negative and economically significant effect of blockholdings on the propensity to report management guidance: a one standard deviation increase in blockholdings reduces the likelihood of guidance by 17%. Including a measure of concentrated institutional ownership with average institutional holdings means the latter captures the effect of institutional non-blockholdings. Model (2) confirms that the positive relation between average institutional holdings and the likelihood of guidance in Model (1)

Table 1. Summary statistics

Variable	Mean	Std. Dev.	Q1	Median	Q3
Panel A: Full sample results					
Dependent variables					
MF_occur	0.499	0.500	0.000	0.000	1.000
MF_items	2.403	1.708	1.000	2.000	3.000
Ownership variables					
IO	0.583	0.304	0.331	0.647	0.843
Block	0.188	0.148	0.065	0.175	0.286
HHI	2.515	1.814	1.127	2.303	3.606
Controls					
Size	6.271	2.016	4.852	6.252	7.618
MTB	1.967	1.657	1.106	1.469	2.199
Lev	0.203	0.219	0.010	0.157	0.315
ROA	− 0.005	0.081	− 0.004	0.009	0.020
Special	− 0.004	0.035	− 0.001	0.000	0.000
ΔEPS	0.003	0.153	− 0.007	0.000	0.007
Ret	0.041	0.285	− 0.103	0.020	0.146
σRet	0.110	0.102	0.049	0.084	0.140
Analyst	1.558	1.017	0.693	1.609	2.398
Boardsize	1.901	0.389	1.609	1.946	2.197
Boardindep	0.809	0.155	0.714	0.833	0.909
CEOturnover	0.036	0.186	0.000	0.000	0.000
Complexity	0.744	0.286	0.500	0.885	1.000

	Blockholder groups			
	Low Mean	Medium Mean	High Mean	Difference in means High vs. Low
Panel B: Summary statistics for terciles of blockholdings				
IO	0.317	0.572	0.799	0.482***
HHI	0.745	1.884	4.413	3.669***
Size	5.745	6.497	6.431	0.686***
MTB	2.153	1.953	1.814	− 0.338***
Lev	0.199	0.198	0.212	0.013***
ROA	− 0.018	0.000	0.000	0.018***
Special	− 0.004	− 0.003	− 0.005	− 0.001**
ΔEPS	0.004	0.002	0.003	− 0.001
Ret	0.051	0.046	0.025	− 0.026***
σRet	0.122	0.107	0.105	− 0.017***
Analysts	1.227	1.639	1.718	0.491***
Boardsize	1.835	1.919	1.932	0.096***
Boardindep	0.799	0.809	0.815	0.016***
CEOturnover	0.033	0.036	0.037	0.004***
Complexity	0.758	0.726	0.748	− 0.010***
N	34,922	34,922	34,921	

	Low IO		2		3		High IO	
	MF_occur	IO	MF_occur	IO	MF_occur	IO	MF_occur	IO
Panel C: Pearson correlation between MF_occur and IO and Block for quartiles of IO								
IO	0.054		0.179		0.071		0.021	
	(0.000)		(0.000)		(0.000)		(0.001)	
Block	− 0.048	0.660	− 0.172	0.172	− 0.161	0.132	− 0.092	0.301
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

(*Continued.*)

Table 1. Continued.

		MF_occurr	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
Panel D: Pearson correlations between control variables														
I.	Size	0.407												
		(0.000)												
II.	MTB	−0.035	0.096											
		(0.000)	(0.000)											
III.	Lev	0.037	0.087	−0.074										
		(0.000)	(0.000)	(0.000)										
IV.	ROA	0.146	0.238	−0.263	−0.060									
		(0.000)	(0.000)	(0.000)	(0.000)									
V.	Special	−0.002	0.056	0.006	−0.028	0.515								
		(0.573)	(0.000)	(0.052)	(0.000)	(0.000)								
VI.	ΔEPS	−0.005	−0.023	−0.008	0.015	0.189	0.267							
		(0.116)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)							
VII.	Ret	−0.015	0.051	0.149	−0.004	0.067	0.074	0.032						
		(0.000)	(0.000)	(0.000)	(0.157)	(0.000)	(0.000)	(0.000)						
VIII.	σRet	−0.105	−0.277	0.091	0.025	−0.202	−0.080	0.033	0.278					
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
IX.	Analyst	0.474	0.816	0.046	0.075	0.164	0.016	−0.013	−0.030	−0.185				
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
X.	Boardsize	0.257	0.549	−0.123	0.156	0.100	0.010	−0.003	−0.016	−0.170	0.447			
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.380)	(0.000)	(0.000)	(0.000)			
XI.	Boardindep	0.049	0.007	0.038	−0.037	−0.001	0.007	−0.001	−0.012	−0.015	0.028	−0.219		
		(0.000)	(0.026)	(0.000)	(0.000)	(0.640)	(0.036)	(0.724)	(0.000)	(0.000)	(0.000)	(0.000)		
XII.	CEOturnover	0.020	0.026	−0.020	0.002	−0.019	−0.024	0.005	−0.020	0.008	0.029	0.057	0.000	
		(0.000)	(0.000)	(0.000)	(0.444)	(0.000)	(0.000)	(0.125)	(0.000)	(0.011)	(0.000)	(0.000)	(0.889)	
XIII.	Complexity	−0.096	−0.222	0.140	−0.054	−0.040	−0.003	0.001	0.005	0.091	−0.111	−0.238	0.005	−0.016
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.354)	(0.727)	(0.120)	(0.000)	(0.000)	(0.000)	(0.110)	(0.000)

Note: The table reports summary statistics for the variables used in our main tests. The sample consists of 104,765 firm-year-quarter observations from 2001 to 2015. Panel A presents the summary statistics for the full sample. Panel B presents the summary statistics by terciles of block ownership. Panel C reports Pearson correlation between the indicator for management guidance and average institutional ownership and average blockholdings for quartiles of institutional ownership. Panel D reports Pearson correlations between control variables.

Table 2. Institutional blockholders and management forecasts

	(1)			(2)			(3)	
	Without controlling for blockholdings			Full model			#of forecasted items	
	Estimate	ME	*p*-value	Estimate	ME	*p*-value	Estimate	*p*-value
Panel A: Blockholdings and management guidance								
Block				−0.999	−16.6%	0.000	−0.278	0.000
IO	1.244	20.7%	0.000	1.722	28.5%	0.000	0.246	0.000
Size	0.080	1.3%	0.007	0.052	0.9%	0.078	0.023	0.022
MTB	−0.066	−1.1%	0.002	−0.068	−1.1%	0.002	0.000	0.978
Lev	0.392	6.5%	0.007	0.412	6.8%	0.004	0.094	0.023
ROA	3.766	62.6%	0.000	3.570	59.2%	0.000	0.812	0.000
Special	−4.152	−69.0%	0.000	−3.987	−66.1%	0.000	−0.843	0.000
ΔEPS	−0.065	−1.1%	0.231	−0.055	−0.9%	0.298	−0.051	0.051
Ret	0.142	2.4%	0.000	0.139	2.3%	0.000	0.030	0.060
σRet	0.152	2.5%	0.261	0.150	2.5%	0.264	−0.080	0.134
Analyst	0.780	13.2%	0.000	0.774	12.8%	0.000	0.103	0.000
Boardsize	0.411	6.8%	0.000	0.416	6.9%	0.000	−0.007	0.807
Boardindep	0.395	6.6%	0.018	0.378	6.3%	0.023	0.091	0.091
CEOturnover	−0.142	−2.4%	0.003	−0.141	−2.3%	0.003	0.008	0.635
Complexity	−0.120	−2.0%	0.240	−0.107	−1.8%	0.294	−0.078	0.015
Year∗quarter effects	Yes			Yes			Yes	
Industry effect	Yes			Yes			Yes	
N	104,765			104,765			52,283	
Pseudo R^2	0.274			0.275			0.034	

	(1) Regression in changes		(2) Fixed effects	
	Estimate	*p*-value	Estimate	*p*-value
Panel B: Regression with changes in block ownership and with firm-fixed effects				
ΔBlock	−0.235	0.052		
Block			−0.029	0.051
IO	1.238	0.000	0.028	0.017
Controls	Yes		Yes	
Year∗quarter effects	Yes		Yes	
Industry effects	Yes		No	
Firm-fixed effects	No		Yes	
N	104,765		104,765	
Pseudo R^2/R^2	0.271		0.573	

	(1)			(2)		(3)	
	Herfindahl index to capture blockholdings					Number of blockholders	
	Estimate	ME	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Panel C: The Herfindahl index of ownership concentration and the number of blockholders							
HHI	−0.112	−1.9%	0.000	−0.007	0.000		
#blockholders						−0.036	0.028
IO	1.903	31.5%	0.000	0.058	0.000	1.447	0.000

(*Continued*).

is driven by institutional non-blockholdings. The signs of the coefficients on the control variable are in line with earlier studies (Basu et al., 2019; Boone & White, 2015; Karamanou & Vafeas, 2005).[10]

[10]Because some of the control variables could potentially be outcomes of blockholdings, in untabulated results, we repeated equation (1) with only *Block*, *IO* and fixed effects on the right-hand-side and find consistent evidence.

Table 2. Continued.

	(1)			(2)		(3)	
	Herfindahl index to capture blockholdings					Number of blockholders	
	Estimate	ME	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Controls	Yes			Yes		Yes	
Year∗quarter effects	Yes			Yes		Yes	
Industry effects	Yes			No		Yes	
Firm-fixed effects	No			Yes		No	
N	104,765			104,765		104,765	
Pseudo R^2/R^2	0.276			0.573		0.274	

Note: The table presents regression results for the effect of institutional blockholding on management guidance. **Block** is the total ownership of institutional blockholders where blockholders are defined as holding at least 5% of ordinary shares outstanding. **HHI** is the ownership concentration of institutional investors measured by the Herfindahl index multiplied by 100. **#blockholders** is the number of blockholders. Panel A reports results for equation (1) where the dependent variable is either an indicator variable for whether a firm issued guidance in the next quarter or the number of forecasted items. Panel B reports results for regressions with changes in block ownership and with firm-fixed effects. Panel C reports results where we measure ownership concentration by the Herfindahl index and the number of blockholders. We use the logistic model to estimate models (1)-(2) in Panel A, model (1) in Panel B and models (1) and (2) in Panel C. We use Poisson regression to estimate model (3) in Panel A. We use OLS linear regressions to estimate model (2) in Panels B and C. Standard errors are clustered at the firm level. We report Pseudo R^2 for logit and Poisson regressions and R^2 for OLS.

Our conclusions could be affected by infrequent opportunistic guidance where managers provide a single forecast that is easy to beat. To illustrate, Aboody and Kasznik (2000), Cheng and Lo (2006), and Nagar et al. (2003) report increased pessimistic guidance before option grant dates. Matsumoto (2002) and Richardson et al. (2004) document that managers use guidance to beat analyst quarterly earnings targets. To address this concern, we examine whether blockholdings affect the comprehensiveness of guidance measured by the number of forecasted items, *MF_items*. Model (3) in Panel A reports Poisson regression results where *MF_items* is the dependent variable in equation (1) and we find a negative association between blockholdings and the comprehensives of guidance.

The level of blockholdings can correlate with unobserved firm characteristics, which in turn can correlate with the likelihood of managerial guidance. To address this concern, we perform two tests. First, we examine the sensitivity of managerial guidance to *changes* in the level of blockholdings. Skinner (1996, p. 397) argues that 'changes regressions are less susceptible to correlated omitted variables problems.' Model (1) in Panel B of Table 2 includes the first difference in blockholdings, *ΔBlock*, as an explanatory variable instead of *Block*. We find a negative association between the likelihood of guidance and changes in blockholdings, a result consistent with our main findings. Further, we repeat equation (1) after including firm-fixed effects, which capture time-invariant unobserved firm characteristics. Because the Maximum Likelihood Estimation (MLE) used for the logit model may produce inconsistent estimates in the presence of fixed effects (Greene, 2004), we estimate equation (1) with firm-fixed effects using a linear regression. Model (2) in Panel B documents that controlling for firm-fixed effects leaves our conclusions unchanged.[11]

The 5% cut-off to define blockholdings is based on past literature, but is arbitrary, which is why we also measure concentrated holdings using the Herfindahl index of institutional ownership

[11]The results are similar if we use MLE to estimate the model with firm-fixed effects.

calculated as $HHI_{it} = \sum_{i=1}^{N} \left(\frac{\textit{shares held by institution } i}{\textit{total shares outstanding}} \right)^2 * 100$.[12] Model (1) in Panel C of Table 2 reports results for equation (1) where we use *HHI* instead of *Block*. We continue to find a negative association between ownership concentration and the likelihood of management forecasts: a one standard deviation increase in *HHI*∗100 lowers the likelihood of guidance by 1.9%.[13] Model (2) in Panel C repeats the regression with the Herfindahl index of institutional ownership after we control for firm-fixed effects and the conclusions are unchanged. Finally, we estimate equation (1) when we capture blockholdings by the number of blockholders in a firm, *#blockholders*. We find a negative association between the number of blockholders and the likelihood of managerial guidance. Jointly, Table 2 evidence suggests that when the institutional ownership shifts from dispersed to concentrated, firms decrease their propensity to communicate through management forecast.

In untabulated tests, we perform two additional tests. First, we use a dummy variable for whether there is at least one blockholder in a firm and find evidence similar to our main results. This further corroborates the conclusion that our results are not driven by a specific blockholder measures. Second, to understand the extent our results can be captured by Bushee's (1998) classification of institutional investors into dedicated, transient and quasi-indexers, we calculated the proportion of blockholdings (as we classify blockholders) held by dedicated investors (using Bushee's classification) and find this proportion is only 14%. Excluding these dedicated blockholders from the analysis produces a highly significant negative association between blockholdings and voluntary disclosure. These results suggest our findings generalize beyond the dedicated investor group suggesting higher generalizability of our conclusions.

4.3. Alternative Measures of Voluntary Disclosure

Management forecast is just one type of firms' voluntary disclosure. To ensure our conclusion is not driven by this specific measure of corporate disclosure, Table 3 repeats the analysis where we predict the likelihood of management conference calls and 8 K filings. Conference call data comes from Thomson Reuters Streetevents and starts in 2002. We code as 1 if a firm holds at least one conference call in quarter $t+1$, and 0 otherwise. The 8-K filing data comes from the SEC and starts in 2001. We count the number of voluntary 8-K filings for each firm-quarter. We follow prior literature and consider a filing to be voluntary if it is reported under the item labeled 'Other Events and Regulation FD' (He et al., 2019).

Figure 3 reports that the proportion of firms with conference calls is 13% in 2002 and increases to 67% in 2015. For comparison, Frankel et al. (1999) report that around 11% of firms held conference calls between February and November 1995, and Tasker (1998) finds that around 35% of firms hosted quarterly conference calls between March 1995 and February 1996. Chen, Doogar, et al. (2008) report that around 79% of S&P1500 firms had conference calls between 1996 and 2000. Figure 3 shows that the number of 8-K filings is 1.83 in 2001 and 2.29 in 2015. For comparison, He et al. (2019) report that the average number of voluntary filings is 2.78 for a sample of Compustat firms between 2005 and 2016.

Model (1) in Table 3 reports estimates for equation (1) where the dependent variable is an indicator whether a firm will host a conference call. Because we control for firm-fixed effects, we estimate the model using OLS, but the conclusions are the same when using MLE. Blockholdings reduce the probability of conference calls in contrast to the positive effect of non-blockholding

[12] Our conclusions remain robust to other cut-off points to define blockholdings such as 1% and 10%.

[13] Multiplying the Herfindahl index by 100 correspondingly reduces the magnitude of the coefficient on HHI. Unadjusted economic magnitude of HHI would be equivalent to 1.9%∗100 = 190%.

Table 3. Alternative measures of voluntary disclosure

	(1)		(2)	
	Conference calls		Voluntary 8-K filings	
	Estimate	*p*-value	Estimate	*p*-value
Block	− 0.037	0.000	− 0.061	0.005
IO	0.128	0.000	− 0.023	0.181
Controls	Yes		Yes	
Year∗quarter effects	Yes		Yes	
Firm-fixed effects	Yes		Yes	
N	103,206		104,765	
R^2	0.764		0.414	

Note: The table presents regression results using two other measures of voluntary disclosure. Column **Conference calls** reports results from an OLS model predicting the likelihood of conference calls. Column **Voluntary 8-K filings** reports results of an OLS regression measuring voluntary disclosure by the natural logarithm of one plus the number of voluntary 8-K filings in a quarter.

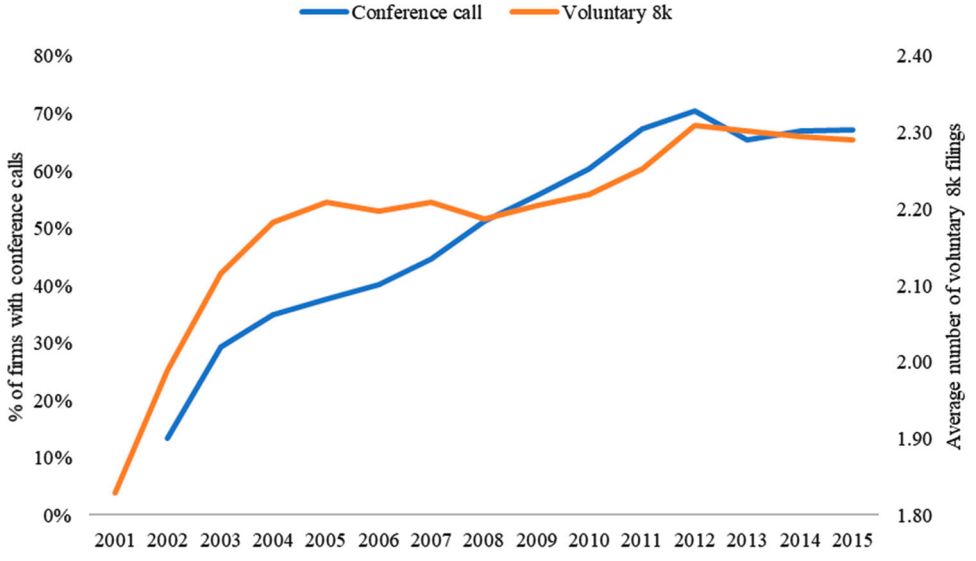

Figure 3. The annual proportion of firms hosting quarterly conference calls and providing voluntary 8 K filings. Conference call data starts in 2002

institutional ownership. Thus, the results using conference calls confirm our main conclusions. Model (2) repeats the analysis for voluntary 8-K filings and our conclusions for blockholdings are similar to our main results. Overall, Table 3 results show our conclusions are not driven by a specific measure of voluntary disclosure.

4.4. Endogeneity Concern

This section first presents tests that address the endogeneity concern that our results capture unobserved characteristics that correlate with both blockholdings and the frequency of management forecasts. Then we address the reverse causality concern.

To address endogeneity, first, we use cross-sectional variation in *managerial incentives* to respond to blockholder pressure in the presence of sell-side analysts. Specifically, we argue that

Table 4. Endogeneity concern

	(1)		(2)		(3)		(4)	
	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Block	− 2.579	0.000	− 1.085	0.000	− 0.967	0.000	− 0.648	0.000
Block∗Analyst	0.763	0.001						
Block∗Q4			0.354	0.000				
Q4			0.100	0.000				
Port_Num∗Block					0.004	0.015		
Port_Num					0.005	0.152		
MF_occur_t							3.122	0.000
IO∗Analyst	− 1.096	0.000						
IO	3.493	0.000	1.722	0.000	1.663	0.000	1.080	0.000
Controls	Yes		Yes		Yes		Yes	
Year∗quarter effect	Yes		Yes		Yes		Yes	
Industry effect	Yes		Yes		Yes		Yes	
N	104,765		104,765		104,765		104,765	
Pseudo R^2	0.280		0.276		0.276		0.489	

Note: The table presents regression results for the effect of institutional blockholding on management guidance. **Analyst** is the natural logarithm of 1 plus the number of analysts following a firm. **Q4** is an indicator variable for the fourth fiscal quarter. **Port_Num** is the average number of firms in blockholders' portfolios scaled by 100. **MF_occur_t** is past management guidance. Regressions are estimated using logistic regressions. Standard errors are clustered at the firm level.

analysts use public guidance to improve the quality and informativeness of their reports and are more likely to follow companies that provide forecasts (Feng & McVay, 2010; Givoly & Lakonishok, 1979; Lys & Sohn, 1990; Stickel, 1991). Managers may be reluctant to cut guidance, in response to blockholder pressure, if this will negatively affect their relationship with analysts and risk losing coverage. Thus, the blockholder effect on voluntary disclosure should be weaker in the presence of analyst coverage. Model (1) in Table 4 confirms that higher analyst coverage moderates the negative effect blockholding has on the likelihood of issuing management forecasts.

Second, we build on the psychology literature that documents a negative association between busyness and performance (Fich & Shivdasani, 2006; Gunny & Hermis, 2020; López & Peters, 2012; Tanyi & Smith, 2015). We exploit this feature and argue that managers are particularly busy close to the fiscal year-end as their attention is devoted to preparing and assessing the accuracy of the annual statements. In contrast to 10-Qs, which are unaudited and shorter, 10-K filings and annual reports need to be audited and are more comprehensive. Limited managerial time and resources close to fiscal year-end means managers are less able to respond to blockholders pressure for private communication, thus the blockholder effect on voluntary disclosure should be weaker around fiscal year-end. We use this exogenous variation in *managerial ability* to respond to blockholders to contrast the disclosure effect of blockholders in the fourth compared to the other three fiscal quarters. Specifically, we define *Q4* as an indicator variable equal to 1 for the fourth fiscal quarter and 0 otherwise. We then interact *Q4* with the measure of institutional blockholdings, *Block∗Q4*. This analysis is effectively a difference-in-differences regression where the treatment group is stocks with at least one blockholding and the control sample includes non-blockholding stocks. Model (2) in Table 4 reports the difference-in-differences regression results and we confirm the incrementally less negative effect of concentrated ownership on the propensity to issue guidance in the fourth quarter.

Third, we exploit heterogeneity within blockholders to identify instances where the blockholding effect on managers is likely to be stronger. Specifically, we argue that blockholders demand

for private communication reduces with the level of blockholder portfolio diversification. This effect is driven by limited blockholder ability to monitor an increasing number of securities in a portfolio and a comparatively lower effect of idiosyncratic shocks on wealth (Faccio et al., 2011). We use the number of firms held by each blockholder to measure their diversification and calculate the average institutional blockholders' portfolio diversification in each firm weighted by their percentage of ownership. Specifically, *Port_Num* is the average number of firms in each blockholders' portfolio scaled by 100. Consistently, Model (3) confirms a diminishing effect of blockholdings on voluntary disclosure as blockholders' portfolio diversification increases.

Fourth, our results could capture the reverse association where blockholders choose to invest in infrequent voluntary disclosure firms. To address this concern, we run a Granger-type lead-lag test similar to Ajinkya et al. (2005) where we include a lagged indicator for managerial guidance as an independent variable, MF_occur_t. Regression results in Model (4) show a positive coefficient on past guidance, consistent with persistence in firm's voluntary communication. Controlling for past guidance does not change our conclusion about the negative effect that blockholdings have on the likelihood of future guidance.

4.4.1. Instrumental variable analysis

The last test to address endogeneity is an instrumental variable approach. Following Appel et al. (2016), we make use of the Russell index assignments for identification. Specifically, we focus on the variation in institutional blockholdings that occurs around the cut-off point used to construct the Russell 3000 index, and use the inclusion into the Russell 3000 index as an instrument for blockholding. We focus on Russell 3000 where the exogenous effect on blockholdings is likely to be the highest. Specifically, to reduce institutional blockholding by 1%, an investor would require around $1.76million for the bottom Russell 3000 index stocks compared to £240million for Russell 1000 stocks. Thus, investors would need to spend disproportionally more to reduce blockholdings in a much larger Russell 1000 index, which would question the validity of the instrument and reduce the power of our tests. Bottom stocks of Russell 3000 are effectively bottom stocks of Russell 2000 thus our choice is consistent with using Russell 2000 index.[14]

We use data from 2001 to 2006 because Russell 3000 changed their reconstitution policy after 2006. During 2001–2006, the Russell 3000 index included the 3000 largest US stocks in terms of market capitalization. The rankings which determine whether a stock is included in the Russell 3000 index are based on the end-of-May market capitalization. We use a similar method to rank stocks on end-of-May market capitalization and select firms that rank between 2500 and 3500. This method ensures that the firms in our sample are similar in terms of market capitalization. We then assess the effect of institutional blockholders on firms' voluntary disclosure exploiting the variation in blockholder ownership around the Russell 3000 cut-off in an instrumental variable setting. Specifically, we instrument institutional blockholders ownership with an indicator for being assigned to the Russell 3000 in a given year, *R3000*. The estimation relies on the assumption that, after conditioning on the stocks' market capitalization, inclusion in the Russell

[14]Our focus on Russell 3000 is the main difference of our research design compared to previous papers using similar setting. Several papers use the Russell index assignment as a source of exogenous variation in firms' ownership structures. The specifications in the literature range from regression discontinuity to instrumental variable estimation. According to Appel et al. (2020), papers that use unbiased estimators find that Russell index assignments have little to no impact on total institutional ownership (e.g., Appel et al., 2016, Wei & Young, 2019) and only increase ownership by index funds (e.g., Appel et al., 2016, 2020; Ben-David, Franzoni, & Moussawi, 2019; Cao, Gustafson, & Velthuis, 2019; Glossner, 2019). Consistently, in untabulated results, using Russell 1000/2000 assignment shows no significant changes in institutional ownership and in blockholdings. Therefore, focusing on Russell 2000/1000 cut-off cannot generate variations in institutional blockholding that we need.

3000 index does not affect firms' voluntary disclosure except through the impact on institutional blockholdings.

The inclusion into Russell index provides a source of exogenous variation in the ownership structure and affects institutional blockholding in the following ways. Russell index inclusion will affect the number of institutional investors (Appel et al., 2016; Crane, Michenaud, & Weston, 2016). This evidence reflects that (1) some non-index funds are benchmarked against the Russell index and fiduciary laws, e.g., the Employee Retirement Income Security Act, oblige funds to hold broad index portfolios, thus non-index investors have an incentive to hold index stocks, and (2) index funds that track the Russell index will mechanically buy stocks added to the index. The exogenous pressure to purchase stocks newly added to the index means an increase in their share price (Beneish & Whaley, 1996; Lynch & Mendenhall, 1997), which incentivizes some existing shareholders, including blockholders, to sell their stock. We do not expect all blockholders to sell, however, we expect that the price increase will reach the reservation price of at least some blockholders leading to a decrease in average blockholdings in the stocks added to the index. Importantly, we do not expect existing blockholders to increase their holdings in the newly added stock because their holdings already exceed the weights required for performance benchmarking. Further, we do not expect new blockholdings to form as a result of index additions as weights of stocks newly added to the Russell 3000 index are less than 0.1%, thus new institutional investors' holdings would typically be substantially below the 5% blockholding cut-off.

We merge stock-level ownership data and Russell 3000 equity index membership with firm disclosure data and control variables between 2001 and 2006. We select firms with institutional ownership higher than 50% (median) and restrict our sample to stocks in the 500 bandwidths around the 3000th market capitalization cut-off, i.e., 500 firms included in the Russell 3000 index and 500 firms that missed being included. Our ranking of market capitalization is based on the end-of-May CRSP market capitalization rankings.[15] This results in a sample of 2,376 observations in the baseline analysis.

We use 2SLS to estimate the instrumental variable regressions. Equation (2) shows the specification of the first-stage regression. Specifically, we regress blockholdings on the dummy variable *R3000*, and because Russell 3000 index assignment is determined by the stock's market capitalization, we control for the stocks' end-of-May log market capitalization, ln $(marketcap)_{it}$. To control for the potential effect of other institutional ownership, we control for total institutional ownership, IO_{it},

$$Block_{it} = \beta_0 + \beta_1 R3000_{it} + \beta_2 IO_{it} + \beta_3 \ln(marketcap)_{it} + \tau_t + u_{it}. \tag{2}$$

In the second stage regression, we predict the likelihood of management guidance using the instrumented block ownership controlling for the level of institutional ownership and market capitalization,

$$P(MF_{occurit+1}) = \alpha_0 + \alpha_1 \widehat{Block_{it}} + \alpha_2 IO_{it} + \alpha_3 \ln (marketcap)_{it} + \tau_t + \varepsilon_{it}. \tag{3}$$

Since institutional blockholding is correlated with total institutional ownership, we use two approaches to ensure that the blockholding effect does not affect voluntary disclosure through the change in total ownership. First, we select firms with a high level of institutional ownership, i.e., firms with institutional ownership higher than 50%, so that the inclusion in the index does not significantly change the total ownership of institutional investors. This step, jointly with the fact that we control for institutional ownership in the estimation, should significantly reduce the

[15] A detailed discussion of different ranking methods and their effects can be found in Appel et al. (2020).

Table 5. Instrumental variable regressions

	(1)		(2)	
Second stage regression estimates	Estimate	*p*-value	Estimate	*p*-value
Block	− 2.807	0.000	− 2.722	0.000
IO	2.178	0.000	2.083	0.000
ln(mktcap)	− 0.248	0.002	− 0.261	0.001
Analyst			0.059	0.050
Year effect	Yes		Yes	
N	2,376		2,376	
	(1)		(2)	
First stage regression estimates	Estimate	*p*-value	Estimate	*p*-value
R3000	− 0.053	0.000	− 0.050	0.000
IO	0.541	0.000	0.572	0.000
ln(mktcap)	− 0.109	0.000	− 0.095	0.000
Analyst			− 0.037	0.000
Year effect	Yes		Yes	
R^2	0.313		0.339	

Note: The table presents regression results using the 2SLS instrumental variable approach described in equations (2) and (3). **R3000** is an indicator variable for whether a firm is included in the Russell 3000 index. Standard errors are clustered at the firm level.

confounding effect of changes in total ownership. Second, to validate the proposition that Russell 3000 index additions induce exogenous variation in blockholdings, but do not change total institutional ownership in a stock, in untabulated results, we run a regression of total institutional ownership on the variable *R3000*. We observe that the inclusion in the index does not affect total institutional ownership. These results suggest a low likelihood of the potential confounding influence of total institutional ownership on our analysis.

Table 5 Model (1) reports instrumental variables regression results. The first stage results document that being included in the Russell 3000 index decreases the ownership of institutional blockholders by 5.3%, which is around 28% of the average shares held by blockholders. In the second stage regression, we find a negative effect of instrumented block ownership on the probability of management forecast. Thus, 2SLS results support our main findings.

In untabulated results, we find that our conclusions remain unchanged when we forward the blockholding variable by one, two and three quarters in the first-stage model similar to Boone and White (2015). Further, we find that the reduction in blockholdings is driven by an increase in the number of institutions holding the firm's stock and a reduction in the number of blockholders, consistent with some blockholders selling their stock to new investors. Finally, our conclusions are the same when we use a narrower ± 250 bandwidths around the index inclusion cut-off.

There is a concern that Russell index inclusion could correlate with unobservables, such as higher analyst coverage or visibility of the stock to investors, which in turn could affect firm voluntary disclosure. We address this point in the two ways. First, in untabulated results, we checked for changes in analyst coverage and find no evidence of significant changes in analyst coverage for stocks added to the index. Second, in Model (2) of Table 5, we add analyst coverage to control variables and find that it does not change our conclusions that higher blockholdings reduce voluntary disclosure. Because we include institutional holdings in the regressions, we control for any effect higher visibility due to index inclusion would have on a firm's disclosure that would mediate through changes in institutional ownership. However, we acknowledge that we cannot

fully preclude that other factors correlated with both index inclusion and with blockholdings could affect our conclusions.

We believe our analysis in Table 5 is not affected by the bias caused by the Russell float adjustment. Russell adjusts the index membership every year using a proprietary measure of market capitalization. After identifying the membership stocks, Russell uses a float-adjusted market capitalization to weigh the firm within each index. Studies that use the regression discontinuity method, such as Boone and White (2015), are subject to omitted variable bias related to market liquidity if they use a regression discontinuity design based on the observable float-adjusted ranking provided by Russell. We use an instrumental variables approach to identify firms included in the index, which eliminates the risk of estimation bias coming from Russell's float-adjusted reweighting of stocks.

Overall, tests that address endogeneity and reverse causality support our main conclusion. However, we cannot preclude the possibility that changes in blockholdings affect a firm's voluntary disclosure *indirectly* through their effect on non-blockholder information demand and the firm's fundamentals. It is possible that there may be indirect effects of blockholdings on voluntary disclosure mediated through channels such as blockholdings effect on firms' performance, risk-taking behavior, or non-blockholders' information demand. We believe that our research design choices coupled with several robustness tests significantly reduces the likelihood that these indirect channels have first-order effects on voluntary disclosure. For example, a correlation between voluntary disclosure and firm performance suggests that controlling for the latter would significantly diminish the association between blockholdings and voluntary disclosure. We include several proxies for a firm's complexity, business risk, and operating and market performance, which should largely capture the effects mediated through these channels. Further, if firms engage in less voluntary disclosure in anticipation of changes in future performance and risk, then including measures of future performance and risk should eliminate the association between ownership concentration and voluntary disclosure. In untabulated results we controlled for future risk and performance and find that our results remain unchanged. Further, our conclusions are robust when we include firm-fixed effects in the model, which should pick up unobservable time-invariant characteristics that could correlate with blockholdings. We believe the overall evidence suggests a direct effect of blockholdings on voluntary communication is of first-order magnitude.[16]

4.5. Channels Through Which Blockholding Affect Voluntary Disclosure

This section explores two channels through which institutional blockholdings affect voluntary disclosure: the private for public information substitution of active blockholders and low monitoring incentives of passive blockholders.

4.5.1. Active blockholders

Blockholders have easier access to managers, which can facilitate private information acquisition. As blockholders substitute private for public information acquisition, managers have less incentive to provide costly public disclosure. Having a board seat creates opportunities for private

[16] In unablated results, we attempted to reconcile our evidence with Ali et al. (2007) and Chen, Doogar, et al. (2008), who find that family ownership and concentrated ownership in family firms have no effect on voluntary disclosure. Because institutional ownership in family firms tends to be low (Chen, Doogar, et al., 2008), their evidence likely captures that institutional holdings must reach a certain threshold before managers respond to institutional pressure. Consistently, we find that neither institutional blockholdings nor average institutional holdings associate with voluntary managerial guidance for stocks in the bottom total institutional ownership decile.

Table 6. Institutional blockholders' board representation and management forecast

	(1) Estimate	*p*-value	(2) Estimate	*p*-value
Block∗Board	− 0.866	0.013		
Block∗#Board seats			− 0.762	0.025
Block	− 0.982	0.000	− 0.982	0.000
Board	− 0.123	0.470		
#Board seats			− 0.016	0.630
IO	1.716	0.000	1.714	0.000
Controls	Yes		Yes	
Year∗quarter effect	Yes		Yes	
Industry effect	Yes		Yes	
N	104,765		104,765	
Pseudo R^2	0.276		0.275	

Note: The table presents regression results for the effect of board representation on the propensity to issue management guidance. **Board** is an indicator variable for whether any of the blockholders holds a board seat. **#Board seats** is the number of board seats held by blockholders. Regressions are estimated using logistic regressions. Standard errors are clustered at the firm level.

communication between blockholders and managers and we examine if the effect we document is stronger in instances when blockholders hold board seats. We collect board director information from BoardEx and create an indicator variable *Board* if any of the blockholders hold board seats. We then interact this variable with blockholdings, *Block∗Board*, to capture the joint effect of blockholdings and board seats. Model (1) in Table 6 reports regression results for equation (1) augmented with the board membership measure. We document that the blockholder effect on voluntary disclosure becomes more negative when they have board representation. To sharpen this analysis, we also count the number of board seats held by blockholders, *#Board seats*.[17] A larger number of seats gives more opportunities for private information acquisition. Consistently, Model (2) documents a more negative effect when blockholders hold more board seats. Overall, Table 6 results support the private for public information substitution hypothesis.

4.5.2. Passive blockholders

The second channel through which blockholdings can affect voluntary disclosure is through blockholders' monitoring incentives. Building on Almazan et al. (2005) and Boone and White (2015), we argue that passive blockholders have low demand for public information because of their low monitoring need and a disproportionally high cost of public disclosure they bear compared to non-blockholders. Specifically, as the fraction of shares held by non-monitoring blockholding institutions increases, such as by passive index funds, managers face less pressure to engage in costly public disclosure. This reflects that monitoring costs vary with the skills and resources an institution can devote to collect and analyze information and such costs tend to be higher for non-monitoring passive investors (Almazan et al., 2005). Non-monitoring blockholders may also encourage less public disclosure as they bear a disproportionally high cost of voluntary disclosure (Shleifer & Vishny, 1986). Passive blockholders have also limited demand for private information due to their limited ability to trade on private information (Parrino et al., 2003). Further, their large holdings compensate for lower stock liquidity due to lower public disclosure. Consistently, Maug's (1998) blockholding formation model shows that blockholders

[17] In unablated results, we find that the average number of board seats held by blockholders, conditional on blockholders having at least one board seat, is 1.063.

build higher stakes to compensate for lower stock liquidity. Non-monitoring non-blockholders prefer higher disclosure to promote higher stock liquidity as transaction costs have a larger wealth impact on their trades (Boone & White, 2015; Heflin & Shaw, 2000).

Previous research uses Bushee's (1998) classification into transient, quasi-indexers, and dedicated investors to identify passive and active institutional investors (e.g., Boone & White, 2015). A disadvantage of Bushee's (1998) classification is that institutions categorized as quasi-indexers include not only pure index-tracking passive institutions but also actively managed institutions whose portfolio holdings mimic a passive institution. These institutions may be quite active in governance and demand for private information compared to index-tracking institutions. To avoid this misclassification concern, we use a more precise mutual fund-level measure of passive ownership to test our prediction. Specifically, we obtain fund names by merging Thomson Reuters S12 mutual fund holdings data with the CRSP mutual fund data. We then categorize a fund as passively managed if the fund's name includes a string that identifies it as an index fund or if the CRSP Mutual Fund database classifies the fund as an index fund. Next, we compute the percentage of each stock's market capitalization that is owned by passive and other mutual funds at the end of each quarter. We then calculate the passive ownership concentration at the mutual fund level. Specifically, we define *Passive MFHHI* as the concentration of passive mutual fund holdings calculated using the Herfindahl index and multiplied by 100. We classify all other mutual funds as other mutual funds. Specifically, *Other MFHHI* is the concentration of other mutual fund holdings calculated using the Herfindahl index and multiplied by 100. We multiply the measures by 100 for ease of reporting as they tend to have relatively small magnitudes, which increases the magnitudes of coefficients. Similar to our main regressions that control for total institutional ownership, we include *Passive MF*, which is the percentage of shares held by passive mutual funds, and *Other MF*, which is the percentage of shares held by other types of mutual funds.

Table 7 reports results using the mutual fund classification. We confirm that both passive and other categories of concentrated passive mutual funds holdings have a negative effect on voluntary disclosure, which mirrors our main conclusions. In contrast, average (non-blockholding) mutual funds ownership has a positive effect on voluntary disclosure. To test if passive ownership has a more negative effect on voluntary disclosure, we compare magnitudes of coefficients on *Passive MFHHI* compared to *Other MFHHI*. We confirm that passive mutual fund ownership has an incrementally more negative effect on voluntary disclosure, a result consistent with managers reducing costly public disclosure when ownership by concentrated investors with low monitoring incentives is high.

5. Other Robustness Tests

There is a concern that our results are being driven by firms' pre-2001 ownership. That is, the results could be driven in part by the fact that some firms enter the sample with an already high blockholder ownership, whereas other firms enter the sample with low blockholder ownership. This leaves open the possibility that blockholders have already pre-selected into firms that meet their reporting preferences. To address this concern, we first re-do the analysis for a sample of firms from 2005 to 2015, which moves the sample start year by four years. Panel A of Table 8 presents the result. We find our conclusions are unchanged for this subsample. Second, we split the sample into firms that enter the sample with an already high block ownership (higher than sample median in the years that the firms enter the sample) and firms that enter with low block ownership. Panel B of Table 8 presents the result. We find that the results are similar in both subsamples. This evidence suggests our main results are unlikely to be driven by firms' pre-2001 ownership structure.

Table 7. Passive institutional blockholders and voluntary disclosure

	Estimate	*p*-value
Passive MFHHI	− 2.291	0.004
Other MFHHI	− 0.585	0.000
Passive MF	14.317	0.000
Other MF	3.466	0.000
Controls	Yes	
Year∗quarter effect	Yes	
Industry effect	Yes	
N	101,629	
Pseudo R^2	0.270	
Test of coefficient equality: Passive MFHHI = Other MFHHI		
Chi2-test	4.420	
p-value	0.036	

Note: The table presents regression results for the effect of passive ownership concentration on the propensity to issue management guidance. **Passive MFHHI** is the concentration of passive mutual fund holdings calculated using the Herfindahl index and multiplied by 100. **Other MFHHI** is the concentration of other mutual fund holdings calculated using the Herfindahl index and multiplied by 100. **Passive MF** is the percentage of shares held by passive mutual funds. **Other MF** is the percentage of shares held by other types of mutual funds. Regressions are estimated using logistic regressions. Standard errors are clustered at the firm level.

Table 8. Other robustness tests

Panel A Management forecast and institutional blockholders for firms between 2005 and 2015

	Estimate	*p*-value
Block	− 0.932	0.000
IO	1.736	0.000
Controls	Yes	
Year∗quarter effect	Yes	
Industry effect	Yes	
Observations	82,703	
Pseudo R^2	0.299	

Panel B Management forecasts and institutional blockholders for firms with high and low block ownership

	(1) Low Block		(2) High Block	
	Estimate	*p*-value	Estimate	*p*-value
Block	− 0.963	0.006	− 1.300	0.000
IO	1.480	0.000	2.008	0.000
Controls	Yes		Yes	
Year∗quarter effect	Yes		Yes	
Industry effect	Yes		Yes	
Obs.	41,103		36,689	
Pseudo R^2	0.254		0.244	

Note: Panel A presents regression results for the effect of institutional blockholding on management guidance for the sample of firms between 2005 and 2015. Panel B presents regression results for the effect of institutional blockholding on management guidance for firms that enter the sample with high and low block ownership. Regressions are estimated using logistic regressions. Standard errors are clustered at the firm level.

6. Conclusions

We study how institutional blockholders affect corporate voluntary disclosure. We document that blockholders reduce the likelihood of management forecasts and the comprehensives of guidance. We find similar results using conference calls and voluntary 8 K filings. We identify

two channels through which blockholders affect a firm's voluntary disclosure. First, blockholders have easier access to managers and substitute private for public information acquisition. Second, a higher proportion of non-monitoring blockholders with low demand for voluntary disclosure, such as passive blockholders, reduces a firm's incentive to provide voluntary disclosure. The study identifies an important consequence concentrated ownership has on firm corporate disclosure. While our findings are based on the US market, we expect the conclusions to generalize to other markets with institutional settings similar to the US. For example, countries like the UK and Japan have highly fragmented ownership structures similar to the US and our results should be replicable there. Conversely, our results might not be as applicable in markets where ownership is more concentrated, e.g., markets with high family ownership (Franks, 2020). Further cross-country research will be helpful in validating our predictions.

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Appendix A. Variable definitions

This appendix provides definitions for variables used throughout the paper.

Variables	Description
Disclosure Variables	
MF_occur	An indicator variable that equals 1 if the firm issued at least one management forecasts during quarter $t+1$, and 0 otherwise. We consider as non-guidance firms absent from the I/B/E/S guidance database.
MF_items	The number of items disclosed in management forecasts in quarter $t+1$.
Institutional Blockholding and Concentration	
Block	Cumulative holdings by blockholders in a firm. We define institutional blockholders as institutional investors who hold at least 5% of the firm's outstanding common shares.
HHI	The ownership concentration of institutional investors measured by the Herfindahl index times 100.
Control Variables	
IO	The total percentage of shares owned by institutional investors
Size	Natural logarithmic of the firm market value of equity at the end of quarter t.
MTB	A ratio of the market value of equity plus book value of long-term liabilities scaled by the book value of total assets.
Lev	Leverage is defined as the sum of long-term debt and short-term debt scaled by total assets.
ROA	Profitability is measured as income before extraordinary items scaled by total assets.
Ret	Stock return momentum is calculated as the buy-and-hold stock return during quarter t.
σRet	Standard deviation of stock return.
Special	A ratio of special items divided by total assets
Analyst	Natural logarithm of the number of analysts issuing earnings forecast for next year available at the end of quarter t.
ΔEPS	Change in earning per share in quarter t scaled by the stock price at the end of quarter $t-1$.
Boardsize	Natural logarithmic of the number of board directors at the end of quarter t.
Boardindep	The number of independent directors divided by the total number of directors.
CEOturnover	A dummy variable that equals 1 if there is CEO turnover in quarter t.
Complexity	The diversification of business segments by total revenue measured by Herfindahl index.
ω_i	Industry effect based on 2-digit SIC code classification.
τ_t	Year-quarter time effects.