Institutional Bidding in IPO Allocation: Evidence from China

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Abstract

Using a proprietary data of bidding information by institutional bidders in IPO underwriting process, we examine information content of institutional bids. IPOs with higher levels of divergence of opinions among bidders experience greater first-day return than other IPOs, greater trading turnover and volatility. Our results hold after controlling for potential endogeneity. Divergence of opinions is negative predictive of one-year operating performance post-IPO and three-month stock performance. Bid characteristics such as the timing of the bid and the frequency and the type of the bidder, matter in the pricing of IPOs, as does the distance between bidders and the IPO firm. Institutional optimism is negatively related to first day IPO returns. Using a regulation change on the IPO share allocation rule as a natural experiment, we show that the new rule decreases the levels of divergence of opinions among institutional bidders but renders dispersion a greater impact on first day return. The evidence highlights the role of intuitions and regulatory policies on IPOs in China.

Keywords: Heterogeneous beliefs, Institutional investors, Book building, Initial public offering, IPO underpricing, China, Auction

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China's IPO (initial public offering) market has witnessed significant development during the past two decades, with the total market value of listed companies growing from virtually zero in the early 1990s to 21.15 trillion RMB (US$2.79 trillion) on August 9, 2007. In 2010, the 347 IPO listings (including those of Agricultural Bank of China and Everbright Bank) raised nearly 490 billion RMB (US$74.6 billion) through first-time share issues in the domestic A-share market, making it the world's largest IPO market. Unlike the United States, however, China's underwriting process includes an approval system in which qualified institutional investors are invited to bid for shares in soon-to-be public companies under the supervision and approval of the China Securities Regulatory Commission (CSRC). Hence, rather than underwriters having discretion in allocating shares, both underwriters and institutional investors must follow the guidelines[1] issued by the CSRC in what many believe is a highly inefficient approval-based system.

In an information acquisition model, on the other hand, underwriter control of allocations serves as a mechanism to induce institutional investors to reveal private information about IPO firms (Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990[2]), lead underwriters to price IPO stocks efficiently. In this model, institutional investors are expert at producing information on the worthiness of IPO companies and are thus assumed to play an important role in the IPO process. China's underwriting system for IPO allocation, however, follows a pro rata allocation rule,[3] which some argue is akin to an efficient auction approach. Degeorge, Derrien, and Womack (2010) basing on evidence that in U.S. IPO auctions propose that auctions can be an effective alternative to book-building procedures. Critics of the approval-based system, however, are concerned that institutional investors will simply inflate their bids in order to receive an allocation of shares.

Given China's IPO size and unique features, it is important to assess whether the Chinese IPO allocation mechanisms result in institutional investors producing valuable information or simply enjoying a free ride. To this end, we empirically examine the information role of institutional investors in China's IPO underwriting process using a large proprietary data set of detailed information on institutional bids (bidding price, bidding shares, and bidding institutions) for each IPO. Because Varian (1985) and Merton (1987) both suggest that divergence of opinion is positively related to future asset returns, we first construct

[1] This official guidance often involves asking issuing companies to refrain from overpricing, raising excess capital, and selling shares currently held by existing stakeholders. Underwriters and institutional investors consider such guidance to be de facto interference that often supresses the offering prices of new IPO stocks.

[2] Alternatively, Chemmanur (1993) argues that IPO firm insiders underprice their shares to induce outsiders to produce costly information.

[3] Institutional investors that bid above the final offer price receive shares allocated proportionally to the shares for which they bid.

several measures of institutional dispersion or divergence bidding prices. In doing so, we hypothesize that institutional bidding dispersion is positively related to IPO first-day return and share turnover, meaning that if institutional bids carry private information about IPO companies, dispersion will be related to firm performance ex post. We thus further hypothesize that bidding dispersion will negatively predict IPO long-run performance, including both operating performance and stock returns one year post-IPO. In addition, because optimistic investors' valuations are reflected in the marketplace when divergence of opinion about assets impacts pricing under short sale constraints (Miller, 1977), which are binding for new IPO shares, IPO markets are ideal settings in which to test the implications of optimism on asset pricing. That is, if institutional investors are optimistic, the offering price will be set higher and underpricing will be lower. Hence, our second hypothesis posits that institutional investors' optimism will be negatively related to underpricing.

One challenge for empirically studying these aspects is the availability of objective institutional bidding data in the IPO share allocation processes. The unique contribution of our paper, therefore, is that our large sample of IPO underwriting in China enables the construction of clean measures of opinion dispersion among institutional investors. The extant literature, in contrast, has had to rely on post-IPO market trading data to construct opinion divergence measures. Houge, Loughran, Suchanek, and Yan (2001), for example, find that opening spread, time of first trade, and flipping ratio are related to IPO first-day returns and long-run performance. The concern with their study, however, is that these measures, being ex post IPO process and noisy, are probably contaminated by the look forward bias embedded in secondary market trading. Our measures, in contrast, are clean and suffer no such bias.

Our proprietary IPO bidding data, which cover 783 IPOs listed from 2009 to 2012 on the Shenzhen Stock Exchange (SZSE), allows us to construct objective measures of opinion divergence among institutional IPO investors. We find that the divergence of institutional bids is positively associated with IPO first-day returns and trading volume as measured by turnover but negatively predicts stock returns or one year post-IPO operating performance. Not only do these measures of institutional bidding dispersion with predictive power for post-IPO performance constitute a significant contribution to the literature, but this empirical study is the first to provide evidence that institutional bids carry private information about IPO companies. We also address the endogeneity concern that unobserved IPO firm qualities may be correlated with dispersion and IPO first-day return or performance by running instrumental variable (IV) regressions in which the instrument is the relative underwriter valuation range deflated by the valuation price midpoint. The rationale for this choice is that this measure is unrelated to first-day returns but related to dispersion; that is, the narrower the range, the smaller the dispersion. The findings for our baseline regression do indeed remain robust in the IV regressions.

We are also able to take advantage of a natural experiment in the form of a regulatory change in the IPO share allocation rule for institutional investors implemented by the CSRC. Prior to November 5, 2010,

the allocation of IPO shares in China followed a pro-rata system in which allocations were proportional to bidding volume; after this date, the allocation rule switched to a lottery system[4]. This regulatory change means that institutional investors cannot simply bid a superficially high price for IPO shares in the allocation process without revealing private information. We find that this regulatory change has caused institutional dispersion to drop significantly while actually increasing first-day returns. This finding suggests that institutional investors have improved their information production since the regulatory change, which has made underpricing more pronounced. Lastly, to examine the effect of institutional optimism on IPO, we measure optimism as the percentage difference between the mean bidding price and the midpoint of the IPO valuation range set by lead underwriter. We find that this optimism measure is negatively related to IPO first-day returns, which implies that, consistent with observations that retail investor optimism drives IPO's short-term high returns, the market takes institutional optimism into account.

Our paper contributes to a large emerging body of literature on Chinese IPOs or capital market, including work on the role of state and mutual funds in split share reforms in China (Firth, Lin, and Zhou, 2010) and the political connections and post-IPO performance of newly privatized firms (Fan, Wong, and Zhang, 2007). Other relevant topics include the benefits of risk sharing and share split reforms in privatized firms in China (Li, Wang, Chueng, and Jiang, 2011) and the extent of success in Chinese privatization through IPOs (Sun and Tong, 2003), as well as securities market regulation and investor protection (Berkman, Cole, and Fu, 2010) and trading synchronicity related to ownership and foreign institutions in China (Gul, Kim, and Qiu, 2010). None of these studies, however, examine IPO share allocation in China or the institutional role in post-IPO performance, a void that our paper strives to fill.

The rest of the paper is organized as follows: Section 2 profiles the unique institutional setting of the IPO market in China, after which section 3 describes the data and variables. Section 4 presents the findings on the relation between IPO underpricing and the pre-market dispersion measure. Section 5 examines the predictive power of the dispersion measure on firms' post-IPO performance. Section 6 provides an analysis of institutional optimism, and Section 7 concludes the paper.

1. Institutional Setting

The Chinese IPO market is notorious for its high first-day returns followed by poor post-IPO performance, such as an average first-day return of 247% (Tian and Megginson, 2007) or average first-day returns of 145% in A shares traded in Shanghai and Shenzhen Stock Exchanges (Yu and Tse, 2006). Although Tian and Megginson (2007) blame such high returns on government regulation, many others blame them on speculation or noise trades by retail investors (see Ritter, 2011, for a summary of

[4] The qualified bids that institutional investors bid above the final offer price enter a lottery process to be randomly determined the shares they received.

underpricing and development in the Chinese IPO market, and Ljungqvist, 2004, for a valuable survey of IPO underpricing).

Cornelli and Goldreich (2001, 2003) and Jenkinson and Jones (2004) use proprietary IPO data sets to examine actual orders and allocations in the European book building process. We concentrate on opinion divergence among institutional investors. Specifically, our proprietary sample of institutional bids includes all IPO companies that go public on the Shenzhen ChinNext Board and Shenzhen SME Board, both established to allow small, non-state owned enterprises or growth firms to list shares and raise funds. The IPO process in China is always overseen by the CSRC, which has implemented many reforms to improve the approval-based system.

Before June 2009, the CSRC has implicitly put a Price-Earnings ratio cap of 30 for IPOs, which means offering price cannot be set over 30 times of the earning per share of the firm. It obviously makes the IPO pricing inefficient. In June 2009, for purposes of further improving the mechanisms for the issuance of new shares and enhancing the efficiency of issuance, the CSRC has announced a landmark *Guiding Opinions on Further Reforming and Improving the Issuance System of New Shares*, which are promulgated and came into force on June 11, 2009. It removes the implicit restrictions for Price-Earnings ratio. Our sample period starts right from this great reform. More importantly, during our sample period, two further major regulatory reforms were implemented on offline institutional participants, including the November 5, 2010, alteration that changed the offline IPO share allocation rule from a pro rata to a lottery system. As a result, 373 IPOs in our full sample follow the pro rata system for offline share allocation,[5] with all institutional bidders who have a bidding price above the final offer price receiving allocated shares from the lead underwriter proportional to their bidding volume. The remaining 410 IPOs follow the lottery system in which winning institutional bidders are assigned IPO shares in random drawings. The second change occurred on May 25, 2012; the CSRC removed the three-month lockup period provision imposed on offline institutional bidders, which affects 65 IPOs toward the end of our sample period.

The book building approach is associated with better information production than IPO auctioning because the IPO offer price, rather than being pre-determined, is discovered only after the demand information collected during the offline bidding period is seen. The typical IPO book building process in China proceeds as follows: An IPO firm chooses an investment banker as the lead underwriter (also known as book runner), who is responsible for pricing, selling, and organizing the new issue. Lead underwriter will invite qualified institutional investors from a candidate list maintained by Securities Association of China (SAC) to bid the IPO. To attract the participated institutional investors to bid more cautiously, lead

[5] Both offline and online share allocation allows investors to buy IPO shares at the offer price; however, offline share allocation only allows institutional investors to bid, while online share allocation mainly targets retail or individual investors who are merely offer price taker.

underwriter will provide them with his IPO valuation range and detailed IPO valuation report[6] for their bidding reference. The underwriters allocate IPO shares to institutional investors whose bidding prices are above the final offer price until all the shares are exhausted. Because the allocation rule is set by the CSRC, underwriters in Chinese IPOs, unlike those in U.S. IPOs, have no discretionary power in IPO share allocation. Rather, as already discussed, prior to November 5, 2010, allocation followed a pro-rata system proportional to the bidding volume and then switched to a lottery system. We exploit this regulatory change as a natural experiment to assess how the exogenous shock to institutional bids affects our empirical results.

2. Data and Variables

2.1. Sample Construction

Our proprietary book building data covers IPOs from the Shenzhen Stock Exchange (SZSE), one of the two major stock exchanges in mainland China. Our primary book building sample consists of an entire population of 783 Chinese firms listed on either the Shenzhen Small and Medium Enterprises (SME) Board (428 listings) or the ChiNext Board (355 listings) between July 2009 and November 2012, accounting for 88.5% IPO market share in China[7]. The time period is selected because it fully takes advantage of the landmark reform for new shares issuance system in China and the key regulations on IPO pricing were kept relatively stable to the extent that all IPOs within this time window use a book building[8] rather than an auction or fixed price approach (in which the offer price is determined as the product of an EPS and an implicitly fixed P/E multiple). The cut-off year of November 2012 takes into account that the CSRC suspended the Chinese IPO market in November 2012 for regulatory transition, after which it reopened in January 2014. Each book contains detailed IPO bidding information, including number of bidders; bidder name, type (e.g., stock brokerages, fund management firms or financial firms), and geographic location; date and time of bid submission; number of shares required; and corresponding bidding price. It also contains such information as the final offer price, and number of actual shares allocated to each institutional bidder after close of the bidding period. We extract lead underwriter's IPO valuation range data from his private valuation report.

We obtain IPO firm financials, issue-specific characteristics, lead underwriter information, and stock market conditions directly from the Chinese Stock Market Accounting Research (CSMAR) and Wind databases. Whenever information is missing or incomplete in either database, we manually search for the IPO firm registration statements from the Shenzhen Stock Exchange online database to make these variables available. To further address the robustness of our bidding dispersion measures, for each IPO, we manually collect the direct and indirect flight distance, and also the Euclidian distance based on their

[6] The complete IPO valuation report will not be posted for public access and only be provided to bidding institutional investors.

[7] There are only 102 IPOs in Shanghai Stock Exchange from July 2009 to November 2012.

[8] A partial book building mechanism with unique Chinese characteristics was initially introduced by the China Securities Regulatory Commission (CSRC) in January 2005 and then subsequently altered and enforced in June 2009.

geographical coordinates, between each institutional bidder and the issuing firm, which are used in the instrumental variable estimation to address such potential endogeneity biases as omitted variables and reverse causality.

2.2. Dispersion Measures

Because analyst forecast dispersion is amply documented in the finance and accounting research as a strong negative predictor of future stock returns, it is widely used as a proxy for differences in opinion among investors. Beginning with Diether et al. (2002), a large body of literature examines the relation between such dispersion and cross-sectional stock returns. For example, Diether et al. (2002) find that analyst earnings forecast dispersion is very useful in formulating profitable trading strategies. Specifically, they find that stocks with high analyst forecast dispersion are associated with a discount in future returns, especially in small firms. They attribute this negative relation to market frictions resulting from a lack of consensus among investors that limits the short sales of those pessimistic investors and thus temporarily drives stocks into overpricing. Johnson (2004), however, after developing a simple rational asset pricing model that assumes dispersion as a proxy for unpriced information risk arising when asset values are unobservable, argues that for levered firms with risky debts, higher estimation risk leads to higher stock price and subsequently lower expected returns.

There is also viable evidence that institutional investors are sophisticated and have an informational advantage over individual investors around various corporate events. Indeed, the extant literature clearly documents institutional outperformance over individuals either because institutions have some unique private information that individuals do not have or they can better interpret readily available public information. For example, Field and Lowry (2009), focusing on institutional holdings in newly public firms, find that firms attracting the highest levels of institutional investment significantly outperform those with the lowest levels. They attribute institution investors' superior returns to their ability to better interpret public data. Chemmanur, He et al. (2009) and Chemmanur, Hu et al. (2010), focusing on the role of institutional investors in equity issuances, systematically find that institutions possess private information that enables them to realize superior returns over individual investors in both IPOs and SEOs.

Given the popularity of analyst forecast dispersion as a proxy for risk and uncertainty in the literature, we first construct a simple measure of institutional investors' heterogeneous beliefs in the pre-IPO market based on their bidding price information and then relate this variable to subsequent IPO underpricing. Diether et al. (2002) define the dispersion in analysts' earnings forecasts as the standard deviation of earnings forecast across all analysts, scaled by the absolute value of the mean EPS forecast. Adopting this perspective, we measure the degree of heterogeneous beliefs among institutional investors in the offline IPO sale stage as their bidding price dispersion, defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding prices in the offline subscription process to the mean bidding price:

$$STD = \frac{\sqrt{\frac{\sum_{i=1}^{N}(p_i - \bar{p})^2}{N-1}}}{\bar{p}}$$

where p_i is the bidding price from institutional bidder *i* and $\bar{p}$ is the average bidding price among all the *N* institutional bidders in an IPO. The dispersion in investors' bidding prices is a forward looking measure that takes into account institutional bidders' heterogeneous beliefs about the issuing firm's quality and future profitability. We also construct two alternative measures of dispersion, *MAD,* the mean absolute deviation of the bidding price surrounding the mean bidding price scaled by the mean bidding price, and *STD weighted,* the bidding price dispersion among institutional investors weighted by their bidding volume.

2.3. Summary Statistics

Following existing IPO literature, we define IPO first-day underpricing as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. Panel A of Table 1 reports the summary statistics of our primary analytic variables, all of which are defined in Appendix A. As the panel shows, the average IPO first-day underpricing for the entire sample of IPO firms is 36.84%, with a median value of 27.19%, indicating considerable variation in the dispersion measures across the whole sample. For example, an increase in the dispersion level of institutional IPO bidders from the 10th percentile to the 90th percentile almost doubles the degree of heterogeneous beliefs among them. In terms of general characteristics, our sample firms are on average 8.33 years old at the time of the IPO, the average time gap between offering and listing is 16.6 days, and the average issue size is 1,061 million RMB with a median of 625 million RMB. On average, there are 71 qualified institutional bidders participating in the offline share allocation process for any one IPO, with an average offline oversubscription rate of around 107. About 50% of our sample firms receive financing from either venture capital or private equity before going public. As already stipulated, 373 IPOs participated in the pro-rata system and 410 in a lottery system, while institutional bidders in the 718 IPOs offered before May 25, 2012 faced a three month lockup period for the offline shares obtained during the bidding process.

****** Insert Table 1 about here ******

Panel B of Table 1 reports the Spearman correlation matrix for the primary analytic variables. In particular, we note a correlation coefficient of -0.01 between IPO underpricing and the dispersion measure *STD* that is not significant at the 10% level, which that the association between the two variables is less subject to potential endogeneity concerns than post IPO proxies. In addition, the underpricing level is significantly higher for IPOs with a smaller offer size and a longer time gap between offering and listing, as well as for IPOs that attract more institutional bidders. A strong pre-IPO market return is also positively associated with IPO underpricing.

Figure 1, which depicts the number of IPOs and average IPO underpricing on a quarterly basis during our sample period, clearly shows that the former varies greatly over time, ranging from 83 in

2010Q2 to 4 in 2012Q4. IPO underpricing also fluctuates over time and generally shows a decreasing trend, partly because of the CSRC's implementation during our sample period of various regulations aimed at improving IPO pricing efficiencies. Toward the end of our sample period in 2012Q4, the quarterly number of IPOs drops dramatically while IPO underpricing spikes to an extremely high level. This somewhat surprising trend is probably due to the CSRC's temporary ban on IPOs in the mainland China IPO market since November 2012, just before which investor enthusiasm for the relative scarcity of new shares in the secondary market pushed the first-day underpricing to an unreasonably new height.

****** Insert Figure 1 about here ******

3. Dispersion and IPO Underpricing

The first of our various multivariate analyses of the explanatory power of institutional dispersion for IPO underpricing is a baseline regression using ordinary least squared (OLS) regressions. To address endogeneity concerns, we run an instrumental variable estimation with the ratio of lead underwriter's IPO valuation band to the midpoint of valuation band as the instrument. Using these estimations, we show that our findings are robust to two alternative measures of bidder dispersion in the pre-IPO market. We also run subsample regressions based on issuers' pre-IPO information environments to identify how information environments amplify the effect of institutional bidders' heterogeneous beliefs on IPO underpricing. Finally, we use the natural experiment of the November 2010 share allocation reform to test the robustness of our findings.

3.1. Baseline Results

Following existing IPO literature, we control for a rich set of firm and issue characteristics that may affect IPO underpricing. Like Ritter (1984), Beatty and Ritter (1986), and Carter and Manaster (1990), for example, we consider firm age, offer size, underwriter reputation, and the time gap between offering and listing as measures of the issuing firm's ex ante uncertainty. To control for overall market conditions at the time of the IPO, we also include Shenzhen A-share composite index returns over one month prior to the listing date (see McGuinness, 1992). We capture the profitability of the issuing firm by including return on equity (ROE) for the last fiscal year preceding the IPO, and use the offline share oversubscription rate and number of institutional participants in the offline share subscription stage to control for the aggregate premarket demand for the issue. Because both venture capital (VC) and private equity (PE) are subject to reputation concerns, we include an indicator variable to flag issuers backed by either (see Megginson and Weiss, 1991). We also use an indicator variable to differentiate IPOs listed on the ChiNext Board from those listed on the SME Board and include two separate indicator dummy variables to capture the effects of the two major IPO regulatory reforms introduced by the CSRC during our sample period. Finally, we include industry (based on CSRC classifications) and year fixed effects to account for potential industry and time trends.

Our baseline OLS regression is specified as follows:

$$IPO\ Initial\ Return = \alpha + \beta_1 * Dispersion + \beta_2 Firm\ age + \beta_3 Offer\ size + \beta_4 Time\ gap + \beta_5 ROE + \beta_6 Index\ return + \beta_7 Oversubscription + \beta_8 Log\ \#\ Institutions + \beta_9 VC/PE\ dummy + \beta_{10} Allocation\ dummy + \beta_{11} Lockup\ dummy + \beta_{12} ChiNext\ dummy + \beta_{13} Lead\ reputation + \varepsilon \quad (1)$$

The baseline regression results, with standard errors clustered at the industry level, are reported in Table 2, which shows a positive correlation between bidding dispersion and IPO first-day returns across all regression specifications that is significant at the 1% level. In terms of economic magnitude, the coefficient estimates in column (4) suggest that a one standard deviation increase in the bidding price dispersion measure translates into a 5.28% (=1.57*0.0336) increase in the IPO first-day return. This outcome represents an economically significant 14.33% increase in first-day underpricing relative to the average first-day underpricing of 36.84% in our full sample. The significant positive relation between IPO underpricing and the *allocation dummy*, however, indicates that the CSRC's 2010 share allocation reform has reduced IPO underpricing.

****** Insert Table 2 about here ******

Among the other control variables, smaller issues and those with a longer time gap between offering and listing are associated with a higher underpricing, as is a better overall pre-IPO stock market performance. Consistent with Cornelli and Goldreich (2003), issues that can attract higher premarket demand, as proxied by a higher oversubscription rate and more institutional participants, tend to have higher underpricing. On the other hand, issues listed on the ChiNext Board are significantly more likely to experience less underpricing. We find that VC or PE backed IPOs do not experience significantly larger underpricing. Overall, our baseline results suggest that IPO-related opinion divergence among institutional investors in the pre-IPO market has strong predictive power for IPO underpricing.

3.2. Instrumental Variable Approach

The positive relation reported in the baseline regressions may reflect one or both of two competing explanations: opinion divergence among bidders may in fact be based on some private information about the IPOs or it may be driven purely by the endogenous matching between institutional bidders and IPO firms. That is, if unobservable variables are simultaneously driving the relation between bidders' opinion divergence and IPO first-day returns, then the observed relation reflects the endogenous nature of the bidder's opinion divergence rather than any private information about first-day returns, thereby biasing the OLS estimates. We address this possible endogeneity between bidders' premarket opinion divergence and subsequent IPO underpricing by estimating a two-stage least square (2SLS) regression in which the ratio of lead underwriter's IPO valuation band to the midpoint of valuation band, $2 \times \left(\frac{\mathrm{Prc_H} - \mathrm{Prc_L}}{\mathrm{Prc_H} + \mathrm{Prc_L}}\right)$, instruments for this divergence, as measured by the bidding price dispersion *STD*. To be a valid instrumental variable (IV),

this ratio should satisfy the following requirement: it must be correlated with the bidding price dispersion but uncorrelated with the IPO first-day return. We choose this instrument because a tighter valuation band leaves less room for bidding price variation, resulting in relatively smaller bidding price dispersion. On the other hand, because this relative measure contains little information on price discovery, it is unlikely to directly influence the underpricing of a particular IPO.

****** Insert Table 3 about here ******

Panels A and B of Table 3 report the results of the first-stage and second-stage IV regressions, respectively. In the first-stage regression, the ratio of lead underwriter's IPO valuation band to the midpoint of valuation band is used as an IV for our dispersion measure *STD*. In the second-stage regression, we replace the dispersion measure *STD* with its predicted value from the first-stage, the *Fitted STD,* and reestimate the baseline regression. The first-stage results (panel A) indicate that the proposed instrument is positively and significantly correlated with the bidding price dispersion *STD*, confirming that a tight valuation range helps reduce biding price dispersion. On the other hand, the second-stage results (panel B) show that the instrumented bidding price dispersion *Fitted STD* remains positive and significant at the 1% level, suggesting that IPOs with a higher level of premarket bidder opinion divergence subsequently experience larger underpricing. Collectively, our 2SLS analysis confirms that the positive relation between bidder opinion divergence and IPO first-day returns is unlikely to be driven by endogeneity.

3.3. Alternative Dispersion Measures

We further test the robustness of our main dispersion measure by constructing two alternative measures of IPO-related bidder opinion divergence. Consistent with prior accounting literature (e.g., Jacob et al., 1999;Barniv et al., 2005), our first alternative dispersion measure *MAD* is the simple average of the cross-sectional unsigned mean absolute deviation of individual bidding price from the mean bidding price, scaled by the mean bidding price. Specifically, we calculate *MAD* using the following formula in which p_i is the bidding price from institutional investor i and $\bar{p}$ is the mean bidding price among all the N institutional investors participating in the offline share subscription process of an IPO:

$$MAD = \frac{\frac{1}{N}\sum_{i=1}^{N}|p_i - \bar{p}|}{\bar{p}}$$

Our second alternative measure, *STD weighted*, takes into account the importance of bidders' opinions about an IPO in the whole bidder group by weighting each institutional bid according to bidding volume. Hence, *STD weighted,* formulated as shown below, gives larger bids greater weight relative to smaller bids:

$$STD\ weighted = \frac{\sqrt{\frac{\sum_{i=1}^{N} w_i(p_i - \bar{p}_w)^2}{\frac{(N-1)\sum_{i=1}^{N} w_i}{N}}}}{\bar{p}_w}$$

where p_i is the bidding price from institutional investor i and $\bar{p}_w$ is the average bidding price weighted by corresponding bidding volume among all the N institutional investors participating in the offline share subscription process of an IPO.

****** Insert Table 4 about here ******

Table 4 presents the regression results using the two alternative dispersion measures, with specifications (1) and (3) including neither industry nor year fixed effects, but specifications (2) and (4) containing both. Here, using *MAD* and *STD weighted*, we obtain quantitatively and qualitatively similar outcomes to the baseline results shown in Table 2. Across all regression specifications, both alternative dispersion measures are significantly and positively correlated with IPO first-day underpricing at the 1% levels. Our main findings are thus robust to using alternative measures of opinion divergence among bidders and remain robust when we test them using *price update*, defined as the percentage difference between the midpoint of lead underwriter's IPO valuation range and the final offer price (cf. Aggarwal et al., 2002), with market-adjusted IPO first-day returns as the dependent variable. Nor do our main findings alter when we exclude financial firms or the four IPOs with extremely high underpricing levels in the last quarter of our sample period either separately or simultaneously.

3.4. Cross-Sectional Analysis

In an additional analytic step, we conduct two sets of cross-sectional analyses: the first identifies the role of information asymmetry in the relation between opinion divergence among IPO bidders and subsequent IPO underpricing, and the second assesses the heterogeneity in the predictive power of opinion divergence across different bidder categories given the availability of information on institutional bidder type.

3.4.1. Impact of Information Asymmetry on the Dispersion-Underpricing Relation

Prior evidence that IPO underpricing increases with ex-ante uncertainty about issue value (see, e.g., Beatty and Ritter, 1986; Megginson and Weiss, 1991) implies that uncertainty represents potential risk and greater uncertainty commands greater underpricing. Since our measure of opinion divergence among bidders inherently captures a unique component of institutional investors' issue uncertainty, we expect a stronger association between our dispersion measure and IPO first-day returns as ex ante uncertainty grows. We test this assumption by using offer size, time gap between offering and listing, and underwriter reputation as proxies for ex ante IPO uncertainty. Although previous studies suggest that smaller IPOs and IPOs managed by less reputable underwriters tend to have greater value uncertainty, the correlation between time gap and ex ante uncertainty can move in both directions and must thus be interpreted with caution. For example, Mok and Hui (1998) find a lengthy time gap between the offering and listing of Chinese A-share IPOs, which increases the ex ante uncertainty of the issuer and thus investor risk from traditional information asymmetry (e.g., Baron, 1982; Rock, 1986).

Given the unique institutional environment in China and the short time gap between offering and listing (an average 17 days) in our sample, we thus expect a shorter time gap to indicate greater ex ante issuer uncertainty. We thus partition the full sample into subgroups based on issuer ex-ante uncertainty as proxied by offer size, time gap between offering and listing, and underwriter reputation, and reestimate the baseline regression in Equation (1) for each subgroup. The odd (even) number columns in Table 5 report the outcomes for the subsamples with greater (smaller) ex ante uncertainty. We first note that the forecasting power of our dispersion measure is significant and positive across all subsamples, indicating that our results are not subject to a sample selection issue. Consistent with our expectation, we find that the relation between institutional dispersion and the level of IPO underpricing is more pronounced in smaller IPOs, IPOs with a shorter time gap between offering and listing, and IPOs managed by less reputable underwriters. For example, in the subsample with below median time gap (column 3), a one standard deviation increase in the dispersion measure translates into a 7.4% (=2.273*0.0326) increase in IPO first-day returns, whereas in the subsample with above median time gap (column 4), the increase is only 1.79% (=0.527*0.0340). Overall, these results indicate that ex ante issue uncertainty amplifies the effect of bidder opinion divergence on expected IPO first-day returns.

****** Insert Table 5 about here ******

3.4.2. Heterogeneity of Investor Type

Based on Ke and Ramalingegowda's (2005) finding that different types of institutional investors possess different private information about firms' future earnings and returns, we classify each institutional investor as either a domestic brokerage firm (BJ), fund management firm (JJ), financial firm (CW), trust company (XT), insurance company (BX), or qualified foreign institutional investor (QF) based on their registration information at Securities Association of China (SAC). We then construct a dispersion measure for opinion divergence within each bidder category and examine the heterogeneity in this divergence's predictive power across categories. Because brokerage firms and fund management firms have their own equity research teams and expertise in generating IPO information, we expect divergence among the first to have the most value and strongest forecasting power in determining IPO underpricing, followed by divergence among the second.

Table 6 reports the regression results for the separate bidder categories, with *STD_bj* representing the dispersion measure among brokerage firms, *STD_jj* that among fund management firms, *STD_cw* that among financial companies, *STD_xt* that among trust companies, *STD_bx* that among insurance companies, and *STD_qf* that among qualified foreign institutional investors. For all regression specifications, we include industry and year fixed effects and use the same set of control variables. Consistent with our expectation, we find that opinion divergence within the brokerage firm and fund management firm categories has the strongest predictive power in explaining IPO underpricing. We find no strong relation, however, between IPO underpricing and opinion divergence within the remaining bidder categories (i.e.,

financial firms, trust companies, insurance companies, or qualified foreign institutional investors). Overall, therefore, our findings support the existence of a considerable amount of heterogeneity in the predictive power of opinion divergence across different bidder categories.

****** Insert Table 6 about here ******

3.5. The Importance of Share Allocation Reform

The November 2010 reform of offline share allocations represents an exogenous shock that forced all subsequent 410 IPOs in our sample to use a lottery rather than a pro rata system. Prior to the reform, 373 IPOs had followed the pro rata rule that all institutional bidders with a bidding price above the offer price receive shares proportional to their bidding volume. According to the CSRC's guideline, this reform was supposed to enhance the role of institutional investors in IPO price discovery by encouraging them to bid more cautiously and thus produce less biased bidding prices in the offline share subscription process. This mandatory adoption of the share allocation reform provides a natural experiment that allows us to investigate the information role of institutional IPO investors. It is also important to understand the consequence of the reform. To do so, we perform two sets of empirical analyses: the first determines whether and how the share allocation reform has affected such bidding behaviors as dispersion among the offline institutional bidders; the second assesses the impact of this exogenous regulatory shift on the relation between the opinion divergence of institutional bidders and IPO underpricing.

Panel A of Figure 7 reports the results of a univariate test comparing IPO variables before and after the share allocation reform. The average IPO underpricing after the change is 24.65%, much lower than the 50.24% underpricing before it. Opinion divergence among institutional investors, as proxied by their bidding price dispersion, also drops from 0.16 pre reform to 0.15 post reform, representing a 6.15% reduction in the dispersion measure. The fact that the reduction is significant at the 1% level also suggests that, on average, the share allocation reform has played an important role in disciplining investors' bidding behaviors by forcing them to produce more precise bids among themselves. Panel B of Table 7 reports the outcomes of multivariate regressions that use opinion divergence among institutional investors, *STD*, as the dependent variable. The control variables are the same as in our baseline framework. The variable of interest is the *Allocation dummy*, which takes a value of one for IPOs that follow a lottery allocation system and zero for those adopting the pro-rata allocation system. We find that once firm and issue characteristics are controlled for, the *Allocation dummy* is negatively and significantly related to the *STD* dispersion measure, which further confirms that the CSRC's share allocation reform has been effective in disciplining investor bidding behaviors offline. For example, our coefficient estimates in specification (4) suggest that opinion divergence among investors reduces by 0.0289 after adoption of the new share allocation rule, an approximately 18.6% drop relative to the sample mean dispersion measure of 0.1557.

****** Insert Table 7 about here ******

We next investigate the implications of this allocation rule change on the relation between investor opinion divergence and IPO first-day returns. Specification (1) in Table 8 includes an interaction term *STD* × *Allocation dummy* to gauge the interaction effect between share allocation reform and the dispersion measure on IPO underpricing. The coefficient of this interaction term captures the incremental effect of this latter between subsamples before and after the rule change. We find that the interaction term is positively and significantly related to IPO underpricing, indicating that the relation between investor opinion divergence and IPO underpricing is much more pronounced after the share allocation reform. In specifications (2) and (3), we split the sample into two groups based on the allocation rule change and run the same regression separately on each. Comparing the outcomes for the two subgroups clearly shows that the allocation rule change has amplified the effect of investor opinion divergence on IPO underpricing. For example, after the rule change (3), a one standard deviation increase in the dispersion measure translates into a 7.7% (=2.283*0.0337) increase in IPO underpricing versus only a 3.2% (=0.990*0.0326) increase before the change (2). Taken together, our results indicate that the CSRC's 2010 share allocation reform has had an amplifying impact on the relation between investor opinion divergence and expected IPO underpricing, one that apparently occurs through improved IPO pricing efficiency among the bidders.

****** Insert Table 8 about here ******

4. Dispersion and Post-IPO Firm Performance

Having identified the relation between institutional bidding dispersion and IPO pricing efficiency, we are now interested in whether such dispersion is predictive of subsequent IPO stock returns and post-IPO operating performance.

4.1. Dispersion and Post-IPO Stock Performance

Our primary measures for post-issue firm stock performance are one-, three- and six-month post-IPO buy-and-hold returns (BHRs), which are calculated based on monthly stock returns beginning with the first month after the IPO listing date. Cumulative abnormal returns (CARs) are the cumulative difference between the monthly return of a particular IPO and the monthly return of the corresponding value-weighted market index. Because institutional bidders in the 718 IPOs listed before May 2012 are subject to a three-month lockup provision, however, we expect that the overall predictive pattern of opinion divergence on stock performance will differ between bidders before and after this date. Specifically, the provision will prevent the opinions of the constrained bidders from being too quickly impounded into stock prices because they cannot trade shares obtained offline within the lockup period, meaning that such information can only be reflected in the stock price after the lockup provision expires to be effective. The opinion divergence among bidders that are not constrained by the provision, in contrast, can be expected to predict one-month short-run stock performance because their opinions can be fully revealed immediately after trading starts.

According to Panel A of Table 9, which presents the summary statistics for the post-issue one-, three-, and six-month firm stock performance measured as BHRs and CARs, respectively, newly listed firms on average exhibit negative BHRs over the six-month post-issue period. To assess the predictive power of premarket bidder opinion divergence for subsequent post-issue stock performance using full sample IPOs and IPOs with and without the three-month lockup provision, we use the baseline regression specification but include the corresponding holding period market index returns (we also control for firm- and issue-level characteristics but omit the coefficients here to save space). We first note from Panel B of Table 9 that the association between bidder opinion divergence and BHRs three month post IPO is negative and significant at the 1% level but becomes insignificant for BHRs one month and six months post IPO, seemingly confirming our main argument.

****** Insert Table 9 about here ******

Since many IPOs in our sample are subject to the three-month lockup provision. We therefore also run subsample regressions that explicitly separate out the effect of the lockup provision on the predictive pattern of bidder opinion divergence on post-issue stock performance. Consistent with our expectations, the estimates in columns (4) to (6) show that the opinions of bidders subject to the three-month lockup provision can only predict stock performance three months post IPO, indicating that bidder opinion divergence contains private information about post-issue stock performance that can only be impounded into stock price once the lockup provision becomes ineffective. In terms of economic magnitude, for example, the coefficients in column (5) indicate that a one standard deviation increase in the dispersion measure translates into a 44.96% decrease from the mean value of the three-month BHRs. Finally, the results in columns (6) to (9) show that bidders' divergent opinions can predict BHRs one-month post-issue but the effect is only marginally significant with a t-value of -1.52, confirming that for bidders without the three-month lockup provision, their divergent opinions can be immediately reflected on the stock returns. In an unreported analysis, we obtain similar results using CARs as measures of stock performance. Overall, then, our results strongly suggest that the premarket divergence of bidder opinions does indeed contain private information about post-issue stock performance that is prevented from being too quickly impounded into stock prices by the lock-up provision.

4.2. Dispersion and Post-IPO Operating Performance

We next examine whether our dispersion measure can also forecast long-run post-IPO firm operating performance, and if so, how. Following previous studies, we proxy such performance by one-, two-, and three-year post issue returns on equity (ROE) and operating returns on assets (ROA). According to the descriptive statistics in panel A of Table 10, firm operating performance declines over the three-year post-issue period, with ROE dropping from 8.21% in the one-year post-issue period to 7.68% two years post issue for a 6.46% reduction. Consistent with Jain and Kini (1994), we also find that issuing firms

exhibit a decline in post-issue operating performance relative to their pre-issue levels. To better assess this decline and identify the relation between it and premarket bidder opinion divergence, we use the baseline specification to perform regressions with corresponding one-, two-, and three-year ROE and ROA as dependent variables while controlling for the same holding period stock market index returns. The variable of interest is the *STD* dispersion measure *STD*, and we also include industry and year fixed effects for all regressions. As shown in panel B of Table 10, the coefficient estimates in specifications (1) and (4) indicate a strongly significant and negative relation between the one-year post-issue operating performance as measured by ROE and ROA and the premarket divergence of opinions among bidders. In addition to being statistically significant, our findings are meaningful in terms of economic magnitude. For example, the estimates for specification (1) reveal that a one standard deviation increase in our dispersion measure translates into a 2.54% decrease in firm operating performance relative to the average one-year post issue operating performance measured by ROE. We also find not only that the predictive power of divergent bidder opinions is weakened and only marginal significant for the two-year post-issue operating performance measures but that for three-year post-issue performance, the relation totally disappears (specifications (3) and (6)). Taken together, our results suggest that bidder opinion divergence (as measured by their bidding price dispersion) has strong predictive power for one-year post-issue firm operating performance.

****** Insert Table 10 about here ******

4.3. Bidder Characteristics and Bid Price Accuracy

To examine whether and how institutional bidder characteristics affect bid price accuracy, thereby identifying the informed bidders in an IPO, we measure bid price accuracy as the percentage difference between the bid price and final offer price. The first bidder characteristic that may influence IPO pricing s is the geographical distribution of both bidders and IPO firm, as suggested by the tendency for local investors to be better informed about a firm's prospectus than nonlocal investors. Baik et al. (2010), for example, find that in informed trading, local investors outperform nonlocal investors by exploiting their informational advantages. On the other hand, Hong et al. (2005) demonstrate that local investors behave similarly toward a particular stock within the same time period even when the stock of interest is located far away. This latter suggests that information about firm quality may also be spread by word of mouth over a geographically interconnected investor network. Recognizing both possibilities, we use the mean distances between the bidder and IPO firm and between the bidder and other bidders as proxies for the extent of private information a bidder has about the IPO. We expect that the distance measure should be positively correlated with bid price accuracy. Following Cornelli and Goldreich (2001), we also examine other bid characteristics, including bid size and timing and bidder type and frequency of participation, each of which has separate implications for IPO pricing efficiency.

According to the extant literature, large bidders are better informed and large bids are favored in by underwriters in IPO allocation (e.g., Cornelli and Goldreich, 2001). Late bids might be more informative than early bids because of the time needed for information spillovers to materialize. Hence, we include a dummy variable indicating whether the bid is submitted relatively early or not. We also create a dummy variable to proxy for regular bidders who may be better at pricing IPOs either because of greater pricing experience or more precise private information gleaned from their close business relations with the underwriters. Additionally, because bidders with strong in-house equity research departments (e.g., brokerage and fund management firms) and superior information acquisition and production abilities may predict the IPO offer price more precisely and bid more wisely, we introduce a bidder type dummy that explicitly controls for the effect of investor type heterogeneity on IPO pricing. We then identify the determinants of bid price accuracy by running different specifications of the following regression:

$$\begin{aligned} Bid\ price\ accuracy = {} & \alpha + \beta_1 * Distance + \beta_2 Largest\ bid + \beta_3 Second\ largest\ bid \\ & + \beta_4 Early\ bid + \beta_5 Late\ bid + \beta_6 High\ frequency \\ & + \beta_7 Medium\ frequency + \beta_8 Bidder\ type + \varepsilon \end{aligned} \quad (2)$$

Here, the dependent variable is *Bid price accuracy*, defined as the percentage deviation between individual bid prices and the final offer price. For invalid bids with a bid price below the offer price, we measure bid price accuracy as the maximum price deviation among all bids within an IPO. Several independent variables capture different bidder characteristics: *Distance* is constructed as the natural logarithm of the arithmetic mean of the flight distance between the IPO firm and the bidder and the average flight distance between the bidder and all other bidders as a group. We also directly calculate the Euclidian distance between bidder and IPO firm and among bidders based on their geographical coordinates besides flight distance. *Largest bid (second largest bid)* is a dummy equal to one if the bid size is in the fourth (third) size quartile for that IPO, and *early bid (late bid)* is a dummy equal to one if the bid submission time falls in the first (fourth) quartile. We also split bidders into three categories based on the frequency distribution of their past IPO participation, with *High frequency (medium frequency)* equal to one if the total number of IPOs participated in is in the third (second) tertile during our full sample period. Finally, *bidder type* again categorizes bidders into domestic brokerage firms (BJ), fund management firms (JJ), financial firms (CW), trust companies (XT), insurance companies (BX), and qualified foreign institutional investors (QF). For this bid level analysis, however, we add in two more bidder types: qualified large individual bidders (GR) and institutional bidders (TJ) independently recommended by the lead underwriter. It should be noted that our earlier analysis (section 4.4.2) does not assess the impact of these two groups' divergent opinions on IPO underpricing because dispersion measures for these categories are very rare at the IPO level. In addition, to alleviate concerns that the above variables may not capture unique issue characteristics, the regression also includes issue level fixed effects with standard errors clustered at this level.

Panel A of Table 11 reports estimates of OLS regressions in which the dependent variable is the continuous measure of bid price accuracy as defined earlier. Consistent with our expectation, we first note that both primary and alternative distance measures are positively and significantly correlated with bid price accuracy at the 1% level. This finding suggests that geographical proximity between bidder and IPO firm, as well as between bidder and other bidders as a group, acts to facilitate information acquisition or production by bidders, which in turn help them to improve the efficiency of IPO pricing. In terms of economic magnitude, all else being equal, the coefficient estimates in column (2) suggest that a one standard deviation decrease in the distance measure leads to a 1.18% (=0.027*0.436) improvement in the accuracy of IPO pricing. The coefficients on the two bid size variables are statistically insignificant, confirming that bid size is not a proxy for information about IPO pricing. The coefficient of the dummy variable for early (late) bids, however, is positive (negative) and significant, suggesting that late bids contain more private information about IPO offer price than early bids. Both high frequency and medium frequency bidders are better informed than infrequent bidders. We also notice interesting differences among bidders from different industries: consistent with the information production or business relation assumption discussed earlier, financial firms (CW), fund management firms (JJ), trust companies (XT), and institutional investors recommended by the lead underwriter (TJ) seem to have a considerable information advantage over insurance companies (BX) and individual investors recommended by the lead underwriter (GR).

****** Insert Table 11 about here ******

We test the robustness of these results using a probit model in which the left-hand side dependent variable is a dummy variable indicating whether the bid price is above the offer price or not (see panel B). Interestingly, the bid characteristics that were statistically significant in the OLS regression continue to be significant in the probit model. Their signs, however, differ. For example, the proxies for frequent bidders have positive coefficients in Panel A but become negative in panel B, which seems rational given that an unreasonably high bid price impairs the efficiency of IPO pricing but increases the likelihood of a bid price above the final offer price. Overall, then, the signs and significances of the estimated coefficients in both the OLS regressions and probit models strongly suggest that several bidder characteristics, including bid bidder type, and bidder participation frequency contain private information about IPO pricing.

4.4. Optimism in IPOs

We show that a simple bidder optimism measure based on bidding price information is negatively and significantly related to IPO underpricing.

4.5. Dispersion and Other IPO Related Characteristics

We then examine the forecasting power of investor opinion divergence on a variety of IPO related characteristics, including first-day turnover, post-issue return volatility, offline oversubscription rate, and the likelihood of the closing price falling below the offer price. Here, we calculate turnover as the ratio of

first-day trading volume to the number of IPO shares offered and return volatility as the annualized 30-day volatility of market adjusted returns from the IPO listing date, and offline oversubscription as the natural logarithm of the ratio of institutional investors' total offline subscriptions divided by the number of shares allocated to institutional investors. The FBO dummy is an indicator variable equal to one if the first-day closing price falls below the offer price, and 0 otherwise. As before, premarket bidder opinion divergence captures a unique component of ex ante issue uncertainty, so we expect issues with a higher level of opinion divergence to exhibit both greater first-day turnover and greater one-month return volatility. Conversely, we expect the dispersion measure to have a negative impact on the offline oversubscription rate and the closing price to fall below offer price.

Table 12 reports the regression results on the predictive power of the premarket bidder opinion divergence for IPO first-day turnover, one-month return volatility, offline oversubscription rate, and likelihood of the closing price falling below offer price. As before, we use the same set of control variables and include industry and year fixed effects for all regressions. Specifications (1) to (3) use ordinary least squares (OLS) regressions, while specification (4) employs a probit model in which the FBO dummy is the dependent variable. Consistent with our expectations, investor opinion divergence is positively and significantly related to first-day turnover and post-issue return volatility. Our results also indicate that on average, issues with greater opinion divergence about their quality are less oversubscribed by offline bidders and less likely to have the first-day closing price fall below the offer price. In terms of economic magnitude, a one standard deviation increase in the dispersion measure increases first-day turnover and one month post-issue return volatility 2.39% and 8.85%, respectively, over their mean values. Likewise, with other control variables held constant, a one percent increase in the dispersion measure decreases the oversubscription rate by 2.71% and the likelihood of the closing price falling below the offer price by 0.79%, a decrease that is both economically and practically significant. Taken together, our findings suggest that our measure of premarket bidder opinion divergence also has strong predictive power in determining other IPO related characteristics, such as fist-day turnover ratio, one-month post-issue return volatility, offline oversubscription rate, and the likelihood of the closing price falling below the offer price.

****** Insert Table 12 about here ******

5. Optimism Measure and IPO Underpricing

To assess whether our optimism measure is also related to IPO underpricing, we employ a method analogous to Hong and Kubik (2003) and Jackson's (2005) use of analyst forecasts relative to the consensus to measure analyst optimism. That is, we use the average bidding price relative to the midpoint of the lead underwriter's IPO valuation range as a natural measure of the ex ante optimism embedded in bidders' issue valuation. We expect that a higher degree of premarket bidder optimism will mitigate their ex ante uncertainty about the issue and thus lower the expected IPO underpricing. We calculate this

optimism as the percentage difference between the mean bidding price and the midpoint of the lead underwriter's IPO valuation range:

$$Optimism = \frac{\bar{p} - Prc_M}{Prc_M}$$

where $\bar{p}$ is the average bidding price and $Prc_M = \frac{Prc_H + Prc_L}{2}$ is the midpoint of the lead underwriter's IPO valuation range. In constructing the optimism measure here, we compare the average bidding price with the lead underwriter's IPO valuation range midpoint rather than the offer price, which, being set subsequently based on the bid information collected by the underwriter, cannot serve as the reference point for calculating bidder premarket optimism.

In these regressions, the independent variable of interest is the optimism measure, which is negatively and significantly related to IPO first-day returns across all regression specifications (see Table 13), indicating that issues with a higher degree of bidders' optimism experience less underpricing. This effect is indeed economically significant. For example, the coefficient estimates in specification (2) suggest that a one standard deviation increase in the optimism measure leads to a 5.30% reduction in IPO underpricing. These findings remain robust in an unreported analysis using an alternative weighted optimism measure based on bidding volume, in which the inclusion of optimism does not change the significance of the coefficients associated with the institutional dispersion measures.

****** Insert Table 13 about here ******

6. Conclusions

In this paper, we explore the information content of institutional bids using a large and proprietary sample of Chinese IPO data that contains detailed information on bids and allocations from 2009 to 2013. We find that institutional dispersion is positively related to IPO first-day returns and trade turnover but is negatively predictive of IPO firm's operating performance one year post IPO and stock returns six months post IPO. This evidence suggests that the bids of institutional investors bids carry private information about IPOs. The result of our baseline regressions remain robust to using IV regressions in which we control for the endogeneity problem by instrumenting bidder opinion divergence as the ratio of the lead underwriter's IPO valuation range to its midpoint and to a natural experiment caused by a regulatory change in the share allocation process. We further find that this latter shift from a pro rata to a lottery rule has a significant impact on dispersion: in the post-reform period, institutional investors bid with more information, resulting in a stronger relation between institutional dispersion and IPO underpricing. Overall, therefore, our research sheds new lights on the efficiency of the IPO allocation process in China and highlights the importance of institutional factors and regulatory reforms in the IPO market of the world's largest emerging economy.

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Appendix A: Variable Definitions

Variables	Definition
Panel A: Measure of dispersion and optimism	
Dispersion Measure (STD)	Defined as the ratio of the cross-sectional standard deviation of institutional investors' pre-IPO bidding price to the absolute value of the mean bidding price.
Dispersion Measure (STD weighted)	Dispersion in institutional investors' bidding price weighted by their bidding volumes.
Dispersion Measure (MAD)	Defined as the mean absolute deviation of the bidding price surrounding the mean bidding price scaled by the mean bidding price.
Optimism	Defined as the difference between mean bidding price and the midpoint of lead underwriter's IPO valuation range, scaled by the midpoint of the valuation range.
Panel B: IPO and firm characteristics	
First-day Return	Defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price.
Turnover	The proportion of trading volume to the number of IPO shares.
FBO dummy	An indicator variable equal to one if the IPO first day closing price falls below the offering price.
Return Volatility	Annualized 30-day volatility of market adjusted returns from the IPO listing date.
Firm age	Log (# of years between founding and offering).
Firm size	Log (Pre-issue book value of total assets in Millions RMB Yuan).
Offer size	Log (# of shares offered times offer price in Millions RMB Yuan).
Time gap	Log (1+ # of days between listing and offering).
ROE	Return on equity calculated for the latest fiscal year prior to IPO.
Index return	One month market return prior to IPO.
Oversubscription	Log (ratio of total offline subscription from institutional investors divided by the number of shares allocated to institutional investors).
Log # Institutions	Log (1+ # of institutional participants).
VC/PE dummy	An indicator variable equal to one if the firm is backed by VC or PE, and zero otherwise.
Allocation dummy	An indicator variable equal to one if the IPO filing date is later than 5 November 2010 when the CSRC changed the offline IPO share allocation rule from pro rata basis to lottery basis.
Lockup dummy	An indicator variable equals to one if the IPO filing date is after 25 May 2012 when the CSRC removed the three-month lockup period provision imposed on the institutional participants in the offline shares subscription.
ChiNext dummy	An indicator variable equal to one if the firm is listed in the Shenzhen ChiNext Board and zero if it is listed in the SME Board.
Lead reputation (#)	Log (1+total number of IPOs the lead underwriter has managed prior to the current IPO).
Panel C: Bidder and bid characteristics	
Bid price accuracy	% difference between bid price and offer price.
Distance	Log (average of flight distance between bidder and IPO firm and average flight distance between bidder and all other bidders).
Distance (alternative)	Log (average of Euclidian distance between bidder and IPO firm and average Euclidian distance between bidder and all other bidders based on their geographical coordinates)
Largest (2^{nd} largest) bid	A dummy variable that takes on a value of one if the bid size is in the fourth (third) size quartile within an IPO.
Early (Late) bid	A dummy variable that equals to one if the bid submission time falls in the first (fourth) quartile within an IPO.
High (Medium) frequency	A dummy variable set to one if total # of IPOs the bidder participated in is in the third (second) quartile during full sample period.
Bidder type	Dummy variables indicating bidder type: Brokerage firms (BJ), fund management (JJ), financial firms (CW), trust companies (XT), insurance companies (BX), qualified foreign institutional investors (QF), individual bidders (GR) and institutional bidders (TJ) independently recommended by the lead underwriter.

Table 1: Descriptive Statistics.

This table summarizes our IPO sample, which consists of 783 Chinese IPOs listed in Shenzhen SME Board or Shenzhen ChiNext Board between 10 July 2009 and 2 November 2012. Panel A reports mean, median, standard deviation, 10^{th}, 25^{th}, 75^{th}, and 90^{th} percentile of the main variables used in this paper. Panel B reports the Spearman correlation matrix where ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

Panel A: Summary Statistics

Variable	N	Mean	Median	SD	P10	P25	P75	P90
Initial return	783	0.3684	0.2719	0.4540	-0.0374	0.0768	0.5236	0.8547
Turnover	783	0.7101	0.7700	0.2039	0.3600	0.6300	0.8500	0.8900
STD	783	0.1557	0.1516	0.0336	0.1172	0.1330	0.1737	0.2022
MAD	783	0.1228	0.1202	0.0278	0.0903	0.1041	0.1383	0.1607
Optimism	783	-0.0539	-0.0556	0.2130	-0.3289	-0.2000	0.0966	0.2078
Firm age	783	1.8899	2.1058	0.7520	0.7747	1.3641	2.4122	2.7188
Offer size	783	6.4992	6.4378	0.6049	5.8171	6.0808	6.8416	7.2714
Time gap	783	2.4850	2.4849	0.2515	2.1972	2.3026	2.6391	2.7726
ROE	783	0.2370	0.2237	0.1220	0.1113	0.1620	0.2887	0.3632
Index return %	783	-0.2970	-0.3088	7.5257	-8.8330	-6.0113	4.8580	9.6056
Oversubscription	783	3.3804	3.4898	1.1758	1.7750	2.5055	4.3037	4.8250
Log # institutions	783	4.1662	4.1744	0.4636	3.5264	3.8067	4.5433	4.7791
VC/PE dummy	783	0.4994	0	0.5003	0	0	1	1
Allocation dummy	783	0.5236	1	0.4998	0	0	1	1
Lockup dummy	783	0.0830	0	0.2761	0	0	0	0
ChiNext dummy	783	0.4534	0	0.4981	0	0	1	1
Lead reputation	783	3.5230	3.9703	1.2949	1.6094	2.5649	4.5850	4.8283

Panel B: Spearman Correlation Matrix

ID	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Initial return	1.00													
2	STD	-0.01	1.00												
3	Firm age	-0.05	-0.08**	1.00											
4	Offer size	-0.27***	-0.05	-0.14***	1.00										
5	Time gap	0.16***	0.15***	-0.18***	0.09**	1.00									
6	ROE	-0.20***	0.01	-0.05	0.05	-0.16***	1.00								
7	Index return %	0.47***	-0.06	-0.01	0.03	0.12***	-0.14***	1.00							
8	Oversubscription	0.48***	-0.13***	-0.25***	0.06*	0.30***	-0.25***	0.13***	1.00						
9	Log # institutions	0.44***	-0.17***	-0.24***	0.23***	0.25***	-0.27***	0.16***	0.88***	1.00					
10	VC/PE dummy	-0.02	-0.09***	-0.02	0.02	-0.02	-0.07**	0.04	-0.04	-0.03	1.00				
11	Allocation dummy	-0.37***	-0.15***	0.35***	-0.19***	-0.47***	0.21***	-0.22***	-0.73***	-0.68***	0.06*	1.00			
12	Lockup dummy	-0.16***	-0.07**	0.17***	-0.19***	-0.12***	0.12***	-0.09***	-0.13***	-0.14***	0.04	0.29***	1.00		
13	ChiNext dummy	-0.03	-0.10***	0.00	-0.27***	-0.03	0.16***	0.00	-0.09**	-0.19***	0.14***	0.14***	0.06*	1.00	
14	Lead reputation	-0.13***	-0.12***	0.08**	0.05	-0.11***	0.06*	-0.03	-0.22***	-0.18***	0.13***	0.24***	0.10***	0.01	1.00

Table 2: Dispersion and IPO Underpricing – Baseline Regression.

The dependent variable is the IPO first-day return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. The variable of interest is dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return			
	(1)	(2)	(3)	(4)
STD	1.6539***	1.6563***	1.5651***	1.5737***
	(5.69)	(5.78)	(4.75)	(4.93)
Firm age	0.0150	0.0120	0.0116	0.0079
	(0.98)	(0.82)	(0.97)	(0.77)
offer size	-0.2137***	-0.2204***	-0.2058***	-0.2129***
	(-14.07)	(-12.66)	(-15.01)	(-15.36)
Time gap	0.1232**	0.1200**	0.1093***	0.1043***
	(3.08)	(2.96)	(3.54)	(3.56)
ROE	-0.0215	-0.0029	0.0020	0.0245
	(-0.81)	(-0.13)	(0.06)	(0.86)
INDEX21_shenA	0.0211***	0.0212***	0.0212***	0.0213***
	(19.86)	(19.67)	(16.14)	(16.64)
Oversubscription	0.1425***	0.1468***	0.1372***	0.1414***
	(5.75)	(6.54)	(5.54)	(6.31)
Log # institutions	0.1817***	0.1834***	0.1320***	0.1310***
	(4.70)	(4.92)	(5.74)	(6.31)
VC/PE dummy	-0.0036	-0.0027	-0.0080	-0.0071
	(-0.15)	(-0.11)	(-0.38)	(-0.34)
Allocation dummy	0.1735***	0.1786***	0.2266***	0.2291***
	(4.50)	(4.87)	(15.18)	(17.44)
Lockup dummy	-0.1146*	-0.1099*	-0.0937	-0.0839
	(-2.10)	(-1.97)	(-1.46)	(-1.32)
ChiNext dummy	-0.0639**	-0.0660***	-0.0645**	-0.0676***
	(-2.97)	(-3.14)	(-2.93)	(-3.28)
Lead reputation	0.0086	0.0076	0.0077	0.0070
	(1.52)	(1.41)	(1.71)	(1.60)
Constant	-0.1424	-0.1754	0.2150*	0.2402
	(-1.04)	(-1.25)	(1.80)	(1.61)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
N	783	783	783	783
adj. R^2	0.379	0.378	0.384	0.384

Table 3: Dispersion and IPO Underpricing – Instrumental Variable Approach.

This table reports results from 2SLS instrumental variable regressions, where the relative ratio of lead underwriter's IPO valuation range to the midpoint of valuation range, i.e., $2 \times (\frac{Prc_H - Prc_L}{Prc_H + Prc_L})$ is used as an instrumental variable for the bidding price dispersion, i.e. *STD*, defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. The dependent variable is the IPO initial return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

Panel A: First-stage regression Dependent variable: STD		*Panel B: Second-stage regression* Dependent variable: First-day return	
Price band ratio	0.0545***		
	(6.97)		
		Fitted STD	6.8883***
			(5.89)
Firm age	-0.0012**	Firm age	0.0122
	(-2.26)		(1.10)
Offer size	-0.0042**	Offer size	-0.1882***
	(-2.46)		(-15.11)
Time gap	0.0123***	Time gap	0.0307
	(6.11)		(1.72)
ROE	0.0013	ROE	0.0182
	(0.19)		(0.79)
INDEX21_shenA	-0.0004***	INDEX21_shenA	0.0235***
	(-8.09)		(28.70)
Oversubscription	-0.0091***	Oversubscription	0.1907***
	(-5.58)		(14.52)
Log # institutions	-0.0246***	Log # institutions	0.2573***
	(-7.48)		(6.05)
VC/PE dummy	-0.0020	VC/PE dummy	0.0044
	(-1.37)		(0.18)
Allocation dummy	-0.0288***	Allocation dummy	0.3829***
	(-10.05)		(10.22)
Lockup dummy	0.0001	Lockup dummy	-0.0828
	(0.04)		(-1.27)
ChiNext dummy	-0.0093***	ChiNext dummy	-0.0170
	(-11.36)		(-0.53)
Lead reputation	-0.0025***	Lead reputation	0.0207***
	(-7.92)		(3.19)
Constant	0.3057***	Constant	-1.4056***
	(20.35)		(-3.52)
Industry FE	Yes	Industry FE	Yes
Year FE	Yes	Year FE	Yes
N	783	*N*	783
adj. R^2	0.246	adj. R^2	0.376

Table 4: Alternative Dispersion Measures and IPO Underpricing.

The dependent variable is the IPO initial return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. The variables of interest are the alternative dispersion measures *MAD* and *STD weighted*, where *MAD* is defined as the mean absolute deviation of the bidding price surrounding the mean bidding price scaled by the mean bidding price and *STD weighted* is calculated as the biding price dispersion among institutional investors weighted by their bidding volume. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return			
	(1)	(2)	(3)	(4)
MAD	2.0272***	1.9612***		
	(4.86)	(4.46)		
STD weighted			1.4750***	1.4530***
			(4.84)	(4.71)
Firm age	0.0153	0.0081	0.0160	0.0085
	(1.01)	(0.79)	(1.05)	(0.84)
Offer size	-0.2140***	-0.2128***	-0.2163***	-0.2148***
	(-14.53)	(-15.96)	(-14.33)	(-15.95)
Time gap	0.1240**	0.1044***	0.1280**	0.1076***
	(3.06)	(3.51)	(3.03)	(3.49)
ROE	-0.0211	0.0248	-0.0270	0.0193
	(-0.77)	(0.90)	(-0.99)	(0.63)
INDEX21_shenA	0.0211***	0.0213***	0.0210***	0.0213***
	(19.86)	(16.65)	(20.06)	(16.89)
Oversubscription	0.1417***	0.1408***	0.1422***	0.1415***
	(5.71)	(6.30)	(5.60)	(6.19)
Log # institutions	0.1855***	0.1350***	0.1725***	0.1219***
	(4.85)	(6.43)	(4.15)	(5.21)
VC/PE dummy	-0.0036	-0.0070	-0.0045	-0.0083
	(-0.15)	(-0.33)	(-0.18)	(-0.38)
Allocation dummy	0.1711***	0.2288***	0.1686***	0.2280***
	(4.39)	(16.13)	(4.46)	(17.48)
Lockup dummy	-0.1158*	-0.0867	-0.1138*	-0.0831
	(-2.13)	(-1.37)	(-2.06)	(-1.30)
ChiNext dummy	-0.0644**	-0.0682***	-0.0625**	-0.0658***
	(-2.98)	(-3.30)	(-3.03)	(-3.29)
Lead reputation	0.0093	0.0077	0.0082	0.0067
	(1.65)	(1.73)	(1.42)	(1.48)
Constant	-0.1492	0.2230	-0.0667	0.3079**
	(-1.07)	(1.51)	(-0.43)	(2.32)
Industry FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes
N	783	783	783	783
adj. R^2	0.379	0.385	0.377	0.383

Table 5: Dispersion and IPO Underpricing – Cross-sectional Analysis.

This table reports regression results using subsamples based on offer size, time gap and lead underwriter reputation respectively. The dependent variable is the IPO initial return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. The variable of interest is dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return					
	Offer Size		Time Gap		Underwriter Reputation	
	Small	Large	Short	Long	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
STD	1.5751***	0.8507***	2.2730***	0.5274*	2.6365***	0.9433***
	(3.91)	(4.97)	(4.11)	(2.12)	(4.47)	(3.37)
Firm age	-0.0003	0.0194***	-0.0126	0.0139	0.0242	-0.0009
	(-0.01)	(3.18)	(-0.73)	(1.31)	(1.19)	(-0.07)
Offer size	-0.5993***	-0.0283	-0.1974***	-0.2566***	-0.3038***	-0.1494***
	(-6.92)	(-1.61)	(-9.83)	(-6.54)	(-10.25)	(-8.48)
Time gap	0.2011***	0.0090	-0.3300***	0.0774	0.0880	0.0685**
	(7.11)	(0.18)	(-3.61)	(0.92)	(0.89)	(2.44)
ROE	-0.1501**	0.0344	0.0954*	-0.0959**	0.2779**	-0.1135*
	(-2.47)	(1.04)	(1.90)	(-2.33)	(2.46)	(-2.20)
INDEX21_shenA	0.0279***	0.0152***	0.0219***	0.0187***	0.0198***	0.0223***
	(9.69)	(22.59)	(24.76)	(9.37)	(11.52)	(16.57)
Oversubscription	0.1635***	0.0952***	0.1683***	0.1082***	0.1924***	0.0625**
	(3.28)	(22.91)	(9.72)	(3.57)	(7.75)	(2.53)
Log # institutions	0.1632***	0.1273***	0.1575***	0.1459***	0.2057***	0.1621***
	(3.61)	(5.06)	(4.40)	(7.18)	(4.82)	(3.22)
VC/PE dummy	-0.0282	0.0001	-0.0249	-0.0047	-0.0414**	0.0140
	(-0.78)	(0.01)	(-0.99)	(-0.21)	(-2.62)	(0.39)
Allocation_ dummy	0.3685***	0.1123***	0.1739***	0.3263***	0.2638***	0.2298***
	(12.07)	(4.11)	(11.14)	(12.48)	(9.02)	(14.65)
Lockup dummy	-0.0366	-0.0823**	-0.0565	-0.2215***	-0.0190	-0.1770**
	(-0.58)	(-2.89)	(-0.77)	(-5.47)	(-0.27)	(-3.05)
ChiNext dummy	-0.1425***	-0.0297	-0.1257***	-0.0319	-0.1521***	0.0059
	(-4.37)	(-1.25)	(-7.92)	(-1.41)	(-4.57)	(0.28)
Lead reputation	0.0389***	-0.0110**	0.0214***	-0.0077	0.0589***	-0.0156
	(7.81)	(-2.54)	(4.34)	(-0.47)	(4.51)	(-1.64)
Constant	2.3038***	-0.5130*	0.7093***	0.9742***	-0.2811	0.3455*
	(4.25)	(-2.11)	(4.63)	(3.94)	(-1.43)	(1.89)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	393	390	493	290	397	386
adj. R^2	0.428	0.387	0.385	0.407	0.373	0.455

Table 6: Dispersion and IPO Underpricing by Bidder Category.

The dependent variable is the IPO initial return. The variable of interest is the dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. We calculate bidding price dispersion for each different type of institutional investors separately. Specifically, *STD_bj* is the dispersion measure calculated among the stock brokerage firms; *STD_jj* is the dispersion measured using only fund management firms; *STD_cw* is calculated among financial companies; *STD_xt* refers to the dispersion among trust companies; *STD_bx* is measured using insurance companies only; and *STD_qf* is the dispersion measured among qualified foreign institutional investors (QFIIs). Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return					
	(1)	(2)	(3)	(4)	(5)	(6)
STD_bj	1.4043***					
	(9.65)					
STD_jj		1.1918***				
		(4.27)				
STD_cw			0.6083*			
			(2.16)			
STD_xt				0.2672		
				(1.71)		
STD_bx					0.0745	
					(0.96)	
STD_qf						0.0486
						(0.16)
Firm age	0.0053	0.0089	0.0100	0.0088	-0.0268***	0.0254
	(0.45)	(0.97)	(0.66)	(0.86)	(-3.37)	(0.43)
Offer size	-0.2176***	-0.2111***	-0.2258***	-0.2229***	-0.2289***	-0.1278
	(-16.83)	(-14.66)	(-15.95)	(-17.26)	(-29.33)	(-0.95)
Time gap	0.1021***	0.1290***	0.1124***	0.1287***	-0.2101***	0.3824**
	(3.80)	(4.80)	(3.79)	(4.40)	(-7.59)	(2.75)
ROE	0.0314	0.0170	-0.0172	-0.0104	0.0813*	-0.6813
	(1.11)	(0.53)	(-0.54)	(-0.37)	(1.88)	(-1.34)
INDEX21_shenA	0.0214***	0.0212***	0.0210***	0.0208***	0.0233***	0.0300**
	(19.44)	(16.65)	(12.76)	(16.72)	(25.83)	(3.29)
Oversubscription	0.1369***	0.1394***	0.1476***	0.1350***	0.1920***	0.3244***
	(7.24)	(5.97)	(4.33)	(5.30)	(8.10)	(7.50)
Log # institutions	0.1268***	0.1227***	0.0942**	0.1120***	0.0542*	0.5607**
	(6.03)	(6.58)	(2.30)	(3.61)	(2.06)	(2.86)
VC/PE dummy	-0.0062	-0.0082	-0.0157	-0.0227	-0.0554***	0.1248
	(-0.29)	(-0.37)	(-0.66)	(-1.03)	(-4.63)	(0.97)
Allocation dummy	0.2088***	0.2346***	0.1943***	0.1978***	0.1745***	-0.0018
	(18.53)	(15.96)	(9.62)	(14.03)	(10.20)	(-0.01)
Lockup dummy	-0.0796	-0.0917	-0.1513***	-0.1261*	0.0282	0.0000
	(-1.34)	(-1.54)	(-4.06)	(-1.84)	(0.71)	(.)
ChiNext dummy	-0.0848***	-0.0769***	-0.0820***	-0.0710**	0.2287	0.0636
	(-3.44)	(-3.73)	(-3.19)	(-2.84)	(1.07)	(0.57)
Lead reputation	0.0048	0.0063	0.0044	0.0045	0.0242***	-0.0009
	(1.05)	(1.71)	(0.82)	(1.11)	(6.97)	(-0.04)
Constant	0.3552**	0.2835	0.5906***	0.5770***	1.1869***	-4.2271*
	(2.78)	(1.70)	(4.63)	(5.04)	(6.56)	(-2.17)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	783	783	709	730	414	86
adj. R^2	0.384	0.383	0.374	0.377	0.341	0.321

Table 7: Impact of Share Allocation Reform on Dispersion.
This table presents regression results on the impact of share allocation reform on the divergence of opinions about an IPO among institutional bidders. Panel A reports summary statistics of main variables before and after the share allocation reform by the CSRC in 5 November 2010 and compares the mean differences. Panel B reports the regression results. The dependent variable is the dispersion measure *STD*, which is defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. The variable of interest is the *Allocation dummy*, which equals to one if the IPO filing date is after than 5 November 2010 when the CSRC changed the offline IPO share allocation rule from a pro-rata system to a lottery system. We use baseline regression specifications and variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

Panel A: Impact of Share Allocation Reform on Dispersion - Univariate Tests

	Allocation Dummy = 0 (Pro-rata basis)		Allocation Dummy = 1 (Lottery basis)		0 vs. 1 (Pro-rata vs. Lottery)	
	N	Mean	N	Mean	Diff	T-stat
IPO Initial Return	373	0.5024	410	0.2465	-0.2559	-8.21***
STD	373	0.1609	410	0.1510	-0.0099	-4.16***
Firm age	373	1.6203	410	2.1351	0.5147	10.17***
Offer size	373	6.6104	410	6.3979	-0.2125	-4.98***
Time gap	373	2.5977	410	2.3824	-0.2153	-13.23***
ROE	373	0.2160	410	0.2561	0.0401	4.65***
Index return (%)	373	1.2780	410	-1.7299	-3.0079	-5.70***
Oversubscription	373	4.2545	410	2.5851	-1.6693	-28.14***
Log # institutions	373	4.4937	410	3.8683	-0.6254	-25.51***
VC/PE dummy	373	0.4665	410	0.5293	0.0628	1.76*
ChiNext dummy	373	0.3780	410	0.5220	0.1439	4.08***
Lead reputation	373	3.2946	410	3.7307	0.4361	4.77***

Panel B: Impact of Share Allocation Reform on Dispersion - Multivariate Tests

	Dependent variable: STD			
	(1)	(2)	(3)	(4)
Firm age	-0.0009	-0.0006	-0.0010	-0.0008
	(-1.43)	(-1.45)	(-1.41)	(-1.57)
Offer size	-0.0048***	-0.0047***	-0.0048***	-0.0046***
	(-4.09)	(-4.46)	(-3.20)	(-3.11)
Time gap	0.0151***	0.0147***	0.0141***	0.0138***
	(6.13)	(6.77)	(6.50)	(7.10)
ROE	-0.0004	-0.0013	0.0030	0.0012
	(-0.07)	(-0.23)	(0.53)	(0.19)
INDEX21_shenA	-0.0004***	-0.0004***	-0.0004***	-0.0004***
	(-8.63)	(-9.20)	(-7.08)	(-7.09)
Oversubscription	-0.0089***	-0.0091***	-0.0092***	-0.0093***
	(-5.51)	(-5.87)	(-5.39)	(-5.61)
Log # Institutions	-0.0219***	-0.0209***	-0.0251***	-0.0238***
	(-5.53)	(-6.42)	(-6.07)	(-7.04)
VC/PE dummy	-0.0021	-0.0021	-0.0021	-0.0022
	(-1.50)	(-1.44)	(-1.54)	(-1.52)
Allocation dummy	-0.0339***	-0.0341***	-0.0276***	-0.0289***
	(-16.42)	(-15.78)	(-12.84)	(-9.61)
Lockup dummy	-0.0018	-0.0020	0.0014	-0.0002
	(-0.73)	(-0.83)	(0.57)	(-0.09)
ChiNext dummy	-0.0099***	-0.0095***	-0.0098***	-0.0095***
	(-9.49)	(-11.09)	(-9.66)	(-11.03)
Lead reputation	-0.0026***	-0.0026***	-0.0026***	-0.0026***
	(-7.83)	(-8.26)	(-7.47)	(-8.35)
Constant	0.3054***	0.2883***	0.3280***	0.3097***
	(19.59)	(21.64)	(21.47)	(21.20)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
N	783	783	783	783
adj. R^2	0.233	0.238	0.234	0.238

Table 8: Share Allocation Reform, Dispersion and IPO Underpricing.

The dependent variable is the IPO initial return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. The dispersion measure *STD* is defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. *Allocation Dummy* equals to one if the IPO filing date is later than 5 November 2010 when the CSRC changed the offline IPO share allocation rule from pro rata basis to lottery basis. In column (1) we include interaction term between *Dispersion* measure and the *Allocation dummy* in our baseline regression. In column (2), we report baseline regression results using the subsample firms with pro-rata share allocation (i.e., *Allocation dummy* = 0). Results in column (3) describe regression output for subsample firms with lottery share allocation (i.e., *Allocation dummy* = 1). Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return		
	Full Sample	Allocation dummy = 0	Allocation dummy = 1
	(1)	(2)	(3)
STD	0.9593**	0.9903***	2.2825***
	(2.70)	(5.09)	(6.26)
STD ×	1.0917***		
Allocation dummy	(4.52)		
Firm age	0.0070	0.0008	0.0073
	(0.66)	(0.05)	(0.79)
Offer size	-0.2153***	-0.2332***	-0.2002***
	(-16.07)	(-11.56)	(-13.15)
Time gap	0.1125***	0.1481***	-0.0452
	(3.81)	(7.13)	(-1.17)
ROE	0.0217	-0.1103***	0.1718***
	(0.78)	(-4.10)	(5.31)
INDEX21_shenA	0.0211***	0.0220***	0.0181***
	(16.81)	(20.14)	(16.18)
Oversubscription	0.1415***	0.1015***	0.1711***
	(6.44)	(6.26)	(7.55)
Log # Institutions	0.1276***	0.2082***	0.1464***
	(6.14)	(6.06)	(4.04)
VC/PE dummy	-0.0049	-0.0014	-0.0254
	(-0.23)	(-0.05)	(-1.55)
Allocation dummy	0.0654		
	(1.78)		
Lockup dummy	-0.0774	0.0000	-0.1163
	(-1.20)	(.)	(-1.58)
ChiNext dummy	-0.0700***	-0.0160	-0.1364***
	(-3.14)	(-0.49)	(-5.42)
Lead reputation	0.0068	0.0010	0.0229***
	(1.46)	(0.16)	(5.81)
Constant	0.3519**	0.2036	0.2748
	(2.49)	(0.93)	(1.71)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	783	373	410
adj. R^2	0.385	0.359	0.302

Table 9: Dispersion and Post-IPO Stock Performance.

This table reports regression results with post-IPO stock performance measured as the one-, three- and six-month buy and hold returns (BHRs) as dependent variables. BHRs are calculated using monthly stock returns starting from the first month after the IPO listing date. Cumulative abnormal returns (CARs) are measured as the cumulative difference between monthly return of IPO and corresponding monthly return of value-weighted market index. Panel A presents summary statistics of post-IPO stock performance measures. Panel B reports regression results with corresponding stock performance measures as dependent variables. Specifically, the first three columns report results using all sample IPOs. The last six columns reports results using IPOs with and without three-month lockup provision respectively. The variable of interest is dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. In all regression specifications, we control for firm and issue specific characteristics. However, we don't report their coefficient estimates to save space. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

Panel A: Summary Statistics of Post-IPO Stock Performance

Variable	N	Mean	Median	SD	P10	P25	P75	P90
BHR_1m	783	-0.62%	-1.72%	15.81%	-18.42%	-11.31%	8.47%	17.96%
BHR_3m	783	-2.58%	-6.22%	21.84%	-26.51%	-17.63%	9.07%	26.46%
BHR_6m	783	-2.07%	-8.81%	29.72%	-34.37%	-22.77%	14.82%	35.54%
CAR_1m	783	-0.60%	-2.36%	12.84%	-13.67%	-8.05%	4.50%	14.58%
CAR_3m	783	-2.43%	-3.90%	17.77%	-23.13%	-13.85%	7.16%	19.61%
CAR_6m	783	-0.58%	-4.02%	23.85%	-29.20%	-17.56%	13.87%	31.20%

Panel B: Impact of Dispersion on Post-IPO Stock Performance

	Full sample IPOs			IPOs with three-month lockup provision			IPOs without three-month lockup provision		
	BHR_1m	BHR_3m	BHR_6m	BHR_1m	BHR_3m	BHR_6m	BHR_1m	BHR_3m	BHR_6m
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
STD	-0.0108	-0.2874**	0.0062	0.0224	-0.3457***	0.0441	-0.2079	0.4062	-0.0883
	(-0.11)	(-2.85)	(0.04)	(0.19)	(-3.29)	(0.42)	(-1.52)	(1.07)	(-0.09)
Market return 1m	1.3131***			1.3230***			1.6429***		
	(30.56)			(33.10)			(5.68)		
Market return 3m		1.2037***			1.1917***			1.3181***	
		(22.87)			(22.57)			(3.86)	
Market return 6m			1.0864***			1.1041***			1.3820***
			(31.45)			(29.82)			(14.85)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	783	783	783	718	718	718	65	65	65
adj. R^2	0.372	0.407	0.366	0.387	0.414	0.373	0.116	0.271	0.261

Table 10: Dispersion and Post-IPO Operating Performance. This table reports regression results with post-IPO operating performance measured as the one-, two- and three-year ROE and ROA as dependent variables. Panel A presents summary statistics of post-IPO operating performance measures. Panel B reports regression results with corresponding operating performance measures as dependent variables. The variable of interest is dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

Panel A: Summary Statistics of Post-IPO Operating Performance

Variable	N	Mean	Median	SD	P10	P25	P75	P90
ROE_1yr	783	8.21%	7.79%	2.89%	5.20%	6.29%	9.73%	11.62%
ROE_2yr	731	7.68%	7.50%	4.70%	3.18%	5.01%	10.16%	12.75%
ROE_3yr	544	6.45%	6.48%	8.55%	1.50%	3.72%	9.72%	13.28%
ROA_1yr	783	6.64%	6.29%	2.48%	3.95%	5.03%	7.88%	9.46%
ROA_2yr	731	6.03%	5.86%	3.69%	2.36%	3.77%	7.99%	10.20%
ROA_3yr	544	4.99%	4.83%	4.61%	1.06%	2.60%	7.32%	10.03%

Panel B: Impact of Dispersion on Post-IPO Operating Performance

	ROE_1yr	ROE_2yr	ROE_3yr	ROA_1yr	ROA_2yr	ROA_3yr
	(1)	(2)	(3)	(4)	(5)	(6)
STD	-0.0621***	-0.1029	0.0004	-0.0359***	-0.0565	-0.0040
	(-4.63)	(-1.60)	(0.01)	(-4.29)	(-1.23)	(-0.11)
Firm age	0.0005	0.0036**	0.0086***	-0.0003	0.0027**	0.0072***
	(0.90)	(2.53)	(6.25)	(-0.65)	(2.85)	(10.18)
Offer size	0.0085***	0.0107***	-0.0002	0.0087***	0.0100***	0.0075***
	(8.33)	(6.00)	(-0.05)	(11.22)	(9.85)	(4.82)
Time gap	0.0083***	0.0123	0.0423***	0.0083***	0.0114**	0.0299***
	(4.90)	(1.60)	(6.38)	(6.32)	(2.22)	(3.76)
ROE	0.0606***	0.0446***	0.0909***	0.0652***	0.0501***	0.0559***
	(10.41)	(4.20)	(3.55)	(10.61)	(8.26)	(5.83)
Market return 1yr	0.0087			0.0018		
	(1.14)			(0.28)		
Market return 2yr		0.0162***			0.0062**	
		(3.11)			(2.70)	
Market return 3yr			0.0228***			0.0100
			(4.08)			(1.78)
Oversubscription	0.0005	0.0051***	0.0107***	0.0014*	0.0037***	0.0048***
	(0.60)	(3.75)	(4.38)	(2.15)	(3.89)	(3.46)
Log # institutions	-0.0125***	-0.0117	-0.0091*	-0.0056***	-0.0018	0.0006
	(-7.99)	(-1.64)	(-1.81)	(-4.43)	(-0.42)	(0.17)
VC/PE dummy	-0.0047***	-0.0132***	-0.0109***	-0.0040***	-0.0109***	-0.0076***
	(-3.19)	(-7.27)	(-5.54)	(-3.17)	(-7.15)	(-5.68)
Allocation dummy	-0.0014	0.0016	0.0308***	-0.0004	0.0061***	0.0189***
	(-0.32)	(0.84)	(5.22)	(-0.12)	(4.77)	(9.83)
Lockup dummy	-0.0053***	-0.0154**	0.0000	-0.0046**	-0.0140***	0.0000
	(-3.59)	(-2.69)	(.)	(-2.71)	(-4.22)	(.)
ChiNext dummy	-0.0068***	-0.0037	-0.0124***	-0.0002	0.0026	-0.0021
	(-7.29)	(-1.31)	(-3.23)	(-0.15)	(1.35)	(-0.52)
Lead reputation	0.0010*	0.0023	0.0006	0.0011**	0.0018*	0.0014
	(1.89)	(1.68)	(0.33)	(2.41)	(1.80)	(1.31)
Constant	0.0598***	0.0320	-0.0220	0.0027	-0.0313	-0.0939*
	(3.76)	(0.48)	(-0.33)	(0.17)	(-0.78)	(-1.94)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	783	731	544	783	731	544
adj. R^2	0.258	0.098	0.042	0.247	0.101	0.105

Table 11: Bidder Characteristics and Bid Price Accuracy. This table reports results of regression analysis on the determinants of bid price accuracy. Panel A reports estimates of OLS regressions in which the dependent variable is the continuous measure of bid price accuracy, defined as the percentage difference between bid price and offer price. Panel B reports estimates of a probit model in which the left-hand side dependent variable is a dummy variable indicating whether the bid price is above offer price or not. Independent variables capture a variety of bidder characteristics such as the size of the bid, the timing of the bid, the participation frequency of the bidder, the type of the bidder as well as the distance measures between bidder and IPO firm and between bidders. We include issue level fixed effects for all specifications. Variable definitions are given in Appendix A. Reported are coefficients and t-values calculated using robust standard errors with clustering on issues. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Panel A: OLS regression		Panel B: Probit regression	
	Dependent variable: % difference between bid price and offer price		Dependent variable: 1 if bid price > offer price, otherwise 0	
	(1)	(2)	(3)	(4)
Distance	0.0259***		-0.0537***	
	(3.58)		(-3.55)	
Distance (alternative)		0.0270***		-0.0567***
		(4.19)		(-4.22)
Largest bid	0.0006	0.0005	-0.001	-0.0006
	(0.10)	(0.070)	(-0.07)	(-0.04)
Second largest bid	-0.0128	-0.0129	0.0271	0.0273
	(-1.34)	(-1.35)	(1.29)	(1.31)
Early bid	0.0328***	0.0331***	-0.0572***	-0.0577***
	(3.70)	(3.73)	(-3.00)	(-3.03)
Late bid	-0.0441***	-0.0441***	0.0849***	0.0849***
	(-4.82)	(-4.82)	(4.42)	(4.43)
High frequency	-0.0783***	-0.0782***	0.1834***	0.1834***
	(-2.69)	(-2.69)	(2.79)	(2.79)
Medium frequency	-0.0843***	-0.0844***	0.1891***	0.1894***
	(-3.21)	(-3.22)	(3.18)	(3.18)
Type_bx	0.111***	0.112***	-0.2485***	-0.2497***
	(7.49)	(7.50)	(-7.87)	(-7.89)
Type_cw	-0.0668***	-0.0665***	0.1181***	0.1175***
	(-6.57)	(-6.54)	(5.67)	(5.64)
Type_gr	0.0648	0.0657	1.2220***	1.2220***
	(0.37)	(0.38)	(15.48)	(15.52)
Type_jj	-0.0522***	-0.0518***	0.1042***	0.1033***
	(-5.29)	(-5.25)	(4.98)	(4.93)
Type_qf	-0.0641*	-0.0632*	0.1037	0.1018
	(-1.91)	(-1.89)	(1.53)	(1.50)
Type_tj	-0.0639***	-0.0629***	0.1470***	0.1448***
	(-3.11)	(-3.07)	(3.28)	(3.28)
Type_xt	-0.119***	-0.119***	0.2487***	0.2491***
	(-10.28)	(-10.29)	(10.42)	(10.43)
Constant	0.704***	0.698***	-0.2608**	-0.2401**
	(12.68)	(13.75)	(-2.22)	(-2.23)
IPO FE	Yes	Yes	Yes	Yes
N	123,819	123,819	123,819	123,819
adj. R2	0.102	0.102	0.091	0.091

Table 12: Dispersion and Other IPO Characteristics. This table reports regression results using *Turnover, Return Volatility, Offline Oversubscription and the probability of IPO first-day closing price below its offer price (denoted as FBO dummy)* as dependent variables respectively. *Turnover* is defined as the proportion of first-day trading volume to the number of IPO shares offered. *Volatility* is calculated as the annualized 30-day volatility of market adjusted returns from the IPO listing date. *Oversubscription* is defined as the natural logarithm of ratio of total offline subscription from institutional investors divided by the number of shares allocated to institutional investors. *FBO dummy* is an indicator variable that takes on a value of one if the first-day closing price falls below the offer price and otherwise 0. The variable of interest is dispersion measure *STD* defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	OLS Regression			Probit
	Turnover	Volatility	Oversubscription	FBO dummy
	(1)	(2)	(4)	(3)
STD	0.5043**	0.2545**	-2.7083***	-5.3640***
	(2.80)	(2.30)	(-6.89)	(-7.35)
Firm age	0.0074	0.0038	0.0177*	-0.1332***
	(1.59)	(1.73)	(1.91)	(-3.16)
Offer size	-0.0977***	-0.0386***	-0.2697***	0.6822***
	(-5.97)	(-7.11)	(-16.67)	(4.10)
Time gap	-0.0031	0.0305***	-0.0086	0.4677***
	(-0.11)	(7.56)	(-0.31)	(2.86)
ROE	-0.0137	0.0143***	-0.0163	0.0499
	(-0.27)	(3.39)	(-0.24)	(0.12)
INDEX21_shenA	0.0073***	0.0037***	-0.0058**	-0.1014***
	(28.11)	(9.27)	(-3.03)	(-9.78)
Oversubscription	0.0459***	0.0266***		-0.4708***
	(9.46)	(3.17)		(-6.43)
Log # institutions	-0.0398***	0.0244***	1.6499***	0.1060
	(-4.30)	(3.98)	(44.54)	(1.00)
VC/PE dummy	-0.0093	-0.0020	0.0013	0.1604
	(-0.76)	(-0.40)	(0.03)	(1.22)
Allocation dummy	0.0878***	0.0946**	-0.6851***	-5.1771***
	(3.89)	(2.60)	(-15.63)	(-28.51)
Lockup dummy	0.0373*	-0.0081	0.5105***	0.8663***
	(1.87)	(-0.74)	(9.40)	(4.16)
ChiNext dummy	-0.0172	-0.0155**	0.0958***	0.1445**
	(-1.68)	(-2.69)	(6.09)	(2.49)
Lead reputation	0.0039	0.0016	-0.0163**	-0.0885***
	(1.19)	(1.51)	(-2.72)	(-2.75)
Constant	1.4062***	0.0292	-1.0947***	-10.4677***
	(18.29)	(0.59)	(-4.21)	(-12.65)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	783	783	783	766
adj. R^2	0.215	0.282	0.819	0.376

Table 13: Optimism and IPO Initial Return.

The dependent variable is the IPO initial return, defined as the ratio of the closing price of the stock on its first trading day less the offer price to its offer price. Primary dispersion measure *STD* is defined as the ratio of the cross-sectional standard deviation of institutional investors' bidding price in the offline subscription process to the mean bidding price. Alternative dispersion measure *MAD* is defined as the mean absolute deviation of the bidding price surrounding the mean bidding price scaled by the mean bidding price. The optimism measure *Optimism* is defined as the percentage difference between mean bidding price and the midpoint of lead underwriter's IPO valuation range. Variable definitions are given in Appendix A. Reported are coefficients and *t*-value calculated using the industry clustered standard errors. ***, **, and * indicate 1%, 5%, and 10% statistical significance levels respectively.

	Dependent variable: First-day return		
	(1)	(2)	(3)
STD		1.4323***	
		(4.57)	
MAD			1.8117***
			(4.14)
Optimism	-0.2949***	-0.2490***	-0.2533***
	(-5.80)	(-4.99)	(-4.94)
Firm age	0.0059	0.0072	0.0074
	(0.57)	(0.67)	(0.69)
Offer size	-0.2079***	-0.2032***	-0.2028***
	(-15.18)	(-13.21)	(-13.66)
Time gap	0.1332***	0.1123***	0.1122***
	(5.22)	(4.19)	(4.12)
ROE	-0.0266	-0.0201	-0.0205
	(-1.06)	(-0.65)	(-0.68)
INDEX21_shenA	0.0200***	0.0207***	0.0207***
	(17.11)	(16.92)	(16.94)
Oversubscription	0.1328***	0.1451***	0.1449***
	(5.66)	(5.90)	(5.86)
Log # institutions	0.1815***	0.2019***	0.2074***
	(7.39)	(8.98)	(9.28)
VC/PE dummy	-0.0149	-0.0111	-0.0110
	(-0.64)	(-0.49)	(-0.48)
Allocation dummy	0.1954***	0.2350***	0.2355***
	(18.12)	(16.05)	(14.74)
Lockup dummy	-0.0848	-0.0845	-0.0870
	(-1.45)	(-1.41)	(-1.46)
ChiNext dummy	-0.0583**	-0.0485**	-0.0484**
	(-2.81)	(-2.78)	(-2.80)
Lead reputation	0.0050	0.0083*	0.0091*
	(1.08)	(1.94)	(2.07)
Constant	0.2155	-0.1483	-0.1783
	(1.39)	(-0.66)	(-0.79)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	783	783	783
adj. R^2	0.380	0.388	0.389

Figure 1: Number of IPOs and Average Underpricing.

This figure depicts number of IPOs and average underpricing on a quarterly basis for our full IPO sample which consists of 783 firms listed in Shenzhen SME board or the ChiNext board during the period of 2009Q3 to 2012Q4. The blue bars show the number of IPOs for each quarter and the red line shows the quarterly average IPO underpricing.