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Share pledging and optimism in analyst earnings forecasts: Evidence from China

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ABSTRACT

This study examines the relation between share pledging by controlling shareholders and optimism in analyst earnings forecasts. Using a sample of listed Chinese firms from 2007 to 2018, we find that analysts make more optimistic forecasts for firms whose controlling shareholders have pledged their shares for bank loans and whose share pledge ratio is high. This relation is stronger for firms with poor prior stock performance, for firms located in regions with a high level of marketization, and for analysts who have close connections with firms, but is weaker for reputable analysts and those from larger broker firms. In addition, analyst optimism becomes weaker when the share-pledging loan approaches the end of the term and when the analyst forecast date is closer to the earnings announcement, and becomes more pronounced when analysts make forecasts over a longer horizon. The results suggest that in cases of share pledging, the threat of losing controlling rights creates significant incentives for controlling shareholders to collude with analysts.

1. Introduction

Share pledging has received widespread attention from media and regulators and has become a global phenomenon in recent years. Share pledging occurs when shareholdings are used as collateral for personal loans or charitable endeavors (e.g., Chan et al., 2018; Dou et al., 2019; Li et al., 2019). According to a U.S. survey, 982 directors or officers disclosed their share pledging for loans in 2006–2009 proxy statements, and the average pledge rate reached up to 44% of total holdings (Larcker and Tayan, 2010). Press Trust of India reports that insiders in more than 20% of listed Indian companies pledge part of their holdings, with pledges accounting for a market value of $25.8 billion USD in 2013. In China, the incidence and volume of share pledging has been steadily growing and has become a common practice (Chan et al., 2018; Fan and Wong, 2002; La Porta et al., 2002).[1] As of 2017, 1571 out of 3526 publicly listed companies in China have some of their issued shares pledged by their controlling shareholders; 755 of these companies have a share-pledging ratio higher than 60%, with a few reaching 100%.

One of the major reasons for the increased prevalence of share pledging is that it grants shareholders access to financing through share-backed lending without their having to sacrifice their voting rights attached to these shares (Dou et al., 2019; Li et al., 2019). However, it is not without risks for the pledging shareholders. On the one hand, although share pledging does not affect the voting rights of controlling shareholders, it can weaken their cash flow rights. The deviation of voting rights from cash flow rights could plausibly increase the potential for expropriation and tunneling (Johnson et al., 2000). On the other hand, as stipulated by a loan agreement, share pledging typically requires that the value of the pledged shares be maintained above a certain level. If stock prices fall below this maintenance level, a margin call is triggered, which forces pledging shareholders to deposit additional collateral (e.g., additional shares). If the required margin is not fully satisfied, the lenders have the right to sell the pledged shares to recover their loss. If the number of pledged shares sold by force is high enough,

Abbreviations: IPO, initial public offering.

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[1] In 1995, the Guarantee Law of the People's Republic was promulgated; this law explicitly allows legally transferrable shares to be pledged as collateral in borrowing contracts. As stipulated by the 2013 amendments to the Companies Act, written consent from a majority of the remaining shareholders is required to pledge shares. Listing rules of the Chinese stock exchange require firms to announce when their shares are pledged by major shareholders (with >5% shareholdings).

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the controlling shareholders run the risk of losing their voting rights and control of the firm, which gives them a strong incentive to use corporate resources to avoid a margin call (Chan et al., 2018). Analysts are perceived as prominent information intermediaries in financial markets (Jensen and Meckling, 1976), and their recommendations and forecasts have a significant impact on investors' decisions and thus on a firm's stock price (e.g., Francis and Soffer, 1997; Frankel et al., 2006). Yet how analysts respond to corporate risks exposed by the share-pledging behaviors of firms' controlling shareholders is underexplored. Therefore, our study fills this gap by examining the association between share pledging and optimism in analyst earnings forecasts.

We rely on both collusion and reputation views to predict the association between share pledging and analyst optimism. The threat of losing controlling rights creates significant incentives for controlling shareholders to use all of their power to maintain the firm's share price above the margin call threshold (Chan et al., 2018). Such incentives may motivate them to collude with analysts to make more optimistic forecasts. Financial analysts may be willing to do this because they want to please firm managers to obtain better access to private information (Ke and Yu, 2006; Lim, 2001; Richardson et al., 2004). In line with this collusion view, we hypothesize a positive association between share pledging and analyst optimism. At the same time, however, share pledging is perceived as an indicator of shareholder entrenchment and underlying weaknesses in corporate governance (Claessens et al., 2002; Fan and Wong, 2002). In addition, share pledging could decrease firm value and increase the risk of a crash in stock price (Dou et al., 2019). It may be difficult for analysts to accurately account for these effects, and they may choose to be more conservative when making earnings forecasts to protect their professional reputations. Thus, this reputation view predicts a negative association between share pledging and analyst optimism. Given these two competing arguments, the impact of share pledging on analyst optimism remains an empirical question.

The Chinese setting provides a great opportunity to examine controlling shareholders' motivation and its impact on analyst forecast behaviors. Share pledging is a major financial tool in the Chinese stock markets and has been growing year after year (Li et al., 2020a; Ouyang et al., 2019). Its scale and ubiquity in these markets is greater than in any other capital market across the globe (Li et al., 2019). We use a sample of companies listed on the Chinese A-share market between 2007 and 2018 to empirically examine the relation between analyst optimism and share pledging by controlling shareholders. We find that analysts are more optimistic about firms' earnings when their controlling shareholders participate in share pledging and when their share pledging ratios are high. This result suggests that analysts collude with firms and optimistically bias their forecasts in order to reduce the odds that controlling shareholders, who have borrowed against pledged shares, will face a margin call. Our results are robust when we exclude the alternative explanation (the undervaluation view) and conduct a range of sensitivity tests.

Furthermore, this study examines whether the impact of controlling shareholders' equity pledges on analyst optimism is dependent on different motives of firm insiders (both managers and controlling shareholders) and analysts. We argue that there is more incentive to collude when the benefits of the collusion exceed the reputation costs and vice versa. In particular, we find that incentives to collude are stronger for firms with poor prior stock performance, located in regions with a high level of marketization, and for analysts with close connections with firms; and are weaker for reputable analysts and those who are affiliated with larger broker firms. These results are consistent with our expectations. Furthermore, the incentive to collude is weaker when the share-pledging loan approaches the end of the term and when the analyst forecast date is closer to the earnings announcement, and more pronounced when analysts make forecasts over a longer horizon.

This study makes four major contributions to the literature. First, it contributes to the emerging literature on share pledging (e.g., Chan et al., 2018; Li et al., 2019, 2020a; Wang and Chou, 2018). Our study focuses on the behaviors and decisions of analysts, who are important intermediates in capital markets. To the best of our knowledge, this is the first paper to examine this relation. Second, the study adds to relevant research on financial analysts by enhancing knowledge of the determinants of analyst bias, thus shedding more light on the decision processes and behavior of financial analysts. Third, we provide additional insights into circumstances under which collusion or reputation incentives are strengthened or weakened and offer nuanced evidence of how analysts choose a collusion strategy to maximize their private interests without destroying their professional reputation. Fourth, we contribute to a growing body of share-pledging studies in developing economies such as China (Li et al., 2019, 2020a; Ouyang et al., 2019). It is important to understand share pledging in China because the phenomenon is ubiquitous in this market as well as other emerging markets. Furthermore, the Chinese equity markets are an important topic in their own right, as China is the second largest economy overall and the largest developing economy in the world.

2. Literature review and hypothesis development

2.1. Share pledging

Previous studies are interested in the share-pledging behavior of controlling shareholders (and blockholders) and suggest that financing with share pledging helps controlling shareholders recover their investment, increase their leverage, or relieve themselves from financial constraint or distress (Deren and Ke, 2018). In recent years, a growing literature focuses on the consequences of share pledging from the perspective of firms.

One group of studies examines how share pledging affects shareholder wealth and a firm's market reaction. Chan et al. (2018) and Ouyang et al. (2019) suggest that insiders' shareholding pledges are associated with agency problems. They argue that firms with controlling shareholders are more likely to engage in expropriation at the expense of minority shareholders, which brings about additional shareholder risk and decreases firm value. Prior studies provide empirical support for this view (Anderson and Puleo, 2020; Dou et al., 2019; Wang and Chou, 2018). In contrast, Li et al. (2019) argue that the threat of a margin call can deter controlling shareholders' expropriation, and thus share pledging can also have benefits in terms of firm value.

Another group of studies investigates the association between share pledging and the quality of financial reporting. These studies show that pledging firms have an incentive to inflate accrual-based earnings and stabilize the share price to avoid the pressure of a margin call (Deren and Ke, 2018; Huang and Xue, 2016; Xu, 2019). However, discretionary accruals cannot produce positive results forever and eventually need to be reversed (Asija et al., 2014). Stated differently, share-pledging firms may attract increased monitoring by different parties, and thus earnings management practices may be constrained and easily identified (Xu et al., 2020). Thus, colluding with analysts is a more subtle and less risky way of achieving the same goal of protecting against a drop in share price for the duration of the share-pledging loan. However, the existing literature is largely silent regarding how share pledging can alter controlling shareholders' incentives and subsequently affect firm–analyst dynamics. Our paper fills this void by examining the impact of share pledging on analyst optimism.

2.2. Analyst optimism

Prior research on analyst forecast suggests that analysts tend to issue optimistic recommendations and earnings forecasts. Three major incentives are considered in the current literature. First, analyst optimism may be driven by analysts' desire to curry favor with management (Das et al., 1998; Francis and Philbrick, 1993; Lim, 2001). Specifically, analysts have an incentive to release biased earnings forecasts to obtain better access to companies' private information (Ke and Yu, 2006; Lim, 2001; Richardson et al., 2004). Second, analysts who work for integrated investment banking houses are motivated to maximize revenue from investment banking fees by publishing more favorable research about their employers' clients (Dugar and Nathan, 1995; Kolasinski and Kothari, 2008; Lin and McNichols, 1998; Michaely and Womack, 2015). Third, analysts may be under pressure to maximize brokerage commissions (Agrawal and Chen, 2012; Cowen et al., 2006; Irvine, 2004; Jackson, 2005). This brokerage pressure also provides incentives for analysts to issue positively biased opinions.

In sum, explanations for analyst optimism in the literature stem from factors internal to analysts, such as generating additional trading business for their brokerage firms and receiving higher compensation. Our study offers a new perspective on the determinants of analyst optimism with a specific focus on firms' share-pledging behaviors.

2.3. Hypothesis development

As mentioned previously, to maintain their control, controlling shareholders have strong incentives to use various available corporate resources to avoid a margin call and decline in stock price (Chan et al., 2018). One of the best and most convenient ways to resist these pressures is to form a collusive alliance with analysts (Richardson et al., 2004).

Analysts can influence fluctuations in stock price by releasing optimistic earnings forecasts and valuation reports (Abarbanell and Bernard, 1992; Bulkley and Harris, 1997; Skinner and Sloan, 2002). Moreover, they are also willing to curry favor with firm managers and controlling shareholders and issue optimistic earnings forecasts to obtain better access to private information about the firm (Francis and Philbrick, 1993; Ke and Yu, 2006; Lim, 2001; Matsumoto, 2002; Mayew, 2008; Mest and Plummer, 2003). In particular, analysts, who face fierce competition in retaining clients and attracting new ones, are likely to compromise their independence and issue biased forecasts (Francis and Philbrick, 1993; Jackson, 2005). Consequently, a collusive relationship could be mutually beneficial for managers and analysts. Along this line, we predict a positive association between share pledging by controlling shareholders and analyst optimism, which is called the *collusion view.*

However, the incentive to collude may be curbed by analysts' concerns about their reputation given that the accuracy of their predictions is important for their career prospects (Hong and Kubik, 2003; Hong et al., 2000). Pledging shareholders tend to expropriate the interests of outside minority shareholders for more funds either for their private benefit or to fulfill a margin call (Claessens et al., 2002; Fan and Wong, 2002). In the worst case scenario, pledging shareholders who intend to tunnel cash out of their companies never pay back the loans and leave a shell company. Furthermore, they tend to manipulate associated earnings and information disclosure to cover these opportunistic activities, which increases financial opaqueness (Xu, 2019), weakens corporate governance and future performance (Dou et al., 2019; Wang and Chou, 2018), and increases the probability of financial distress (Lee and Yeh, 2004). Thus, it brings great uncertainty among analysts and makes it more difficult for them to give an accurate earnings forecast. Analysts, who build their reputation by providing reliable, accurate, unbiased, and timely forecasts and recommendations, tend to make less optimistic forecasts for pledged firms. Therefore, in line with this *reputation view*, we predict a negative association between share pledging by controlling shareholders and analyst optimism.

According to these competing arguments, analysts face a trade-off between the benefits of collusion and concerns over their reputation. We posit that the relation between share pledging by controlling shareholders and analyst optimism is an empirical question. We therefore state our hypotheses in alternative form as follows:

Hypothesis 1a. There is a positive association between share pledging by controlling shareholders and analyst optimism.

Hypothesis 1b. There is a negative association between share pledging by controlling shareholders and analyst optimism.

3. Research design

3.1. Research model

We use ordinary least squares regression method to estimate coefficients. Standard errors are clustered along the analyst, firm, broker, and year dimensions.

$$\begin{aligned} AFE_{i,t,j} = {} & \beta_0 + \beta_1 PLEDGE_{i,t,j} + \beta_2 SIZE_{i,t-1,j} \\ & + \beta_3 LEV_{i,t-1,j} + \beta_4 GROWTH_{i,t-1,j} \\ & + \beta_5 MB_{i,t-1,j} + \beta_6 FOLLOW_{i,t,j} \\ & + \beta_7 LISTAGE_{i,t-1,j} + \beta_8 LOSS_{i,t-1,j} \\ & + \beta_9 VOL_{i,t-1,j} + \beta_{10} HORIZON_{i,t,j} \\ & + \beta_{11} INST_{i,t-1,j} + \beta_{12} COVERAGE_{i,t,j} \\ & + Broker\ fixed\ effect_{i,t} + Firm\ fixed\ effect_{i,t} \\ & + Year\ fixed\ effect_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Here i, t, and j represent the firm, year, and analyst, respectively.

3.1.1. Dependent variable: analyst optimism (AFE)

We construct our dependent variable, analyst optimism (*AFE*), using analyst forecast errors over a 1-year horizon. Specifically, we use the following formula:

$$AFE = \frac{EPS_{Forecast} - EPS_{Actual}}{NAPS_{Actual}} \quad (2)$$

where $EPS_{Forecast}$ is the latest earnings forecast issued by analyst j for firm i in year t and EPS_{Actual} denotes the actual annual earnings per share for year t. A positive value for *AFE* indicates an optimistic analyst forecast. Instead of using the share price (Choi et al., 2014; Das et al., 1998; Eames and Glover, 2003), we use the actual value of total book equity per share at the beginning period, $NAPS_{Actual}$, as a scaling variable. This is because when share prices drop, analysts may face more pressure to issue upwardly biased earnings, but at the same time, the price-scaled forecast error goes up mechanically. This may result in an overstatement of the magnitude of the coefficient on the presence of share pledging.

3.1.2. Independent variable: share pledging (PLEDGE)

We use two proxies to measure our independent variable, share pledging (*PLEDGE*): the presence of share pledging (*PLD*) and the share-pledging ratio (*PLR*). To alleviate potential reverse causality running from analyst forecast to share pledging, we give *PLD* a value of 1 only when an analyst's earnings forecast is released after a share-pledging event in the year t and 0 otherwise. We follow the same principle for *PLR*. This is calculated as the total number of shares pledged divided by the total number of shares owned by controlling shareholders (e.g., Lee and Yeh, 2004) when an analyst's earnings forecast is released after a share-pledging event in

the year t and 0 otherwise. For example, suppose the controlling shareholder of Company A pledged shares in May 2015. In that case, we define the value of *PLD* for those analysts' earnings forecasts released after May as 1, and *PLR* is given the corresponding ratio value. If the earnings forecast was issued before May of the current year, we assign a value of 0 to *PLD* and *PLR*. Note that we give a value of 0 to *PLD* and *PLR* for all observations without a share pledge event. All main regressions reported in this study are performed in this way.

3.1.3. Control variables

We control for a number of variables that have an impact on our dependent variable. First, we control for variables that may affect firms' information environment. Larger and highly leveraged firms, growth firms, and firms with more analysts following are often perceived to have a better information environment because of greater visibility, scrutiny, and monitoring (Barth et al., 2001; Hutton et al., 2012; Karamanou, 2011; Liu and Natarajan, 2012). A superior information environment enables analysts to draw more accurate inferences about a firm's future earnings and reduces the need for them to develop beneficial relationships with management (Lim, 2001). Firm size (*SIZE*) is calculated as the natural logarithm of total assets. Leverage (*LEV*) is measured as total liabilities divided by total assets. We use two proxies for firms' growth opportunities: sales growth (*GROWTH*) and market-to-book ratio (*MB*). *GROWTH* is measured as the annual growth rate of operating revenue. *MB* is the sum of market capitalization and the book value of liabilities divided by the total book value of assets. Analyst following (*FOLLOW*) is measured as the natural logarithm of 1 plus the number of analysts following the firm through the year. Firm age (*LISTAGE*) is also considered a determinant of analyst optimism (Muslu et al., 2019). *LISTAGE* is measured as the natural logarithm of 1 plus the total number of years listed. Because the forecast bias is negatively related to these proxies in a superior information environment, we expect that analyst optimism decreases with firm size, leverage, growth opportunities, analyst following, and firm age.

Second, firms with accounting losses or volatile earnings tend to be difficult for analysts to forecast (Dhaliwal et al., 2012; Dichev and Tang, 2009; Hutton et al., 2012). *LOSS* is a dummy variable that equals 1 if the firm reports negative earnings at the end of the fiscal year and 0 otherwise. Earnings volatility (*VOL*) is calculated as the standard deviation of monthly return in a given year. Previous studies find that analyst forecast error increases as the forecast horizon increases (Karamanou, 2011; O'Brien, 1990). *HORIZON* is measured as the natural logarithm of 1 plus the number of days between the date of the earnings announcement and the forecast date. Furthermore, previous studies show that analysts issue more optimistic earnings forecasts for firms with high institutional ownership to retain their customers (Ackert and Athanassakos, 2003; Das et al., 1998). *INST* is the total percentage of shares owned by institutional shareholders. In addition, an analyst who follows more firms likely devotes fewer resources and attention to building and maintaining relationships with each firm by making optimistic forecasts (Bae et al., 2008; Clement, 1999; Dechow and Haifeng, 2012). *COVERAGE* is measured as the natural logarithm of 1 plus the number of firms covered by an analyst. Following Han et al. (2018), the three control variables related to analyst characteristics are measured in the same period as our dependent variable *AFE*, whereas our financial control variables are measured with 1-year lagged values.

Finally, we also include broker fixed effects, firm fixed effects, and year fixed effects to control for any variation in broker, firm-specific, or time characteristics (Ertimur et al., 2011). The definitions of all variables in this study are summarized in the Appendix.

3.2. Sample and data

The unit of analysis in our study is the analyst forecast. Our initial sample comprises 218,736 firm-year-analyst observations covering 29,191 firm-years from 2007 to 2018. We then exclude observations in the financial industry and those denoted ST (special treatment). Furthermore, we exclude observations with missing variables. Our final sample includes 168,044 firm-year-analyst observations, and the total number of firm-year observations is 16,826. Please see Table 1 for the stepwise sample selection process.

All financial data are downloaded from the China Stock Market and Accounting Research (CSMAR) database, the most popular database for Chinese capital markets. The marketization index used in additional tests is obtained from the annual *Marketization Index for China's Provinces* (Wang et al., 2016).[2] Related analyst data are retrieved from the CSMAR database and the Wind Economic Database. The detailed share-pledging data are obtained from the Equity Pledge Research sub-database of the CSMAR database. The sub-database includes 11 data tables comprising a total of 193 variables covering 5 major themes: share pledge status, detailed exchange statistics, China Securities Depository and Clearing statistics, freeze status, and others. All continuous variables are winsorized at the 1% and 99% levels to reduce the impact of extreme values.

4. Empirical results

4.1. Descriptive statistics

Panel A of Table 2 presents descriptive statistics for all dependent and independent variables. The mean *AFE* is 0.0328, which indicates that during the sample period, analysts overestimate corporate earnings by on average 3.3% of book value per share.[3] In firms followed by analysts, 22.14% of controlling shareholders pledge their shares for personal loans, which is consistent with Li et al. (2019). In addition, pledged shares account for an average of 9.73% of total shares. Moreover, the mean *SIZE* is 22.5616, suggesting that the average total assets is RMB 6.3 billion yuan, which is comparable to Xu (2019). The total liabilities average out to 43.36% relative to the total assets, and the operating revenue of firms grows at an average annual rate of 40.44%. The mean *MB* is 2.2051, and 1.88% of our sample observations show a financial loss. The mean *INST* is 0.1173, which suggests that institutional shareholders hold approximately 11% of shares. On average, firms have been listed for about 7 years, and there are about 16 analysts following a firm. There is a gap of 93 days between the release of the analyst forecast and the release of the company's annual report. The mean *COVERAGE* suggests that the average number of firms covered by an analyst in our sample is 13.

Panel B of Table 2 reports the number of observations and means of our dependent variables by year. The number of firm-year observations has a consistent upward trend during the sample period, with 603 firm-year observations in 2007 and 1986 in 2018. The occurrence of share-pledging events among listed Chinese companies also experiences substantial growth from 2007 to

[2] The marketization index measures the level of marketization in different regions of China (Wang et al., 2016). It is constructed from five dimensions: the relation between governments and the markets, the growth of the private sector, the development of product markets, the development of factor markets, and the development of market intermediaries and legal environment (Firth et al., 2009). A higher value suggests stronger market institutions and further progress toward a market economy in the region.

[3] This positive average analyst forecasting error suggests overall optimism among analysts in their earnings forecasts, which is consistent with prior literature (Chu and Zhai, 2021; Cowen et al., 2006; Herrmann et al., 2008).

Table 1
Sample selection.

	No. of firm-year observations	No. of firm-year-analyst observations
Initial sample (2007–2018)	29,191	218,736
Less		
Observations in the financial industry	(771)	(12,825)
Observations denoted as ST	(1161)	(6763)
Missing observations	(10,433)	(31,104)
Final sample	16,826	168,044

Table 2
Descriptive statistics
This table presents descriptive statistics at the analyst level. The sample size (N) is 168,044 firm-year-analyst observations. See the Appendix for detailed definitions and measurement of variables.
This table presents descriptive statistics for share pledging by controlling shareholders by year from 2007 to 2018.

Panel A: Descriptive statistics at the analyst level (N = 168,044)

Variable	N	Mean	SD	P25	Median	P75
AFE	168,044	0.0328	0.0897	−0.0079	0.0087	0.0459
PLD	168,044	0.2214	0.4152	0	0	0
PLR	168,044	0.0973	0.2315	0	0	0
SIZE	168,044	22.5616	1.3720	21.5525	22.3544	23.3830
LEV	168,044	0.4336	0.2006	0.2727	0.4332	0.5907
GROWTH	168,044	0.4044	1.1605	−0.0231	0.1396	0.4137
MB	168,044	2.2051	1.3629	1.3236	1.7621	2.5792
FOLLOW	168,044	2.7701	0.6973	2.3983	2.8905	3.2961
LISTAGE	168,044	1.9643	0.8316	1.3863	2.0794	2.6391
LOSS	168,044	0.0188	0.1360	0	0	0
VOL	168,044	0.1357	0.0645	0.0932	0.1220	0.1607
HORIZON	168,044	4.5339	0.4232	3.9435	4.4734	4.8529
INST	168,044	0.1173	0.0912	0.0463	0.0957	0.1665
COVERAGE	168,044	2.6460	0.8660	2.0794	2.6391	3.1781

Panel B: Descriptive statistics for share pledging by controlling shareholders by year

Year	N (firm-year)	N (Pledging-case)	N (Analyst forecast)	Mean PLD	Mean PLR
2007	603	344	3277	0.0806	0.0401
2008	727	539	7580	0.0703	0.0309
2009	838	643	9092	0.0915	0.0417
2010	1023	702	11,711	0.1296	0.0629
2011	1340	1053	14,157	0.1216	0.0503
2012	1517	1267	16,899	0.1557	0.0657
2013	1582	1716	16,539	0.1648	0.0746
2014	1630	2024	14,733	0.2160	0.1020
2015	1742	3168	13,589	0.2679	0.1213
2016	1801	4418	20,723	0.3204	0.1164
2017	2037	5137	18,004	0.3393	0.1464
2018	1986	5855	21,740	0.3407	0.1666
Total	16,826	26,866	168,044	0.2214	0.0973

2018, with the number of events in 2018 about 17 times that in 2007. We find that the mean *PLD* and *PLR* increase each year. For example, in 2007, 8.06% of our sample observations have share pledging; this rate increases drastically to 34.07% in 2018. Similarly, 4.01% of shares are pledged by controlling shareholders in 2007, whereas in 2018 this number increases to 16.66%.

4.2. Regression analysis

Table 3 presents the regression results for our main models. Columns (1) and (2) include only our independent variables of interest: *PLD* and *PLR*. Columns (3) and (4) include all independent and control variables. In all columns, we cluster standard errors along four dimensions: analyst, firm, broker, and year. The results are analyzed based on columns (3) and (4).

As shown in columns (3) and (4), the coefficient of *PLD* is positive and significant ($\beta_{PLD} = 0.0106$, $p < 0.01$). Similarly, the association between *AFE* and *PLR* remains positive and significant ($\beta_{PLR} = 0.0170$, $p < 0.01$). These findings are consistent with Hypothesis 1a, which suggests that optimism in analyst earnings forecast is greater when controlling shareholders have their shares pledged for loans and when the share pledge ratio is high. These results are also economically significant. The coefficient of *PLD* is 0.0106, which means that on average, analyst forecast optimism is 32.31% higher for share-pledging firms than for non-share-pledging firms.[4] The coefficient of *PLR* is 0.017, which means that a one standard deviation increase in the share-pledging ratio is associated with a 12.00% increase in analyst optimism.[5] As for the control variables, the coefficient of *SIZE* is positive and significant, which suggests that analysts are more optimistic about larger firms. *MB* and *INST* are also consistently positively associated with *AFE* in all models, which indicates that analysts are more optimistic about firms with a high market-to-book value and more institutional shareholdings. In addition, we find that forecasts with longer horizons are more optimistic, which is consistent with prior studies (Cowen et al., 2006; Muslu et al., 2019). Finally, the coefficients of *FOLLOW* and *COVERAGE* are significantly negative, as predicted, which is comparable to Clement (1999).

[4] 0.0106/0.0328=32.31%, where 0.0106 is the coefficient estimate of *PLD* in Column (3) of Table 3 and 0.0328 is the mean value of analyst optimism (*AFE*) for the full sample, which is reported in Table 2 (Alok and Ayyagari, 2020).

[5] 0.0170×0.2315/0.0328=12.00%, where 0.0170 is the coefficient estimate of *PLR* in Column (4) of Table 3, 0.2315 is the standard deviation of *PLR*, and 0.0328 is the mean value of analyst optimism (*AFE*) for the full sample, which is reported in Table 2 (Alok and Ayyagari, 2020).

Table 3
Share pledging and analyst optimism
This table presents the results of ordinary least squares regressions of the relation between share pledging and analyst optimism. The sample size (N) is 168,044 firm-year-analyst observations. The dependent variable AFE is analyst optimism. PLD and PLR are two explanatory variables. PLD is a dummy variable defined as controlling shareholders' participation in share pledging, and PLR is controlling shareholders' share pledge ratio. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) AFE	(2) AFE	(3) AFE	(4) AFE
PLD	0.0132***		0.0106***	
	(4.42)		(3.61)	
PLR		0.0198***		0.0170***
		(4.40)		(4.03)
SIZE			0.0185***	0.0188***
			(6.17)	(6.31)
LEV			−0.0352***	−0.0350***
			(−3.21)	(−3.18)
GROWTH			0.0003	0.0003
			(0.40)	(0.39)
MB			0.0027*	0.0028*
			(2.12)	(2.19)
FOLLOW			−0.0064***	−0.0064***
			(−3.21)	(−3.23)
LISTAGE			−0.0019	−0.0015
			(−0.78)	(−0.63)
LOSS			0.0072	0.0071
			(0.90)	(0.89)
VOL			−0.0110	−0.0091
			(−0.87)	(−0.73)
INST			0.0007***	0.0007***
			(6.91)	(6.98)
HORIZON			0.0449***	0.0449***
			(10.89)	(10.90)
COVERAGE			−0.0015***	−0.0015***
			(−5.51)	(−5.53)
Constants	0.0298***	0.0308***	−0.6113***	−0.6198***
	(50.56)	(79.88)	(−7.92)	(−8.12)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	168,044	168,044	168,044	168,044
Adjusted R^2	0.2120	0.2117	0.2543	0.2542

4.3. Exclusion of an alternative explanation

It is possible that the above positive relation is simultaneously driven by favorable private information about future prospects. On the one hand, it is reasonable to expect that controlling shareholders are more likely to pledge their shares when they have private information that the firm is undervalued or when they are confident that future performance will meet expectations. On the other hand, analysts who have access to similar private information are also prompted to issue optimistic forecasts and recommendations. This alternative hypothesis needs to be ruled out before any inferences based on the collusion view can be drawn.

To examine whether controlling shareholders and analysts act on private information about undervaluation (the *undervaluation view*), we test whether share-pledging variables are positively associated with abnormal stock returns during specified horizons after share-pledging events (Chan et al., 2018). A positive association reflects the undervaluation of the firm. Conversely, if controlling shareholders collude with analysts to relieve the pressure of a margin call rather than to obtain the benefit of undervaluation, we can expect that abnormal returns are unrelated or even negatively related to share-pledging variables.

Following Bessembinder et al. (2018),[6] we use a two-stage method to assess average abnormal returns for firms with share-pledging events during specified post-event horizons of 6, 9, 12, and 24 months. In the first stage, we estimate predicted returns for all stocks using rolling averages of past slope coefficients:

$$E[(R_{i,t}|I_{t-1})] = \frac{1}{12}\sum_{s=t-12}^{t-1}\hat{\alpha}_s + (\frac{1}{12}\sum_{s=t-12}^{t-1}\hat{\beta}_s)X_{i,t-1} \quad (3)$$

where $R_{i,t}$ is the realized log of stock return for firm i in month t and $X_{i,t-1}$ is a vector of firm i's 14 characteristics measured at the end of month t-1. These 14 characteristics (see Panel B in the Appendix for their definitions) are winsorized within each month at the upper and lower 1% and are normalized by subtracting the mean and dividing by the standard deviation. The predicted log return for month t is the average regression intercept over the prior 12 months plus the sum of the products of average slope coefficients over the prior 12 months and firm characteristics at month t−1.

In the second stage, we conduct regression of abnormal returns (differences between realized and predicted returns) for all stocks on our variable of interest (*PLD*) and 14 firm characteristics as control variables:

$$R_{i,t} - E[(R_{i,t}|I_{t-1})] = \beta_0 + \beta_1 PLD_{i,t} + \sum_{k=1}^{14}\beta_k X_{i,t-1} + \mu_{i,t} \quad (4)$$

where *PLD* is set to 1 if the sample firm experiences a share-pledging event during a specified horizon (N months, where $N = 6$, 9, 12, 24) prior to month t and 0 otherwise. For example, *PLD* in month t equals 1 for firms that experience a share-pledging event between months *t-1* and *t-6* (or *t-9, t-12*, and *t-24* according to the specified horizon), and 0 otherwise. $X_{i,t-1}$ is the vector of firm i's 14 characteristics measured at the end of month t-1. Meanwhile, we cluster standard errors along the firm and year-month dimensions (Petersen, 2009). The coefficients of *PLD* reveal the extent to which the abnormal stock return differs during the specified post-event horizon for share-pledging firms as compared to non-share-pledging firms.

The results are presented in Table 4. Panel A reports the first-stage regression results estimating the predicted returns based on the 14 characteristics model. Panel B presents the second-stage regression results for the four different horizons (6, 9, 12, and 24 months). As shown, the coefficients of *PLD* are consistently significant, with negative signs for the 6-, 9-, and 12-month horizons. Although the coefficient of *PLD* remains negative for the 24-month horizon, it becomes insignificant. Despite this, these negative and insignificant results offer strong empirical evidence against the undervaluation view, showing that controlling shareholders' and analysts' possession of private information about undervaluation does not drive our main results.

4.4. Robustness checks

We run a few sensitivity tests to check the robustness of our results. First, it can be argued that analyst optimism leads to an increase in share price and thus stimulates controlling shareholders to pledge their shares. To rule out this reverse causality, we rerun all tests using the 1-year lag of share pledging. Specifically, *LPLD* (*LPLR*) is given a value of 1 (share pledge ratio) if firm i participates in share pledging by the end of 1 year prior to analyst j's earnings forecast and 0 otherwise. Our key results remain consistent with those reported in the first two columns of Table 5.

[6] Bessembinder et al. (2018) argue that "characteristic-based predicted returns have considerable success in explaining average log returns to firms engaging in important corporate events in the following months" (p. 95).

Table 4
Share pledging and abnormal stock return.

Panel A: Average coefficients for each firm characteristic across the sample period

	Log return
Log Size	−0.1699***
	(−3.64)
Log BTM	0.2823***
	(5.28)
Momentum	0.2533***
	(4.56)
ROA	0.0439
	(0.88)
Log AG	−0.3321***
	(−6.65)
Beta	0.1114***
	(3.40)
Accrual	−0.0541
	(−1.05)
Dividend	0.0656
	(1.17)
Log LReturn	0.0840
	(1.58)
Idio. risk	−0.0689
	(−1.50)
Illiquidity	0.3342***
	(7.97)
Turnover	−0.0177
	(−0.59)
Leverage	−0.3648***
	(−6.10)
Sale/price	0.1604***
	(3.28)
Constant	−0.8824***
	(−7.54)
R^2	0.0858

Panel B: Share pledge and abnormal stock return

Variable	(1)	(2)	(3)	(4)
	Dependent Variable = Abnormal return			
	6 months	9 months	12 months	24 months
PLD	−0.1838***	−0.1440***	−0.0608*	−0.0258
	(−4.56)	(−3.29)	(−1.96)	(−0.92)
Constant	0.3196***	0.3432***	0.3211***	0.3298***
	(3.43)	(3.89)	(3.47)	(3.66)
Controls	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
N	316,810	316,810	316,810	316,810
Adjusted R^2	0.0101	0.0100	0.0102	0.0101

This table presents average coefficients over the sample period based on BJZ's C14 firm characteristics model regressions. The dependent variable is the monthly log stock return and the independent variables are 14 firm characteristics measured at the end of the preceding month. Firm characteristics are winsorized within each month at the upper and lower 1%, and are normalized by subtracting the mean and dividing by the standard deviation. See the Appendix for detailed definitions and measurement of variables. The t-statistics based on standard errors clustered at the firm and year-month levels are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

This table presents coefficients estimated from BJZ's C14 firm characteristics model regressions on PLD dummies, where the dependent variable is abnormal return calculated as the realized monthly log return less the predicted log return. The predicted log return for month t is the average regression intercept over the prior 12 months plus the sum of products of average slope coefficients over the prior 12 months and month t-1 characteristics. PLD takes a value of 1 if a sample firm experienced a share-pledging event during a specified horizon (N months, N = 6, 9, 12, 24) prior to month t and 0 otherwise. Control variables include 14 firm characteristics according to BJZ's C14 model. See the Appendix for detailed definitions and measurement of variables. The t-statistics, based on standard errors clustered at the firm, year, and month levels, are displayed in parentheses. N is the number of valid observations in the regressions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Second, because IPO firms may engage in earnings manipulation, analyst forecast bias tends to be higher for these firms (Huyghebaert and Xu, 2016). We rerun all analyses excluding all IPO firms. Columns (3) and (4) of Table 5 report these results, and our inferences based on these specifications are maintained.

Third, because many of our variables are constant at the firm-year level, we also estimate firm-year-level models as a robustness check. We first average the analyst-level variables for each firm-year. *MAFE* is calculated as the mean *AFE* for all analysts within a company during the year. Then we regress the 1-year lag of share pledging (*PLD* and *PLR*) on analyst forecast (*MAFE*), where *PLD* (*PLR*) is defined as whether the controlling shareholder of a firm pledges shares (pledged share ratio) in the prior year. The results of this specification are presented in columns (5) and (6) of Table 5 and are similar to those of our main analysis.

Fourth, earnings forecasts are quantitative in nature and it is easier to check the accuracy ex-post. Recommendations reflect analysts' opinions of value relative to the current price, so management is more likely to pressure analysts to inflate their stock recommendations rather than earnings. Descriptive statistics in our sample show that 90% of analyst recommendations in China are strong buy or buy, which leads to little variation and limited information content. Thus, we use analyst recommendation (*REC*) as an alternative proxy for analyst optimism (Cowen et al., 2006). *REC* is coded 5 for strong buy, 4 for buy, 3 for hold, 2 for sell, and 1 for strong sell (Chan et al., 2004). Our results reported in columns (7) and (8) of Table 5 show that the coefficients of *PLD* and *PLR* are still positive and significant, which indicates that analysts tend to make more favorable recommendations for share-pledging firms than non-share-pledging firms, or firms with higher ratios of shares pledged. The results are still consistent with our main inferences.

Finally, to further validate our main inferences and any causal relation, we use the release of pledged shares as the source of an exogenous event and examine changes in analyst optimism around this release event. We use only a subsample of all share-pledging firms, which includes firms whose controlling shareholders experience a share-pledging release (treatment group; *RELEASE_D = 1*) and those whose controlling shareholders have their shares pledged over the whole sample period (control group; *RELEASE_D = 0*). Note that we exclude firms that announce multiple share-release events in a particular year. *RELEASE_D* (or *RELEASE_R*) is given a value of 1 (or the ratio of total released shares to the total shares pledged by firms' controlling shareholders) if share-pledging firm i experiences a release event of their shares in year t and 0 otherwise. *POST* is a dummy variable that equals 1 if it is in the post-release period in year t and 0 otherwise. *RELEASE_D*×*POST* and *RELEASE_R*×*POST* are interaction terms,

Table 5
Share pledging and analyst optimism: Robustness tests
This table presents the results of robustness tests of the relation between share pledging and analyst optimism. In columns (1) and (2), we use the 1-year lag of share pledging as the dependent variable. In columns (3) and (4), we delete IPO observations from our sample. In columns (5) and (6), we regress the 1-year lag of share pledging (PLD and PLR) on analyst forecast (MAFE) at the firm-year level, and MAFE is calculated as the mean AFE of all analysts within a company during the year. In columns (7) and (8), we use analyst recommendation (REC) as an alternative proxy for analyst optimism. In columns (9) and (10), we keep only a subsample of all share-pledging firms, which include firms whose controlling shareholders have experienced a share-pledging release (treatment group; RELEASE_$D = 1$) and firms whose controlling shareholders have their shares pledged over the whole sample period (control group; RELEASE_$D = 0$). We exclude firms that have announced multiple share-release events in a particular year. RELEASE_D (or RELEASE_R) is given a value of 1 (or the ratio of total released shares) if share-pledging firm i experienced a release event of its shares in year t and 0 otherwise. POST is a dummy variable that equals 1 if it is in the post-release period in year t and 0 otherwise. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	(1) AFE	(2) AFE	(3) AFE	(4) AFE	(5) MAFE	(6) MAFE	(7) REC	(8) REC	(9) AFE	(10) AFE
	1-year lag of share pledging		Delete IPO observations		Firm-level analysis		Analyst recommendation		Share-pledging release	
PLD	0.0087***		0.0106***		0.0202***		0.0212**			
	(3.24)		(3.67)		(7.24)		(2.75)			
PLR		0.0117**		0.0163***		0.0278***		0.0260**		
		(2.80)		(3.95)		(5.18)		(2.90)		
RELEASE_D POST									−0.0128***	
									(−3.54)	
RELEASE_R POST										−0.0327***
										(−3.15)
Constant	−0.6264***	−0.6255***	−0.6277***	−0.6369***	−0.4974***	−0.5185***	−0.4974***	−0.5185***	−0.8214***	−0.8020***
	(−8.23)	(−8.17)	(−7.92)	(−8.10)	(−6.93)	(−7.16)	(−6.93)	(−7.16)	(−5.03)	(−4.99)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
N	145,208	145,208	159,175	159,175	14,736	14,736	168,044	168,044	10,165	10,165
Adjusted R2	0.2534	0.2534	0.2547	0.2545	0.1261	0.1252	0.3116	0.3116	0.3395	0.3395

and their regression coefficients represent the difference in analyst optimism between the treatment and control firms from the pre-release period to the post-release period. The results are reported in columns (9) and (10) of Table 5. The coefficients of *RELEASE_D*×*POST* and *RELEASE_R*×*POST* in these two columns are negative and significant, which indicates that the incentive for controlling shareholders and analysts to collude to issue optimistic earnings forecast is weakened after pledged shares are released, and that analyst optimism decreases with a decrease in pledged shares.

5. Additional analyses

5.1. Moderating variables

In this section, we examine factors that increase or decrease the motivation for controlling shareholders and analysts to collude, such as prior stock performance, level of marketization, analyst connections with firms, and analyst reputation.

5.1.1. Prior stock performance

We expect that the incentive to collude is likely to be stronger when firms are under greater pressure of a margin call. Firms that experience a consistent drop in price and have poor recent stock returns are more likely to trigger a margin call (Chan et al., 2018). Thus, pledging firms benefit more from colluding with analysts to issue optimistic earnings forecasts to support the declining stock price (Ackert and Athanassakos, 1997; Das et al., 1998). Firms' recent stock return (*RET*) is measured as the log gross return in the N months before the analyst forecast is issued (where $N = 1, 2, 3$). Specifically, we create two truncation variables: *RET_N* and *RET_P*. *RET_N* equals *RET* if it is negative and 0 otherwise. *RET_P* equals *RET* if it is positive and 0 otherwise. We expect the coefficients of *RET_P*×*PLD* and *RET_P*×*PLR* to be insignificant because managers are unlikely to be facing a margin call if the share price has been rising, and thus there is little incentive for analysts to bias their forecasts upward for pledged firms. However, when there are negative prior stock returns, the likelihood of a margin call for pledged shares is higher, so managers have a greater incentive to pressure analysts to bias their forecasts. Thus, we predict that the coefficients of *RET_N*×*PLD* and *RET_N*×*PLR* are statistically significant with a positive sign.

We present the findings in columns (1)–(6) of Table 6. Columns (1) and (2) present the results when *RET* is calculated 1 month before the analyst forecast is issued. Columns (3) and (4) present the results when *RET* is calculated 2 months before it is issued. Columns (5) and (6) present the results when *RET* is calculated 3 months beforehand. As shown in the table, the coefficients of *RET_N*×*PLD* and *RET_N*×*PLR* in all columns are consistently positive and significant at least at the 5% level. In contrast, the coefficients of *RET_P*×*PLD* and *RET_P*×*PLR* are not significantly distinguished from zero. These results suggest that the effect of share pledging on analyst forecast optimism is indeed causal. Specifically, share-pledging firms that face greater pressure of a margin call have a stronger incentive to collude with analysts to make more optimistic earnings forecasts. These effects are also economically significant. The increase in analyst optimism by share-pledging firms is 177.13% (128.96%, 102.74%) higher when these firms experience a negative return 1-month (2-month, 3-month) before the analyst forecast is issued.[7] Similarly, for every one standard deviation increase in share-pledging ratio, the increase in analyst optimism is 64.37% (45.24%, 41.63%) higher when these firms experience a neg-

[7] 0.0581/0.0328=177.13%, where 0.0581 is the coefficient estimate of *PLD*×*RET_N* in Column (1) of Table 6, and 0.0328 is the mean value of analyst optimism (*AFE*), which is reported in Table 2. The methods to calculate the economic significance of other moderators are similar (Alok and Ayyagari, 2020). We thus do not repeat the calculations for other moderators.

Table 6
Moderating effects of stock return
This table presents the results of ordinary least squares regressions of the impact of stock return on the association between share pledging and analyst optimism. The sample size (N) is 168,044 firm-year-analyst observations. Firms' recent stock return (RET) is measured as the log gross return in the N-months before the analyst forecast is issued (N = 1, 2, 3). Specifically, we create two truncation variables, RET_N and RET_P. RET_N equals RET if it is negative and 0 otherwise. RET_P equals RET if it is positive and 0 otherwise. The dependent variable is AFE, which is analyst optimism. PLD and PLR are two explanatory variables. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	AFE 1-month	AFE	AFE 2-month	AFE	AFE 3-month	AFE
PLD	0.0129***		0.0131***		0.0128***	
	(4.51)		(4.58)		(4.37)	
PLD×RET_P	−0.0067		−0.0076		−0.0050	
	(−0.45)		(−0.70)		(−0.48)	
PLD×RET_N	0.0581***		0.0423***		0.0337***	
	(3.19)		(4.33)		(3.39)	
PLR		0.0200***		0.0212***		0.0196***
		(4.23)		(4.42)		(3.71)
PLR×RET_P		−0.0036		−0.0170		−0.0002
		(−0.14)		(−0.81)		(−0.01)
PLR×RET_N		0.0912***		0.0641***		0.0589**
		(3.39)		(3.67)		(3.06)
RET_P	0.0119	0.0106	0.0038	0.0038	0.0015	0.0003
	(1.39)	(1.36)	(0.86)	(0.85)	(0.43)	(0.11)
RET_N	−0.0142	−0.0102	−0.0047	−0.0015	0.0004	0.0023
	(−1.26)	(−0.96)	(−0.53)	(−0.18)	(0.05)	(0.36)
Constant	−0.6163***	−0.6240***	−0.6148***	−0.6225***	−0.6158***	−0.6237***
	(−7.89)	(−8.09)	(−7.71)	(−7.90)	(−7.83)	(−8.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	168,044	168,044	168,044	168,044	168,044	168,044
Adjusted R^2	0.2546	0.2545	0.2545	0.2544	0.2545	0.2544

ative return 1-month (2-month, 3-month) before the analyst forecast is issued.[8]

5.1.2. Level of marketization

Previous studies find that the level of marketization in a region is likely to moderate the relation between share pledging and corporate behaviors (Ouyang et al., 2019; Xu, 2019; Xu et al., 2020). We use the marketization index to measure regional institutional development, which is based on provincial development of the capital market, private sector, product market, legal institution, and contract enforcement (Wang et al., 2016). In regions with a lower marketization index, local government interventions and local protectionism prevail (Cheng et al., 2015). If the controlling shareholders of share-pledging firms lose the control due to the liquidation of pledged shares, local governments have greater incentives to intervene and adopt various measures to prevent the transfer of ownership to other regions, because these listed firms are often the pillar of the local economy and the main source of their fiscal revenue. In contrast, regions with a higher marketization index have less government interventions, better legal environments, and more advanced market development. Due to the lack of local protectionism, controlling shareholders of share-pledging firms in these regions are subject to greater risk of losing control of ownership (Ouyang et al., 2019). Therefore, we expect that controlling shareholders tend to have a stronger incentive to boost the stock price and collude with analysts to obtain optimistic forecasts.

[8] 0.0912×0.2315/0.0328=64.37%, where 0.0912 is the coefficient estimate of *PLR*×*RET_N* in Column (2) of Table 6, 0.2315 is the standard deviation of *PLR*, and 0.0328 is the mean value of analyst optimism (*AFE*), which is reported in Table 2. The methods for calculating the economic significance of other moderators are similar (Alok and Ayyagari, 2020). We thus do not repeat the calculations for other moderators.

Table 7
Moderating effects of marketization
This table presents the results of ordinary least squares regressions of the impact of marketization on the association between share pledging and analyst optimism. The sample size (N) is 168,044 firm-year-analyst observations. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Variable	AFE	AFE
PLD	0.0033	
	(0.69)	
PLD×MLEVEL	0.0144**	
	(2.27)	
PLR		0.0036
		(0.63)
PLR×MLEVEL		0.0262**
		(2.45)
MLEVEL	−0.0016***	−0.0017***
	(−11.61)	(−12.69)
Constants	−0.6031***	−0.6133***
	(−7.90)	(−8.13)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Broker fixed effects	Yes	Yes
N	168,044	168,044
Adjusted R^2	0.2548	0.2547

MLEVEL equals 1 if a firm is registered in a province with a higher than median marketization index for the year and 0 otherwise. We present the findings in Table 7. The coefficients of

PLD×*MLEVEL* and *PLR*×*MLEVEL* are consistently positive and significant at the 5% level. Hence, firms located in provinces with a high level of marketization get more optimistic analyst forecasts when their controlling shareholders have pledged their shares for personal loans. These findings are consistent with our conjecture. These effects are also economically significant. The increase in analyst optimism by share-pledging firms is 43.90% greater when in provinces with a high level of marketization than in other provinces. Similarly, for every one standard deviation increase in the share-pledging ratio, the increase in analyst optimism is 18.49% greater in provinces with a high level of marketization than in other provinces.

5.1.3. Analyst connections with firms (related and local analysts)

Local or related analysts are able to gain a comparative information advantage through their social networks with managers (Cohen et al., 2010). The communal norms and resultant mutual trust shared by connected analysts and managers lower collusion costs (Cohen et al., 2010; Peng and Luo, 2000). These analysts thus have strong incentives to maintain close connections and form collusive alliances with managers in exchange for private benefits.[9] We expect that the positive association between share pledging and analyst optimism is strengthened when analysts have close connections with firms (i.e., when they are local or related analysts).

We use two proxies to measure whether an analyst has a close connection with a firm: *LOCAL* and *RELATED*. *LOCAL* is a dummy variable that equals 1 when the brokerage firm and the headquarters of the company are located in the same city and 0 otherwise (Han et al., 2018). *RELATED* is a dummy variable that equals 1 if an analyst is affiliated with a brokerage firm that participates in activities such as share pledging of listed companies, IPOs, seasoned equity offerings, and so on, and 0 otherwise. The results are reported in Table 8. Consistent with our expectations, the interaction terms *PLD*×*RELATED, PLR*×*RELATED, PLD*×*LOCAL*, and *PLR*×*LOCAL* are positive and significant in predicting analyst optimism. This suggests that on average local (related) analysts issue more optimistic forecasts for pledged firms compared to unrelated (nonlocal) analysts. This indicates that the collusion benefits associated with share pledging are greater when analysts have close connections with firms. These effects are also economically significant. The increase in analyst optimism by share-pledging firms is 19.51% (108.54%) greater when analysts are local (related). Similarly, for every one standard deviation increase in share-pledging ratio, the increase in analyst optimism is 8.47% (41.57%) greater when analysts are local (related).

5.1.4. Star analysts and brokerage size

We also explore the role that analyst reputation plays in moderating the relation between share pledging and analyst optimism. Reputable analysts are able to resist pressure to collude with managers and controlling shareholders to issue biased forecasts to maintain their professional reputation (Bradley et al., 2012; Fang and Yasuda, 2009; Jackson, 2005; Ljungqvist et al., 2006). Reputation loss arising from either the loss of investor clients or legal costs associated with lawsuits related to analyst bias is typically greater for star analysts or large brokerage firms (Karamanou, 2011; Ljungqvist et al., 2007). Thus, we predict that star analysts and those who are affiliated with larger brokerage firms exhibit less optimism for firms whose controlling shareholders have pledged or pledge a high ratio of their shares.

We consider two proxies for analysts' incentives to maintain their reputation: star analyst (*STAR*) and brokerage size (*BSIZE*). *STAR* is a dummy variable that equals 1 if an analyst is chosen by *The New Fortune* as one of the top 5 analysts in year t (regarded as a star analyst) and 0 otherwise. *BSIZE* is a dummy variable that equals 1 if an analyst is affiliated with a brokerage firm whose size is greater than the sample median and 0 otherwise. The results are reported in Table 9. Consistent with our expectations, the interaction terms *PLD*×*STAR* and *PLR*×*STAR* are negative and significant. Similar results are also found for the interaction terms *PLD*×*BSIZE* and *PLR*×*BSIZE*. The results support our predictions, indicating that reputation serves a disciplinary role with regard to incentives to collude and issue biased forecasts. These effects are also economically significant. The increase in analyst optimism by share-pledging firms is 18.6% (7.93%) less when analysts are star analysts (when analysts are affiliated with a larger brokerage firm). Similarly, for every one standard deviation increase in the share-pledging ratio, the increase in analyst optimism is 8.68% (3.81%) less when analysts are star analysts (when analysts are affiliated with a larger brokerage firm).

5.2. Further robustness tests

5.2.1. Timing of analyst forecast relative to the earnings announcement

Previous studies show that an optimistic forecast bias will result in a negative market reaction after an earnings announcement (Ackert and Athanassakos, 1997; Boudt et al., 2015; Chahine, 2004). Analysts are less likely to issue a favorable earnings forecast when their forecast date is close to the earnings announcement date (Ciccone, 2003). As firms' actual earnings are revealed in the earnings announcement, firms whose earnings are overestimated will experience consistently negative abnormal returns. Analysts' reputation among investors will also be damaged when subsequent earnings contradict their forecasts (Raedy et al., 2006).

We first consider the strategies that firms' controlling shareholders undertake to respond to the pressure of a margin call derived from the potential negative market reaction to biased analyst forecasts. Specifically, we examine the distribution of pledging-release events over a certain period before the earnings announcement. If the pledged company experiences a large-scale pledge release before the actual earnings announcement date, it indicates that the company has implemented a countermeasure to offset the negative impacts of the collusion. The results are presented in Panel A of Table 10. Column (2) shows that 40% of companies release their pledged shares within 3 months, and 30% of companies release their shares within 4–6 months. This shows an increase in pledged share-release events when the earnings announcement date approaches. Furthermore, we define high (low) analyst optimism when the mean *AFE* of a firm before the date of the pledged share release is higher (lower) than the mean *AFE* of all analyst forecasts in the same period. The results in columns (3) and (4) show that pledged share-release events occur more frequently in the high analyst optimism group than the low analyst optimism group (5663 vs. 3362 cases within 3 months; 4288 vs. 2290 cases within 4–6 months). This descriptive analysis suggests that firms with more optimistic analyst forecasts tend to make their pledged share releases when the earnings announcement date approaches to protect against price decreases and the pressure of a margin call.

[9] The Shenzhen Stock Exchange issued the "Guidelines for Fair Information Disclosure of Listed Companies on the Shenzhen Stock Exchange" (hereafter, the Guidelines) in 2006, which was subsequently formulated into the Guidelines of the Shenzhen Stock Exchange for Standardized Operation of Companies in 2010 for all companies' compliance and implementation. Although the Guidelines require public companies listed on the Shenzhen Stock Exchange to disclose material information to all investors at the same time, and prohibit major information such as financial assets, mergers and acquisitions, and reorganizations from being disclosed through private channels prior to public disclosure, they have no mandatory enforcement power, making the guidelines less effective. This ineffectiveness is evidenced by many previous Chinese studies finding that analysts, particularly local or affiliated analysts, can still get private information from managers and issue more optimistically biased forecasts (e.g., Chan et al., 2019; Gu et al., 2013; Gu et al., 2019; Li et al., 2020b; Wang et al., 2017).

Table 8
Moderating effects of analyst connections with firms
This table presents the results of ordinary least squares regressions of the impact of analysts' close connections with firms on the association between share pledging and analyst optimism. The sample size (N) is 168,044 firm-year-analyst observations. Columns (1) and (2) present the regression results for related analysts and columns (3) and (4) present the regression results for local analysts. LOCAL and RELATED are the two variables of interest. LOCAL is a dummy variable that equals 1 if the brokerage firm and the headquarters of the company are located in the same city and 0 otherwise. RELATED is a dummy variable that equals 1 if an analyst is affiliated with a brokerage firm that participates in activities such as share pledging of listed companies, IPOs, seasoned equity offerings, and so on, and 0 otherwise. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	AFE	AFE	AFE	AFE
Variable	Related analysts		Local analysts	
PLD	0.0099***		0.0102***	
	(3.47)		(3.47)	
PLR		0.0154***		0.0153***
		(3.60)		(3.59)
PLD×RELATED	0.0064**			
	(2.99)			
PLR×RELATED		0.0120**		
		(2.71)		
PLD×LOCAL			0.0356**	
			(2.70)	
PLR×LOCAL				0.0589***
				(9.46)
RELATED	−0.0009	−0.0008		
	(−1.36)	(−1.08)		
LOCAL			−0.0025	−0.0059*
			(−0.38)	(−1.95)
Constants	−0.6110***	−0.6195***	−0.6107***	−0.6194***
	(−7.92)	(−8.12)	(−7.90)	(−8.13)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	168,044	168,044	168,044	168,044
Adjusted R^2	0.2544	0.2543	0.2546	0.2547

Table 9
Moderating effects of star analyst and brokerage size.
This table presents the results of ordinary least squares regressions of the impact of star analyst and brokerage size on the association between share pledging and analyst optimism. The sample size (N) is 168,044 firm-year-analyst observations. Columns (1) and (2) present the regression results for star analyst, and columns (3) and (4) present the regression results for brokerage size. STAR and BSIZE are the two variables of interest. STAR is star analyst, and BSIZE is brokerage firm size. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	AFE	AFE	AFE	AFE
Variable	Star analyst		Large brokerage firm	
PLD	0.0115***		0.0118***	
	(3.82)		(4.03)	
PLR		0.0189***		0.0170***
		(4.37)		(4.23)
PLD×STAR	−0.0061***			
	(−5.01)			
PLR×STAR		−0.0123***		
		(−6.48)		
PLD×BSIZE			−0.0026***	
			(−3.32)	
PLR×BSIZE				−0.0054**
				(−2.73)
STAR	−0.0011*	−0.0012*		
	(−2.12)	(−1.97)		
BSIZE			0.0003	−0.0002
			(0.28)	(−0.24)
Constants	−0.6116***	−0.6200***	−0.6192***	−0.6272***
	(−7.94)	(−8.13)	(−8.14)	(−8.36)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	168,044	168,044	168,044	168,044
Adjusted R^2	0.2545	0.2544	0.2567	0.2565

Table 10
Timing of the analyst forecast relative to the earnings announcement.

Panel A: Distribution of pledged share releases before the date of the earnings announcement

(1) Pledged-share release date to earnings announcement	(2) Controlling shareholder pledged-share releases	(3) High-optimism forecast releases	(4) Low-optimism forecast releases
Within 3 months	9025	5663	3362
Within 4–6 months	6978	4288	2690
Within 7–9 months	5053	2908	2145
More than 10 months	1774	909	865
Total	22,830	13,768	9062

Panel B: Moderating effects of the timing of the analyst forecast relative to the earnings announcement

Variable	(1) AFE Distant	(2) AFE Close	(3) AFE Distant	(4) AFE Close
PLD	0.0131***	0.0052*		
	(3.91)	(2.04)		
PLR			0.0234***	0.0103**
			(3.58)	(2.95)
Constant	−0.8885***	−0.3551***	−0.8999***	−0.3591***
	(−7.02)	(−6.70)	(−7.23)	(−6.75)
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	84,059	83,985	84,059	83,985
Adjusted R^2	0.3048	0.2190	0.3048	0.2190
Difference between the two groups	$P = 0.017$**	$P = 0.033$**		

This table presents the distribution of controlling shareholders' pledged share releases over certain time periods before the announcement of corporate earnings. Column (1) lists the time frames between the date of pledged-share releases and the date of earnings announcement. Column (2) lists the number of pledged-share releases for the full sample. Columns (3) and (4) present the distribution of pledged-share releases for the high and low analyst optimism subsamples, respectively, where high (low) analyst optimism means that the mean AFE of the firm before the date of the announcement is higher (lower) than the mean AFE of all analyst forecasts in the same period.

This table presents the results of ordinary least squares regressions of the moderating effects of the timing of the earnings forecast relative to the earnings announcement on the relation between share pledging and analyst optimism. We calculate the number of days between the earnings forecast date and the earnings announcement date, and use the year median value to classify our sample into two groups: a distant group and a close group. The sample size is 84,059 and 83,985 firm-year-analyst observations for each group. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Furthermore, we conduct a multivariate test to examine whether the relation between share pledging and analyst optimism is weaker when the analyst forecast date is close to the earnings announcement date. We first calculate the number of days between the earnings forecast date and the earnings announcement date. Then we use the year median as the cutoff to classify our sample into two groups: a distant group and a close group. Panel B of Table 10 presents the results. We find that the coefficients of *PLD* and *PLR* in both the distant and close groups are positive and significant at least at $p < 0.1$. In addition, the results of Fisher's permutation test (Cleary, 1999) show that the differences in the regression coefficients (*PLD* and *PLR*) between the two groups are significant at $p < 0.05$. These results suggest that the incentive to collude decreases as the earnings release date approaches. This is because firms gain less benefit from upward analyst forecast bias and are easily caught when their actual earnings are subsequently revealed to be less than expected.

5.2.2. Timing of analyst forecast relative to the share-pledging event

It is likely that firms are interested in forming a collusive alliance over the loan term of share pledging to stabilize the price to avoid the risk for a margin call. We expect that the incentive to collude is stronger in the early stages of the share-pledging loan than in later stages. As the end of the loan term approaches, the associated risks and incentives to collude diminish. To test whether analyst optimism is stronger when the earnings forecast is issued within a shorter time frame after the share-pledging event, we classify our sample observations into three different groups based on the elapsed time between the inception of share pledging and the issuing of analysts' earnings forecasts: less than 3 months, 4–6 months, and more than 6 months. The results reported in Table 11 show that all coefficients of *PLD* and *PLR* are significant and positive, which confirms our main analyses. However, the coefficients of *PLD* and *PLR* for less than 3 months are largest (0.0154 for *PLD* and 0.0240 for *PLR*) and significant at the conventional level. We also observe a downward trend in the magnitude of the coefficients of *PLD* and *PLR*, which is consistent with our expectation that when share-pledging loans approach their expiration dates, the incentive to collude may gradually disappear.

5.2.3. Analyst forecast horizon

Prior studies show that analysts' forecast optimism increases as the length of the forecast horizon increases (Ackert and Athanassakos, 1997, 2003). The predictive power of earnings quickly deteriorates for longer prediction horizons, so it is more difficult for analysts to give accurate forecasts for a distant future (Dichev and Tang, 2009; Raedy et al., 2006). In addition, there is a large amount of time for analysts to correct their predictions before the earnings announcement. Investors also tend to lower their expectations of forecast accuracy and have more tolerance for analyst optimism for long horizon forecasts. Therefore, analysts face less risk to their reputations and careers by issuing optimistic longer-horizon forecasts for share-pledging firms in exchange for private benefits.

We thus run separate regressions for different forecast horizons to see whether our results vary by forecast horizon. We classify

Table 11
Moderating effects of the timing of the analyst forecast relative to the share-pledging event
This table presents the results of ordinary least squares regressions of the moderating effects of the timing of the earnings forecast relative to the share-pledging event on the relation between share pledging and analyst optimism. We calculate the number of days between the analyst forecast date and the share-pledging event date, and classify our sample into three groups: less than 3 months, 4–6 months, and more than 6 months. The sample size is 152,988, 146,949, and 158,735 firm-year-analyst observations for the three groups, respectively. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) AFE Less than 3 months	(2) AFE	(3) AFE 4–6 months	(4) AFE	(5) AFE More than 6 months	(6) AFE
PLD	0.0154***		0.0103**		0.0047**	
	(3.62)		(2.95)		(2.79)	
PLR		0.0240***		0.0180**		0.0079**
		(3.65)		(3.05)		(2.83)
Constant	−0.6099***	−0.6197***	−0.6010***	−0.6071***	−0.6106***	−0.6168***
	(−7.64)	(−7.90)	(−7.33)	(−7.54)	(−6.96)	(−7.14)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	152,988	152,988	146,949	146,949	158,735	158,735
Adjusted R^2	0.2630	0.2629	0.2578	0.2577	0.2590	0.2589
Difference to less than 3 months			$P = 0.781$	$P = 0.814$	$P = 0.007$***	$P = 0.023$**

Table 12
Moderating effects of forecast horizon
This table presents the results of ordinary least squares regressions of th
e relation between share pledging and analyst optimism with different forecast horizons. Columns (1) and (2) present the regression results for a 2-year forecast horizon, and columns (3) and (4) present the results for a 3-year forecast horizon. The sample size (N) is 145,907 and 95,338 firm-year-analyst observations for each group, respectively. See the Appendix for detailed definitions and measurement of variables. We include year fixed effects, firm fixed effects, and broker fixed effects to control for any variation in time, firm, and broker characteristics, respectively. T values are reported in parentheses. Standard errors are clustered along the analyst, firm, broker, and year dimensions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) AFE 2-year horizon	(2) AFE	(3) AFE 3-year horizon	(4) AFE
PLD	0.0153***		0.0342***	
	(3.49)		(4.71)	
PLR		0.0276***		0.0464***
		(3.72)		(4.89)
Constant	−0.4770***	−0.4854***	−0.6214***	−0.6302***
	(−3.40)	(−3.51)	(−4.33)	(−4.40)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Broker fixed effects	Yes	Yes	Yes	Yes
N	145,907	145,907	95,338	95,338
Adjusted R^2	0.2736	0.2733	0.3140	0.3139
Difference to 1-year horizon	$P = 0.431$	$P = 0.342$	$P = 0.046$**	$P = 0.035$**

analyst forecasts into two groups: 2-year horizon (the forecast is issued 2 years before) and 3-year horizon (the forecast is issued 3 years before).[10] Columns (1) and (2) of Table 12 present the results for the 2-year forecast horizon, whereas columns (3) and (4) report those for the 3-year forecast horizon. As shown, the coefficients of *PLD* and *PLR* are significant and positive for both horizons, consistent with our main analyses. The increase in analyst optimism by share-pledging firms is 35.68% (51.51%) greater when analyst earnings forecasts are in a 2-year (3-year) forecast horizon.[11] Similarly, for every one standard deviation increase in the share-pledging ratio, the increase in analyst optimism is 15.91% (20.53%)[12] greater when analyst earnings forecasts are in a 2-year (3-year) forecast horizon. Further, we run a seemingly unrelated estimation test (SUEST) and examine whether the coefficients of *PLD* and *PLR* are significantly different between the 2-year and 3-year forecast horizons. The results suggest that the increase in analyst optimism is significantly higher when analyst earnings forecasts are in a 3-year forecast horizon than when they are in a 2-year forecast horizon (p-value = 0.0723 and 0.0931, respectively).[13]

[10] According to our data, Chinese analysts primarily forecast companies' earnings per share within 3 years. The number of observations in which analysts forecast companies' earnings per share beyond 3 years is less than 600, which is not representative of our sample.

[11] 0.0153/0.0429=35.68%, where 0.0153 is the coefficient estimate of *PLD* in Column (1) of Table 12 and 0.0429 is the mean value of analyst optimism (*AFE*) in the 2-year horizon sample. Similarly, 0.0342/0.0664=51.51%, where 0.0342 is the coefficient estimate of *PLD* in Column (3) of Table 12 and 0.0664 is the mean value of analyst optimism (*AFE*) in the 3-year horizon sample (Alok and Ayyagari, 2020).

[12] 0.0276×0.2473/0.0429=15.91%, where 0.0276 is the coefficient estimate of *PLR* in Column (2) of Table 12; 0.2473 is the standard deviation of *PLR* and 0.0429 is the mean value of analyst optimism (*AFE*) in the 2-year horizon sample. Similarly, 0.0464×0.2938/0.0664=20.53%, where 0.0464 is the coefficient estimate of *PLR* in Column (4) of Table 12; 0.2938 is the standard deviation of *PLR* and 0.0664 is the mean value of analyst optimism (*AFE*) in 3-year horizon sample (Alok and Ayyagari, 2020).

[13] The significance test results also indicate that the increase in analyst optimism is significantly higher when analyst earnings forecasts are in a 3-year forecast horizon than when they are in a 1-year forecast horizon (p-value = 0.046 and 0.035, respectively). However, we do not find that the increase in analyst optimism is significantly higher when analyst earnings forecasts are in a 2-year forecast horizon vs. a 1-year forecast horizon (p-value = 0.431 and 0.342, respectively).

These results suggest that the effect of share pledging on analyst optimism increases monotonically with a longer forecast horizon.

6. Conclusion

This study examines the relation between share pledging by controlling shareholders and analyst optimism in Chinese capital markets. Our findings show that share pledging is associated with more optimistic analyst forecasting, which supports the collusion view. The results of a range of robustness tests, including lead and lag analysis, alternative measures of our dependent variable, difference-in-differences design, and numerous alternative model specifications, remain unchanged. Furthermore, the positive relation is stronger for firms with poor prior stock performance, for firms that operate in a region with a higher level of marketization, and for analysts with close connections with firms. Moreover, we find that the relation is weaker for reputable analysts and those from large brokerage firms. Finally, the incentive to collude is weaker when the share-pledging loan approaches the end of its term, when the analyst forecast date is closer to the earnings announcement date, and is more pronounced when analysts make forecasts over a longer horizon.

Our study has implications for different stakeholders. Analysts play a crucial role in capital markets and have an impact on market expectations. Our results show that financial analysts have incentives to deliberately bias their earnings forecasts to build better relationships with management and derive informational benefits. These results are of interest to regulators who are interested in formulating policies to increase information transparency and constrain collusion between managers and analysts and establishing an environment in which information is fairly and efficiently transferred to all investors. In addition, we find that the extent to which analysts respond to the incentives they face to bias their forecasts is a function of the perceived benefits and costs associated with bias. Analysts face a trade-off between gains from long-term reputation and short-term opportunism. Reputation is an effective disciplinary device against conflicts of interest and collusion. Connections with firms seem to accelerate conflicts of interest given that analysts issue more biased forecasts when close connections exist. It is imperative for the industry to standardize analyst ratings and strengthen reputational mechanisms in restraining incentives to collude. Finally, our findings are also relevant to investors interpreting earnings forecasts for their investment decisions. Specifically, investors should be aware of potential risks for share-pledging firms when they evaluate firm value.

We acknowledge the following limitation of our study. Although share pledge data are available monthly, analyst forecasts of more frequent earnings (e.g., monthly and quarterly) are not available in China (Han et al., 2018). Future research could extend our analysis to an expanded sample using quarterly data in other research settings.

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CRediT authorship contribution statement

Jun Hu: Conceptualization, Methodology, Software, Validation. **Wenbin Long:** Formal analysis, Writing original draft, Writing review & editing, Project administration. **Le Luo:** Writing original draft, Writing review & editing. **Yuanhuai Peng:** Software, Data curation. All authors contributed equally to this work and are listed in alphabetical order.

Declaration of Competing Interest

None.

Appendix

Definitions and measurement of variables

Variable	Measurement
Panel A: Variables in the base model	
AFE	The difference between the earnings forecasted by the analyst and the real earnings of the firm divided by the actual net asset per share at the beginning of the year
PLD	A dummy variable that equals 1 if controlling shareholders of the firm have any stockholdings pledged and the analyst's earnings forecast is released after the share-pledging event in the year t and 0 otherwise
PLR	The number of shares pledged divided by the total number of shares owned by controlling shareholders, and the definition principle of PLR is the same as PLD
LEV	Total liabilities divided by total assets
SIZE	The natural logarithm of total assets at the end of the fiscal year
GROWTH	Annual growth in operating revenue
MB	The sum of market capitalization and the book value of liabilities divided by the total book value of assets
FOLLOW	The natural logarithm of 1 plus the number of analysts following the firm in a given year
LISTAGE	The natural logarithm of 1 plus the total number of years listed
LOSS	A dummy variable that equals 1 if the company reports a financial loss at the end of the fiscal year and 0 otherwise
VOL	Stock volatility, measured by the standard deviation of the 12 monthly stock returns preceding the forecast period t
HORIZON	Forecast horizon, measured as the natural logarithm of 1 plus the number of days between the date of the earnings announcement and the forecast date
INST	The total percentage of shares owned by institutional shareholders
COVERAGE	The natural logarithm of 1 plus the number of firms covered by an analyst.
Panel B: Variables for BJZ's C14 firm characteristics model regressions	
Log return	Monthly log stock return
Abnormal return	The realized monthly log return less the benchmark log return, which is obtained from BJZ's C14 firm characteristics model regressions
Log Size	The natural log of market capitalization, which is the stock price times the number of shares outstanding at the end of the prior month
Log BTM	The natural log of the book-to-market ratio at the end of the prior month; book value is the firm's common equity in the latest annual report, and market value is the firm's market capitalization at the end of the prior month
Momentum	Buy-and-hold stock returns over months (−12, −2) before the month of interest
ROA	Income before extraordinary items divided by average total assets in the year
Log AG	The natural log of the ratio of total assets at the end of the year to total assets at the beginning of the year
Beta	Market beta, estimated from monthly excess stock returns and market risk premiums over the preceding 60 months
Accrual	Change in working capital from the last year minus depreciation and amortization, divided by average total assets in the year; working capital equals current assets minus cash and short-term investment minus current liabilities plus debt in current liabilities plus income taxes payable
Dividend	Dividends per share over the prior 12 months divided by the price at the end of the prior month
Log LReturn	The natural log of buy-and-hold stock returns over months (−13, −36) before the month of interest
Idio. risk	In each month, we compute the standard deviation of the residual daily stock returns using Fama and French's (1993) three-factor regression; idiosyncratic risk is the average standard deviation over the prior 12 months
Illiquidity	The average daily ratio of absolute stock return to dollar trading volume during the prior 12 months, as defined by Amihud (2002)
Turnover	Average monthly turnover (shares traded divided by shares outstanding) during the prior 12 months
Leverage	Debt in current liabilities plus long-term debt, divided by market capitalization at the end of the last month
Sale/price	Sales divided by market capitalization at the end of the last month
Panel C: Variables for additional tests	
RET_N	A truncation variable that equals the log gross return in the N months before the analyst forecast is issued if it is negative and 0 otherwise
RET_P	A truncation variable that equals the log gross return in the N months before the analyst forecast is issued if it is positive and 0 otherwise
MLEVEL	Level of marketization; according to Wang et al. (2016), a value of 1 is assigned to provinces with a marketization index higher than the median, and a value of 0 is given to other provinces
RELATED	A dummy variable that equals 1 if the analyst is affiliated with a brokerage firm that participated in share pledging of listed companies, seasoned equity offerings, and so on, and 0 otherwise
LOCAL	A dummy variable that equals 1 if the analyst is affiliated with a brokerage firm that is located in the same city as the listed company's headquarters and 0 otherwise
STAR	A dummy variable that equals 1 if the analyst was chosen by *The New Fortune* as one of the top 5 analysts in year t (regarded as a star analyst) and 0 otherwise
BSIZE	A dummy variable that equals 1 if the analyst is affiliated with a brokerage firm whose size is greater than the sample median and 0 otherwise
Panel D: Other variables	
RELEASE_D	A dummy variable that equals 1 for firms that release shares pledged by controlling shareholders and 0 otherwise.
RELEASE_R	The number of pledged shares released divided by the total number of shares owned by controlling shareholders
POST	A dummy variable that equals 1 if it is in the post- release period and 0 otherwise.
MAFE	The mean AFE of all analysts within the company during the year
REC	A variable coded 5 for strong buy, 4 for buy, 3 for hold, 2 for sell, and 1 for strong sell

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