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ORIGINAL RESEARCH

You scratch my back and i scratch yours: evidence from relationship-based bidding in IPO auctions

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Abstract
Using a dataset of institutional bids for IPOs, we study how relationships with lead underwriters impact institutional investors' bidding strategy in the auctioned IPOs. Our paper finds that strong business ties lead to higher bid prices. The effect is more pronounced among IPO firms that receive less market attention, and is attenuated for IPOs certified by reputable intermediaries. We propose that rent-seeking incentives may be the potential mechanism for this relationship-based bidding. Our study highlights that the business connection between underwriters and institutional investors has effect on the IPO pricing.

Keywords Business ties · IPO pricing · Bidding strategy · Mutual funds

JEL Classification L14 · G10 · G23

1 Introduction

Over the last few years, the role of relationships among institutional investors and underwriters has brought attention to economists and policymakers. Though the interaction between underwriters and investors influences the pricing efficiency of IPOs (Sherman and Titman 2002; Loughran and Ritter 2002; Jiang et al. 2022), the evidences on the effects are mixed. One stream of research posits that the underwriters use underpricing strategies to reward their favored institutional investor clienteles to extract information relevant to IPO firms (Benveniste and Spindt 1989; Loughran and Ritter 2002; Reuter 2006; Binay et al. 2007; Seth et al. 2019). Another stream of research asserts that, repeated interactions between the underwriter and investors may reduce search costs and allow for more favorable pricing strategies for issuers (Henderson and Tookes 2012; Geranio et al. 2022).[1]

[1] This stream of research is limited and the only studies we know of are Henderson and Tookes (2012) and Geranio et al. (2022). However, Henderson and Tookes (2012) examines the interaction between investment banks and investors in the setting of the convertible bond market rather than the stock market. Geranio et al. (2022) investigates the impact of frequent interaction between lead underwriter and institutional investors on reducing the partial adjustment of the offer price, rather than how it affects investors' bidding behavior.

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Notwithstanding the importance of relationships between underwriters and investors, the empirical research has provided little evidence of their effect on investors' bidding in the IPO auction process, in part because data on investors' valuations of new issues are generally proprietary and are rarely disclosed by investment banks. To conquer this limitation, we hand-collect data on the institutional bids for 403 Chinese IPOs during 2010–2012. The Chinese market is of particular relevance for this study for two reasons. First, China is known for its prevalence of connections and weak legal institutions (Du et al. 2018; Du 2019). In such an environment, firms often conduct business through social relationships; many of their transactions fall within the gray areas of the law, and such firms cannot afford public disclosures and transparency. Second, the growing importance of the Chinese economy adds interest to this topic. China's stock market is second largest in the world after that of the United States and its market cap topped 11.4 trillion US dollars in 2022.

In our unique dataset for institutional bids, we only include the bids submitted by mutual funds. There are several features of Chinese mutual funds that cause them to be representative institutional investors. First, mutual funds' bids account for one half of total bids in the IPO auctions, making them the most active institutional investors. (Gao et al. 2020). Second, the potential space for business interactions between mutual funds and investment banks is large.[2] Trading commissions from mutual funds is the largest in the revenue for the brokerage business line of the investment banks (Gu et al., 2013). Last and most importantly, the brokerage commissions data released by the mutual fund families allow us to identify the its connection with the investment banks. The China Security Regulatory Commission (CSRC), the Chinese counterpart to the U.S. Securities and Exchange Commission, requires each fund family to report the payment details of its trading commissions to each brokerage firm. We use brokerage commission payment that those families directed to the lead underwriters to measure the business ties between underwriters and mutual funds.

Using a dataset on 14,496 bids submitted by mutual funds for 403 Chinese IPOs from 2010 to 2012, we find that strong connection between underwriters and mutual funds lead to higher bid prices. This impact is also economically meaningful. Compared with those of weakly connected or unconnected mutual funds, the bid prices submitted by strongly-connected funds are higher by 1.5 percentage points. The results are robust to alternative models of specifications.

To address the endogeneity concerns, we conduct two checks. First, we adopt the approach created by Altonji et al. (2005) and use the selection on observable variables to infer the information of selection on unobservable. We show that the bias from selection on unobservables would be at least 4.25 times as large as selection-on-observables to completely negate the estimated impact. Second, we quantify the bounds for the estimated impact following the method proposed by Oster (2019). We find the lower bound is far above zero. Therefore, our findings are not likely to be caused by unobservables.

We then employ multiple heterogeneous analysis to reinforce our baseline results. Our cross-sectional regression shows the positive relationship between business ties and funds' willingness to bid is stronger in neglected IPO firms. We also find that the documented

[2] In China, many investment banks have direct ownership of some fund families. In addition, many fund families rely on investment bank channels to market their new funds to retail investors. These factors also contribute to the business interactions between mutual funds and investment banks.

impact of business ties on funds' willingness to bid is mitigated in IPO firms certified by prestigious intermediaries.

Furthermore, we also investigate how bids from connected mutual funds affect the stock performance after initial public offering. We find that higher business ties are associated poorer post-IPO stock performance. It suggests that high bids from connected mutual funds lead to IPO overpricing. In addition, the stocks may decline below their offering prices within short period of trading due to the overpricing. This implies that though the investment banks benefit from collecting more underwriting fees by setting higher offer prices, the investors buying the stocks after the IPO may suffer losses.

Finally, we discuss the potential channels that facilitate the aggressive bidding behavior. We find that the lead underwriters may reveal private information of the IPOs to their connected bidders, thus these well-informed institutional investors bid aggressively on IPOs that are expected to outperform. This is consistent with the rent-seeking theory proposed by Chiang et al. (2010).

We contribute to the literature along three dimensions. Our paper is one of the studies that bring attention to the relationships between investment banks and institutional investors. Existing research has studied the role of this relationship in allocating initial public offering (Reuter 2006; Binay et al. 2007; Nimalendran et al. 2007; Goldstein et al. 2011), attracting investors for securities offerings (Huang et al. 2008), influencing sell-side analysts in issuing biased opinions (Gu et al., 2013), and motivating underwriters to stay away from problematic listings (Lee and Masulis 2011; Zhang et al. 2021). In our paper, we offer additional evidence on the impact of this relationship on the IPO pricing, suggesting that strong relationship may impair underwriter independence and eventually result in IPO overpricing and subsequent poorer after-IPO stock performance.

Second, to our best knowledge, our study is among the first batch to examine *quid pro quo* in auctioned IPOs. While previous research finds that *quid pro quo* exists in bookbuilding IPOs (Reuter 2006; Saengchote and Sthienchoak 2020),[3] it is unknown whether similar phenomenon can be observed in auctioned IPOs. IPO auctions in China is a typical type of dirty-Dutch auctions where underwriters have no discretion over allocating shares, whereas bookbuilding IPOs allow the underwriters to allocate shares. We show that *quid pro quo* also exists in auctioned IPOs but appears in a different form.

Third, by using bidding information in the auctioned IPOs, we add to the growing literature on IPO pricing (Ritter 2003; Ljungqvist 2007; Fisch et al. 2022; Liu et al. 2023). Prior research has used first-day return as proxies for IPO underpricing, however, first-day returns cannot capture the divergence in institutional investors' opinions. We fill this gap by exploiting a unique database that provides full information on investors' evaluations.

The remainder of this paper proceeds as follows: Sect. 2 describes the institutional background of auctioned IPO in China. Section 3 introduces the sample and data. Section 4 summarizes the empirical results and provides the results of various robustness checks. Section 5 discusses the mechanism and Sect. 6 concludes the paper.

[3] Based on a sample of US firms, Reuter (2006) finds that lead underwriters use allocations of underpriced IPOs to reward institutional investors that they have close business connection with. In the setting of Thai market, Saengchote and Sthienchoak (2020) observes that underwriters use their affiliated mutual funds to support cold IPOs in order to win favors for future business.

2 Institutional background and hypothesis development

2.1 Institutional background

The stock market in China has grown rapidly since its establishment in 1990. By December 2022, there are totally 5,079 listed firms in mainland China, with market value totaling 79 trillion RMB yuan (approximately 11.5 trillion US dollars). China Securities Regulatory Commission (CSRC) regulated the IPO process in China, and it has initiated several waves of reforms to improve the IPO pricing efficiency.

Since December 2004, the CSRC has implemented a mechanism of dirty-Dutch auctions in which underwriters set a fixed initial public offering price lower than the auction clearing price and have no discretion on allocating shares. The underwriters set the offer price in consultation with the IPO firm, given the bids submitted by institutional investors. They usually strike a balance between the interest of the issuing firm and that of the institutional investors.[4] On November 1, 2010, the CSRC carried a reform on the initial public offering system. There are two major changes in the 2010 reforms as below (Cao et al. 2016):

2.1.1 Mandatory disclosure of bid information from auctions.

Prior to November 1, 2010, information on institutional investors' bids in IPO process was not disclosed to the public. After this date, the CSRC has required that issuing firms and underwriters disclose institutional investors' bid prices and quantities after the auction process is finished. This disclosure policy offers excellent opportunity for the researchers to explore how auction is used to determine the offer prices for IPO firms. Therefore, we choose the start of our sample period with this date (i.e., November 2010).

2.1.2 A lottery-basis allocation of new shares.

Before November 1, 2010, China conducted a pro-rata-basis allocation system in which the allocation of new shares were in proportion to investors' bidding amounts. On November 1, the SME Board and ChiNext Board of the Shenzhen Stock Exchange (SZSE) adopted a lottery system, while the Shanghai Stock Exchange (SHSE) remain the previous allocation rule. In the lottery-basis allocation system, all bids above the determined offer price are qualified for the lottery and institutional investors hit the jackpot subscribed the new shares at the fixed offer price.

In November 2012, the Chinese IPO market was discontinued by the CSRC resulting from the bearish performance in the stock market. In January 2014, the CSRC reinstated the IPO market with implementation of a batch of reforms (Gao et al. 2020; Wang 2022). First, an upper limit is put on the maximum proceeds that an IPO firm could raise from the market. With expected proceeds and number of shares to be issued specified in the prospectus, the offer price could be accurately estimated by the potential investors, therefore their bid price would crowd around the estimated offer price. Second, at least 10 percent of

[4] If the offer price is too high, the profit margins of the participating institutional investors will shrink and their participation in future auctions will be discouraged. If the offer price is too low, the IPO will raise lower-than-expected proceeds, which will hurt the interests of the issuer.

the highest bids would be removed from the auction prior to the offer price has been determined, disincentivizing investors to submit high prices. To minimize the potential impact of this policy change, our sample ends in November 2012, similar with Gao et al. (2018, 2020).

2.2 Literature review and hypothesis development

Prior studies show that *quid pro quo* exists between underwriters and institutional investors in the bookbuilding IPOs (Reuter 2006; Nimalendran et al. 2007; Goldstein et al. 2011; Saengchote and Sthienchoak 2020). Rent-seeking theory argues that, underwriters allocate hot IPOs to investors for the sake of future trading commissions (Loughran and Ritter 2004). The information extraction theory states that underwriters use underpricing strategies to reward favored investors for unveiling their private information on IPO valuation (Benveniste and Spindt 1989; Binay et al. 2007). The IPO price stabilization theory posits that underwriter may make preferential allocation of underpriced shares to investors if they promise to hold the stocks for a long time frame (Aggarwal 2000; Hao 2007).

Unlike in bookbuilding IPOs, underwriters have no discretion to allocate shares in Chinese auctioned IPOs. Although discretionary allocations are absent, *quid pro quo* may still exist between underwriters and institutional investors. Investment banks have the advantage of information production and retention (Geranio et al. 2022; Herron 2022). As underwriters, driven by rent-seeking incentives, they may whisper private information to their favored investors as an exchange for trading commissions (Chiang et al. 2010; Chemmanur et al. 2016). To put it another way, underwriters may act upon their information advantage and help favored investors in the IPO auctions, so as to attract more investors for the investment banks' brokerage business. Underwriters are in possession of two types of information, one is information regarding the evaluation of the IPO firms and the other is the details regarding the distribution of bidding prices. However, leaking bidding information is costly for the underwriters, as it is strictly prohibited by Chinese regulatory authorities and is also practically challenging (Chiang et al. 2010). The remaining possibility is that underwriters may deliver their private information on the value of the IPO firms to their favored bidders. This will allow the bidders to be able to identify good IPOs. As a result, contingent on participation in auctions, these well-informed bidders may bid more aggressively for IPOs underwritten by their connected underwriters. This leads to the following hypothesis.

Hypothesis 1 Institutional investors with strong connection with the lead underwriters are more likely to bid higher price for IPOs that underwritten by these underwriters.

3 Sample and data

3.1 Data and sample

The data used in our paper comes from CSMAR and Wind database. Our sample period runs two years from November 2010 to November 2012. To control for the transition to lottery-basis allocation rules, we focus only on firms listed on the SME Board and ChiNext Board of the SZSE, with a total number of 403 firms going pubic during this time period. Descriptive statistics are summarized in Table 1. Among these IPOs, thirty-seven took

Table 1 Sample distribution

Panel A: sample distribution by year			
Year	# of firms	First-day returns (%)	180-day return (%)
2010	37	43.98	− 5.29
2011	238	21.85	2.22
2012	128	23.94	17.85
Total	403	24.55	6.49
Panel B: sample distribution by listing board			
Listing board	# of firms	% of firms (%)	
Small and Medium-size enterprise	193	47.89	
ChiNext	210	52.11	
Total	403	100.00	
Panel C: sample distribution by fund type			
Fund type	# of funds	% of funds (%)	
Stock fund	18	3.92	
Bond fund	92	20.04	
Hybrid Fund	349	76.03	
Total	459	100.00	
Panel D: bids distribution by fund type			
Fund type	# of bids	% of bids (%)	
Stock fund	196	1.35	
Bond fund	7350	50.70	
Hybrid fund	6950	47.94	
Total	14,496	100.00	

place in 2010, accompanied by 238 and 128 in 2011 and 2012, respectively. The average first-day return of IPOs from 2010 to 2012 was 43.98%, 21.85% and 23.94%, respectively. However, the long-term IPO performance deteriorated, with average 180-day return after the IPO at -5.29%, 2.22% and 17.85%, respectively. The number of firms listed on the SME Board is equally comparable to that on ChiNext Board. We compile a dataset comprising 14,496 bids submitted by mutual funds along with the bidding price and quantity information for these 403 IPOs. The number of individual mutual funds that have participated in the IPO auctions is 459, and most of them are hybrid funds. Regarding to the number of bids, bond funds take the lead.[5]

[5] There are three categories of bond funds in China, namely, pure bond funds, primary bond funds and secondary bond funds. Pure bond funds only invest in fixed income. Primary bond funds can also invest in newly issued stocks in the primary stock market. Secondary bond funds can invest in fixed income as well as stocks in the primary and secondary markets. Among these funds, primary bond funds were the most active in the primary market. In order to boost their return, they seek profits by subscribing to newly issued equities in the primary market and selling them in the secondary market. As required by CSRC, the maximum allowed proportion of stock assets for both primary bond funds and secondary bond funds is 20%.

3.2 Model specification and variables

To examine the impact of business ties with underwriters on a fund's bid price for IPO price, we estimate the econometric model below.

$$BidPrice_{i,j} = \beta_0 + \beta_1 DTies_{i,j} + \gamma Controls + \delta_t + \lambda_{industry} + \varepsilon_{i,j} \quad (1)$$

where $BidPrice_{i,j}$ represents the normalized bid price submitted by fund i for IPO firm j. $DTies_{ij}$ is the business connection between mutual fund i and the lead underwriter of IPO j in the pre-IPO year. *Controls* represents a set of control variables. We also add year fixed effects δ_t and industry fixed effects $\lambda_{industry}$ to our regression model. ε_{ij} is the error term with standard errors clustered at the mutual fund level.

For the dependent variable, following Hanley (1993), Gao et al., (2020) and Wang (2023), we use *Normalized Bid Price* as a proxy for the bid price, which is defined as the bid price normalized by the midpoint of the IPO price range. For the independent variable, we use brokerage commission data to measure the business ties between mutual funds and underwriters (Reuter 2006; Nimalendran et al. 2007; Gu et al. 2013). The proxy variable for business connection *DTies* is an indicator that equals one if the family of the mutual fund pays brokerage commissions to the lead underwriter before the calendar year of IPO, and zero otherwise.

Regarding control variables, we include firm size (*Stock Size*), debt ratio (*Debt Ratio*), return on assets (*ROA*), the number of fund bidders for each IPO (*NBidder*), and market sentiment (*Sentiment*). Following Brockman et al. (2023), we include the proxy variables for the lead underwriter's size (*Underwriter Size*), measured as the market share of the lead underwriter in terms of IPO proceeds raised in the pre-IPO year. Following Huyghebaert and Xu (2015), we include the proxy variables for the lead underwriter's political connection (*Political Connection*), which equals to one if the lead underwriter (investment bank) is ultimately controlled by the central government, and zero otherwise. Board members in a central-government-owned investment bank usually have a higher political hierarchy and have better access to CSRC official, thus giving the bank a big advantage in gaining IPO business.

We also add fund size (*Fund Size*), and fund type (*Fund Type*) to control for fund attributes, as suggested by Tang et al. (2012), Li and Wang (2022) and Wang (2023). Fund managers may obtain soft information on IPOs through personal interaction with investment bankers or issuer's senior officers (Cohen et al. 2008; Brockman et al. 2023), and take advantage of this information during their bidding. Therefore, we control for the social connection between investment bankers and the mutual fund managers (*SC_Sponsor_Fund*), as well as the social connection between issuer's senior officers and the mutual fund managers (*SC_Firm_Fund*). Following Brockman et al (2023), *SC_Sponsor_Fund* is defined as a dummy variable which equals one if the investment bankers (the sponsors) and the fund managers have shared education background and employment history, and zero otherwise. *SC_Firm_Fund* is measured in a similar way, which is defined as a dummy variable which equals one if the issuer's senior officers (chairman of the board, CEO and CFO) and the fund managers have shared education background and employment history, and zero otherwise.[6] The detailed definition of our key variables is listed in Appendix.

[6] Our data on education background and employment history for fund managers and issuer's senior officers are obtained from CSMAR. Our data on sponsors are hand-collected from internet search.

Table 2 Statistics summary

	N	Mean	Std. Dev	Min	Median	Max
Panel A: IPO-level observations						
Stock size	403	6.18	0.78	4.57	6.1	10.88
Debt ratio (%)	403	43.62	16.26	1.78	43.82	82.21
ROA (%)	403	15.63	7.59	2.25	14.26	48.76
Number of fund bidders	403	35.97	24.55	3	31	263
Market sentiment (%)	403	−2.19	6.28	−17.09	−2.83	13.76
Underwriter size	403	0.02	0.03	0	0.01	0.11
Political connection	403	0.20	0.40	0	0	1
First-day return (%)	403	24.55	43.36	−26.33	16.88	626.74
Three-month return (%)	403	10.88	38.65	−39.08	3.34	506.59
Six-month return (%)	403	6.49	38.72	−55.2	−1.71	419.38
Panel B: IPO-family-level observations						
Brokerage Commission (10K RMB)	6053	238.95	385.32	0	63.19	3220.68
DTies	6053	0.56	0.50	0	1	1
NTies	6053	3.09	2.89	0	4.16	8.08
Panel C: fund-level observations						
Fund size	459	7.41	1.2	2.75	7.52	10.17
Bond Fund	459	0.2	0.4	0	0	1
Panel D: IPO-fund level						
Normalized Bid Price (%)	14,496	3.28	17.04	−61.11	4.17	58.33
Alternative Bid Price (%)	14,496	−13.76	24.97	−86.58	−13.98	94.38
SC_Firm_Fund	14,496	0.02	0.16	0	0	1
SC_Sponsor_Fund	14,496	0.03	0.16	0	0	1

4 Summary statistics

Table 2 presents summary statistics for our key variables. Our dependent variable *Normalized Bid Price* has an average value of 3.28%, suggesting that the funds on average submit bids higher than the midpoint of the price range listed in the prospectus. Our independent variable *DTies* has an average value of 0.56, indicating that 56% of mutual fund families in our sample have allocated trading commission fees to the lead underwriters (the investment banks).

Summary statistics for control variables are also reported in Table 2. The size for IPO firms (in natural logarithm) has an average value of 6.18 million yuan and their debt ratios (debt divided by assets) are 43.62% on average. All of the firms are profitable, with a mean value of ROA at 15.63%, which is in stark contrast with the pattern in the United States and the Europe.[7] Typically, each IPO receives bids from around 40 fund bidders, with the

[7] In the United States, profitability is not a prerequisite for initial public offerings. Historically, some US IPOs can successfully go public with negative profit. Based on historical summary statistics for US IPOs since 1980, reported by Ritter (2014), on average, 25% of IPO firms (excluding tech and biotech firms) were unprofitable, and this number was even larger for tech firms (53%) and biotech firms (90%). In Europe, during the past decades, 15% of companies going public had no revenues prior to their IPO (Signori 2018).

maximum value reaching 263 and the minimum at 3. The market sentiment, calculated as market return within 30 trading days before the initial public offering, has an average value of -2.19%. The mutual fund bidders' total net asset (in natural logarithm) ranges from 2.75 to 10.17, with a mean value of 7.41. The average market share for a underwriter is 2%, with the largest one taking 11% share of the IPO market. Among the underwriters, 20% of them have political connection. That is to say, they are ultimately controlled by the central government. The first-day, 3-month and 6-month stock returns after the IPO are all positive but exhibit a declining trend, with mean values of 24.55%, 10.88% and 6.49%, respectively. The average values for *SC_Firm_Fund* and *SC_Sponsor_Fund* are 0.02 and 0.03, respectively, which are in similar magnitude as that calculated in Brockman et al (2023).

5 Empirical analysis

5.1 Baseline results

Table 3 reports our regression results. Column (1) include only business ties between the IPO underwriter and the mutual fund, year and industry fixed effects, and no controls. In column (2), we add IPO-level controls, namely firm size, debt ratio, return on assets, number of fund bidders and market sentiment. In column (3), we add to our model the proxy variables for underwriter's size and political connection, and proxy variables for fund size and fund type. In column (4), we further add to our model the social connection between issuer's senior officers and the mutual fund managers, and the social connection between investment bankers and the mutual fund managers. Columns (1) to (4) show that business ties between the mutual fund and the IPO underwriter are statistically positively correlated with the fund's bid price. Our findings also have economic significance. As shown by column (4), if a fund has a strong business connection with the IPO underwriter, its normalized bid price increases by 1.5 percentage points. Overall, our results support our hypothesis that a mutual fund submits higher bids for an IPO if the fund has a close connection with the underwriter.

5.2 Robustness check

We implement a battery of robustness check to substantiate our empirical findings.

First, we examine the sensitivity of our results to a different measure for bid price. In our baseline regression, we view the midpoint of price range in the IPO prospectus as the expected offer price and use it to scale the bid price. However, as the institutional investors are subject to a three-month holding period requirement, the mutual fund managers may use their expected stock price three months after IPO as a reference point. We utilize this reference point as our scale factor for the bid price *ex post*, and test the robustness of our main results. Table 4 shows that the coefficient on *Business Ties* remains significantly positive at the 1% level. It indicates that our main findings are not driven by different measures of the dependent variable.

Second, we check the robustness of our results to different measures of business ties. In our baseline regression, our business ties measure is constructed based on whether the family of the mutual fund bidder has ever paid brokerage commissions to the IPO underwriter. To ensure that our results are not affected by the definition of our business ties measure, we re-run our baseline model using two different measures of business ties. The first is *DTies_2*, which

Table 3 Baseline regression results

Variables	Normalized bid price			
	(1)	(2)	(3)	(4)
DTies	1.821***	1.930***	1.460***	1.474***
	(0.319)	(0.318)	(0.415)	(0.415)
Stock Size		0.761***	0.692**	0.708**
		(0.273)	(0.288)	(0.288)
Debt Ratio		−0.075***	−0.076***	−0.077***
		(0.016)	(0.016)	(0.016)
ROA		−0.005	−0.016	−0.016
		(0.033)	(0.034)	(0.034)
NBidders		3.283***	3.079***	3.068***
		(0.430)	(0.440)	(0.439)
Sentiment		−0.021	−0.017	−0.017
		(0.025)	(0.026)	(0.026)
Underwriter Size			2.850	2.625
			(7.672)	(7.678)
Political Connection			2.320***	2.344***
			(0.430)	(0.431)
Fund Size			−0.001	0.013
			(0.310)	(0.309)
Fund Type			−0.366	−0.355
			(0.755)	(0.755)
SC_Firm_Fund				−1.421
				(1.018)
SC_Sponsor_Fund				−0.892
				(0.944)
Constant	2.274***	−11.625***	−10.296***	−10.383***
	(0.389)	(2.375)	(3.688)	(3.678)
Observations	14,496	14,496	14,496	14,496
R-squared	0.051	0.064	0.067	0.067

This table examines how the relationships between mutual funds and underwriters affect the funds' bidding prices for an IPO. Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

is an indicator that equals 1 if the payments of brokerage commission directed from fund families to investment banks is greater than the sample mean. The second is *NTies*, which is a continuous measure and is defined as the natural logarithm of one plus the brokerage commission payment directed from the fund family to the investment bank. Table 5 reports the results and it indicates that the relationship between business connection and bid price remains statistically positive.

Table 4 Robustness check: alternative measures for dependent variables

Variables	Alternative bid price	
	(1)	(2)
DTies	5.262***	2.061***
	(0.355)	(0.488)
Controls	No	Yes
Year fixed	Yes	Yes
Industry fixed	Yes	Yes
Observations	14,496	14,496
R-squared	0.195	0.262

We use alternative measures to proxy for the normalized bid price. Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

Table 5 Robustness check: alternative measures for business ties

Variables	Normalized bid price			
	(1)	(2)	(3)	(4)
DTies_2	1.716***	1.282***		
	(0.299)	(0.399)		
NTies			0.309***	0.245***
			(0.053)	(0.072)
Controls	No	Yes	No	Yes
Year Fixed	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes
Observations	14,496	14,496	14,496	14,496
R-squared	0.051	0.067	0.051	0.067

We use two alternative measures to proxy for the business ties between mutual funds and IPO underwriters. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

5.3 Endogeneity

In Eq. (1), although we measure normalized bid prices offered after the brokerage commission payments are made, potential endogeneity issues may still exist. A fund's decision to submit a higher bid for the IPO may be influenced by factors that are also related to the brokerage commission payment that the fund family directs to the lead underwriter. For example, an investment bank that enjoys a high reputation receives more investment banking business and more brokerage business. It can easily obtain brokerage commissions from fund families, and the funds affiliated with those families are willing to place higher bids for the IPO it underwrites. To address the endogeneity issues arising from omitted variable bias, we adopt the method suggested by Altonji et al. (2005) and Oster (2019) to evaluate our selection bias on unobservables. This approach is widely applied in the economic and financial literature, such as Heimer et al. (2019), Cohen et al. (2020), and Babenko et al. (2020).

First, inspired by Altonji et al. (2005), we apply the selection on the observables to judge the likelihood that our estimation could be largely affected by unobserved characteristics

Table 6 Using selection on observables to assess the bias from unobservables

	Normalized bid price	
	(1)	(2)
	Limited	Full
Panel A		
DTies	1.821***	1.474***
	(0.319)	(0.415)
Controls	No	Yes
Year Fixed	Yes	Yes
Industry Fixed	Yes	Yes
Observations	14,496	14,496
R-squared	0.051	0.067
Panel B		
Selection Ratio ($\lvert\beta_F/(\beta_L-\beta_F)\rvert$)		4.25
Identified β-set		[1.281, 1.474]

across fund bidders. β_{L} is the estimated coefficient for *DTies* for a regression containing only *DTies*, as well as industry and year fixed effects (column 1 of Table 6). β_F is the estimated effect for *DTies* for a regression that contains *DTies* and all controls variables, as well as fixed effects (column 2 of Table 6). The formula $\left|\beta_F/(\beta_L-\beta_F)\right|$ evaluates the degree of the selection, with a larger ratio indicating a greater selection effect required to drive away the estimated effect. The result in column (2) shows that, selection on unobservable variables need to be at least 4.25 (≈|1.474/(1.821–1.474)|) times as that on observable variables to diminish the estimated effect to zero. Since this ratio is substantially larger than zero, our concern regarding to selection bias on unobservables lessens.

Nevertheless, as argued by Oster (2019), variations in coefficients need to be considered together with changes in R-squared. If the model approaches to account for all variations in outcome variables, the concerns on the bias arising from omitted variables will be largely alleviated. We assume $R_{\max}$ is the upper limit for the R-squared, that is to say, the R-squared from a model of bid price on *DTies*, as well as all observable and unobservable variables. R_F denotes the R-squared from a model of bid price on *DTies*, along with all controls and fixed effects (column 2) and R_L denotes the R-squared from a model with limited variables (column 1). Additionally, we assume the ratio of selection-on-unobservables to selection-on-observables is $\delta \in [0,\ 1]$.

The impact of business connection on investors' bid price is bounded by $\beta^*(R_{\max},\delta)=\beta_F-\delta(\beta_L-\beta_F)\frac{R_{\max}-R_F}{R_{\max}-R_L}$. As suggested by Oster (2019), the maximum value of R-squared is set to $R_{\max}=\min\{1.3R_F,1\}$ and the ratio of selection-on-unobservables to observables is set at $\delta=1$. The estimated causal impact is expected to locate between β_F and β^*. Panel B of Table 6 shows that the range of the impact is [1.281, 1.474], which is above and beyond zero. It implies that our estimated causal impact is significant and less likely to subject to selection bias.

5.4 Heterogeneous analysis

In this subsection, we provide cross-sectional evidences that strengthen our main findings. In particular, we examine the different effect of business ties on willingness to bid on IPOs that receive less market attention or have a quality certification.

5.4.1 The effect of market attention

Now, we investigate whether willingness to bid on an IPO depends on the amount of attention the IPO firm receives. As argued by Ljungqvist (2007), IPO firms are generally immature and have a higher level of information asymmetry; therefore, investor attention plays an important role in IPO pricing. Existing studies have used various indicators to measure the amount of attention an IPO firm receives, such as its pre-IPO media coverage (Liu et al. 2014; Chen et al. 2020) and its geographical proximity to large cities (Loughran and Schulz 2005; Loughran 2007; El Ghoul et al. 2013).[8] Investors face high informational frictions in IPO pricing for firms that receive less market attention. Therefore, we expect a larger improvement in willingness to bid on neglected IPO firms if the business ties between the mutual fund bidder and the underwriter are strong. We test our expectations using the following regression model.

We use two measures as proxies for market attention: *Coverage* and *Remote*. Our first measure, *Coverage*, is a dummy variable that equals to one if the IPO has appeared in the media up to 30 days prior to its listing and zero otherwise. The second measure, *Remote*, represents whether the IPO firms is remotely located. It equals one if the firm's geographical distance from any of the three financial centers (Shanghai, Beijing or Shenzhen) is at least 200 km. All of the control variables are the same as those in the baseline regression.

Table 7 reports the results. The coefficients on the interaction *DTies*Coverage* are negatively significant, which indicates that a fund with strong business ties increases its bid for a neglected IPO (firms receiving less media coverage). The coefficients on the interaction term between *DTies* and *Remote* are statistically positive; thus, a fund with strong business ties tends to submit a higher bid on IPOs for firms geographically distant from financial centers. Thus, although the funds' average bid prices are lower for IPO firms that fall beneath the radar, funds with strong business ties can increase their bids on such firms more than they do if they bid on firms that receive more market attention.

5.4.2 The effect of IPO certification

Additionally, we investigate how the relation between underwriters' business ties and funds' willingness to bid varies across firms with different IPO certification. Investors use multiple ways to reduce their information asymmetries on the IPO. They assess the quality of the IPO firms based on the intermediaries involved in this process, such as whether the firm is backed by venture capital firms (Megginson and Weiss 1991; Loughran and Ritter 2004) and whether the firm is underwritten by a high-quality underwriter (Lee et al. 2003;

[8] As argued by El Ghoul et al. (2013), a firm's geographic location with respect to central areas is a good measure of the severity of the information asymmetries. Local investors enjoy information advantage on their local firms (Gaspar and Massa 2007). Financial institutions that are primarily located in financial centers tend to ingore remote firms (Loughran 2008). Therefore, remote firms suffer from relatively greater information asymmetries (Loughran and Schulz 2005; Loughran 2007).

Table 7 Business ties and bid prices: moderating effect of market attention

Variables	Normalized bid price			
	(1)	(2)	(3)	(4)
DTies	1.963***	1.568***	0.695*	0.455
	(0.325)	(0.419)	(0.405)	(0.485)
Coverage	5.190	4.436		
	(3.247)	(3.201)		
DTies*Coverage	− 14.567***	− 16.490***		
	(4.088)	(4.057)		
Remote			− 2.650***	− 1.686***
			(0.487)	(0.515)
DTies*Remote			2.745***	2.450***
			(0.615)	(0.616)
Controls	No	Yes	No	Yes
Year Fixed	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes
Observations	14,496	14,496	14,496	14,496
R-squared	0.053	0.070	0.053	0.068

This table presents the regression results for the effects of market attention on the relation between business ties and funds' bid prices. Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

Du et al. 2018; Colombo et al. 2019). The presence of venture capitalists and prestigious underwriters mitigate the information asymmetries by their certification on the IPO (Wang and Wan 2013; Chemmanur et al. 2022; Chen et al. 2020). Therefore, we expect the documented effect of business ties on willingness to bid to be moderated for IPOs with greater levels of certification.

We use two proxies for IPO certification: *Reputation* and *VC Backed*. The first measure, *Reputation*, is a dummy variable for a reputable underwriter. It equals one if the investment bank is among the top 10 underwriters in terms of IPOs underwritten in the previous year. The second measure is the a dummy variable for venture capitalists (*VC Backed*), which is equal to one if a venture capital firm is involved in this IPO.

Table 8 reports the results. The coefficient on the interaction term between *DTies* and *Reputation* is negative and statistically significant, suggesting that the effect of business ties on funds' willingness to bid is attenuated for IPOs underwritten by a reputable underwriter. The coefficient on the interaction term between *DTies* and *VC Backed* is also significantly negative, suggesting that the effect of business ties on funds' willingness to bid is moderated for IPOs endorsed by venture capitalists. Together, these results support our prediction that the effect of business connection on willingness to bid is attenuated for IPOs with creditworthy certification.

5.5 Business ties and post-IPO stock performance

In this subsection, we examine how the relationship-based bidding will affect the stock performance after initial public offering. As shown in our baseline analysis, a mutual

Table 8 Business ties and bid prices: moderating effect of IPO certification

Variables	Normalized bid price			
	(1)	(2)	(3)	(4)
DTies	1.908***	1.629***	2.701***	2.425***
	(0.442)	(0.482)	(0.435)	(0.522)
Reputation	6.562***	4.978**		
	(2.209)	(2.226)		
DTies*Reputation	−6.616***	−5.254**		
	(2.263)	(2.285)		
VC Backed			4.933***	4.748***
			(0.472)	(0.477)
DTies*VC Backed			−2.405***	−2.419***
			(0.683)	(0.681)
Controls	No	Yes	No	Yes
Year Fixed	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes
Observations	14,496	14,496	14,496	14,496
R-squared	0.051	0.067	0.061	0.076

This table presents the regression results for the effects of IPO certification on the relation between business ties and funds' bid prices. Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

fund that has a strong connection with the underwriter submits a higher bid for the IPO. Higher bid prices usually lead to higher offer prices. However, it may result in a poor post-IPO stock performance given the high valuation at IPO. Therefore, we hypothesize that bids submitted by connected mutual funds are associated with poor post-IPO stock performance.

We use two proxies for post-IPO stock performance: cumulative return over the 90-day and 180-day period after the initial public offering, respectively. We also use two dummy variables as alternative proxies for post-IPO stock performance: whether 90-day return is negative and whether 180-day return is negative.

The results are reported in Table 9. In column (2), the coefficients on *DTies* is significantly negative, indicating that bids from connected mutual funds will lead to poorer post-IPO long-term stock performance. In column (3) and (4), the coefficients on *DTies* are both positive and stastically significant, implying that high bids from mutual funds with strong business ties will increase the probability of stock price dropping below their offer price.

Taken together, strong business ties with the underwriter cause funds to submit higher bids for the IPO, which drives down the stock return after initial public offering. With favorable offer price, the issuing firms can raise more capital from the IPO. As the investment banks charge underwriting fees proportional to the raised capital, higher bids from the institutional investors are also in the interest of the investment banks. However, this will result in poor after-IPO stock performance. Investors who buy the stocks in the secondary market may even suffer losses if the stock prices falls below their final offer price.

Table 9 Business ties and post-IPO stock performance

Variables	90-day Return (1)	180-day Return (2)	90-day Return < 0 (3)	180-day Return < 0 (4)
DTies	0.189	− 5.274***	0.108***	0.050***
	(1.069)	(0.972)	(0.009)	(0.012)
Controls	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes
Observations	14,496	14,496	14,496	14,496
R-squared	0.358	0.439	0.288	0.278

This table presents the regression results for the relation between business ties and cumulative stock return after IPO. Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

6 Mechanism

We now explore potential channels through which strong business ties with the underwriter lead mutual funds to submit higher bids in the IPO auction. Rent-seeking theory argues that underwriters allocate hot IPOs to investors to generate greater brokerage commissions (Loughran and Ritter 2004). In Chinese IPO auctions, although the lead underwriters have no discretion on allocating shares, they still have rent-seeking incentives. Investment banks specialize in information production and retention (Geranio et al. 2022; Herron 2022), as they gain unique insights into the value of IPO firms by performing due diligence (Chiang et al. 2019). As underwriters, they may possess undisclosed information on the stock value and deliberately deliver this information to their favored institutional investors as an exchange for brokerage commissions (Chiang et al. 2010). Therefore, we hypothesize that, the informed institutional bidders become better at identifying good IPOs and are able to bid more aggressively on IPOs with higher expected return, which increases their chances of winning shares.[9]

We divide the sample into three groups (high-return IPO, medium-return IPO and low-return IPO). The high-return group refers to IPOs with first-day return greater or equal to 20%, the low-return group refers to IPOs with first-day return no greater than 5%, and the medium-return group refers to the rest of them. We conduct regressions on high-return and low-return groups, respectively, and explore how the effects of business ties on bidding price and bidding amount vary with *ex-ante* IPO return. Table 10 shows that the coefficients of business ties are both significantly positive in the high-return IPO group, while they are negative in the low-return IPO group. It suggests that strong business ties with the lead underwriter drives the mutual funds to submit higher bid prices and larger bid orders for good IPOs, while they are less likely to do so for bad IPOs (IPOs with low-return). This implies that the mutual funds may gain private information on the IPOs from the lead underwriter and bid aggressively on good IPOs in order to increase the probability of winning shares and get excessive expected return. The empirical results support our

[9] As described in Sect. 2.1, all bids above the determined offer price are qualified for the lottery and institutional investors hit the jackpot subscribed the new shares at the fixed offer price.

Table 10 Information advantage and mutual funds' bidding strategy

Panel A	Dep Var: Normalized Bid Price	
	High first-day return	Low first-day return
Variables	(1)	(2)
DTies	3.481***	−1.722**
	(0.523)	(0.799)
Controls	Yes	Yes
Year Fixed	Yes	Yes
Industry Fixed	Yes	Yes
Observations	7,802	3,466
R-squared	0.246	0.225
Panel B	Dep Var: bid amount	
	High first-day return	Low first-day return
Variables	(1)	(2)
DTies	0.032***	−0.013
	(0.010)	(0.015)
Controls	Yes	Yes
Year fixed	Yes	Yes
Industry fixed	Yes	Yes
Observations	7,802	3,466
R-squared	0.452	0.515

This table examines whether the mutual funds acquire information from the lead underwriters and set their bidding strategies accordingly. In Panel A, the dependent variable is the normalized bid price for the IPO submitted by the mutual fund. In Panel B, the dependent variable is the bid amount submitted by the mutual fund divided by the total amount of the stock's IPO shares in the offline phase. The IPOs are classified two groups by the their first-day return. Specifically, an IPO is sorted into the high (low) group if the IPO's first-day return is greater or equal to 20% (less than or equal to 5%). Standard errors are reported in parentheses. One, two and three asterisks denote significance at the 10%, 5% and 1% levels, respectively

hypothesis that rent-seeking incentives exist among underwriters in the auctioned IPOs. Skilled mutual fund managers leverage their connection with the lead underwriter and place aggressive bids on IPOs that are expected to outperform.

7 Conclusion

We examine the effect of relationships on institutional investors' willingness to bid in the auctioned IPOs using a unique dataset on mutual funds' bids. We find that strong business ties between underwriters and mutual funds, proxied by the brokerage commission payment that fund families direct to lead underwriters, are positively associated with higher bid prices. The documented effect of business ties is more pronounced among IPOs receiving less market attention and is attenuated for IPOs backed by reputable underwriters and venture capitalists. We propose that rent-seeking incentives could explain the *quid pro quo* between the lead underwriters and mutual funds.

Besides China, the IPO auctions are also used in other countries including Australia and the UK (Sherman 2005). Our findings may be generalized to other markets and offer implications for the regulation authority and issuers. First, the regulators should take more restrict measures to prohibit possible leakage of private information during the IPO auctions. The *quid pro quo* between underwriter and institutional investors distorts the bid pattern and brings challenge for the objectiveness and fairness of the IPO auctions. Second, the issuers should pay more attention to the downside risk of after-IPO stock prices. Although the issuer can benefit from the lead underwriters who use their business connection to maximize the proceeds from an issue, it also faces a higher reputation risk. As we have shown, relationship-based bidding drives up the levels of offer prices, but results in poorer post-IPO stock performance. To avoid the stock price dropping below the offer price within a short period after the initial public offering, the issuers could consider using market value management strategies, such as share repurchase, to provide support for their stock prices.

Appendix

Variable definition

Normalized Bid Price = calculated as bid price minus midpoint of the initial price range, scaled by the midpoint of the initial price range.

DTies = a proxy for business ties between mutual fund and the lead underwriter, which equals one if the fund family has ever paid brokerages to the lead underwriter in the previous year and zero otherwise.

Coverage = an indicator for the firm's media coverage that equals one if the IPO has appeared in the media up to 30 days prior to its listing and zero otherwise.

Remote = an indicator for the firm's geographic location that equals one if the headquarters of the IPO firm is at least 200 km away from any of the three financial centers (Shanghai, Beijing or Shenzhen).

VC_Backed = an indicator the firm's VC participation that equals one if the IPO firm is backed by a venture capital firm and zero otherwise.

Reputation = an indicator for the underwriter's reputation, which equals one if the investment bank underwriting the IPO ranks in the top 10 in terms of the number of IPOs the underwriter has managed in the year prior to the current IPO, and zero otherwise.

Return = cumulative stock return after the firm has been listed, which is represented by the first-day return, 90-day return and 180-day return.

Stock Size = the natural logarithm of the IPO firm's total assets.

Debt Ratio = the debt-to-asset ratio for the IPO firm, calculated by total liabilities divided by total assets.

ROA = return on the assets for the IPO firm.

NBidders = number of mutual funds that participated for each IPO.

Sentiment = the return on the SZSE Component Index during the 30 trading days prior to a given IPO.

Underwriter Size = proxy variable for underwriter's size, measured as the market share of the underwriter of IPO in terms of proceeds raised in the pre-IPO year.

Political Connection = proxy variable for underwriter's political connection, which equals to one if the underwriter is ultimately controlled by the central government, and zero otherwise.

Fund Size = the natural logarithm of the fund's total net assets.

Fund Type = a dummy variable that equals one if the fund bidder is a bond fund and zero otherwise.

SC_Firm_Fund = a dummy variable that equals one if the issuer's senior officers (chairman of the board, CEO and CFO) and the fund managers have shared education background and employment history, and zero otherwise.

SC_Sponsor_Fund = a dummy variable that equals one if the investment bankers (the sponsors) and the fund managers have shared education background and employment history, and zero otherwise.

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Declarations

Conflict of interest The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Ethical approval The author confirms that the study has not involved human participants, their data or biological material.

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