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The white squire defense: Evidence from private investments in public equity ☆

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ABSTRACT

Firms can effectively stave off outside takeover bids using private investments in public equity (PIPEs) when they face strong takeover pressure. Greater takeover pressure makes PIPE issuers more likely to grant investors large blocks of shares, price discounts, generous dividends, and board seats. Takeover pressure also encourages issuers to place more shares with friendly investors such as managerial investors and strategic alliance investors. The evidence is consistent with the regular methods of the white squire defense. PIPEs can be a preferred method in the choice of a white squire defense when poorly performing and highly overleveraged firms face severe takeover pressure. There is a negative relation between takeover probability and post-issue performance of issuers, which supports the managerial entrenchment hypothesis over the shareholder interest hypothesis. Therefore PIPEs can increase, not mitigate, agency problems.

1. Introduction

A white squire acts as an ally in a possible firm takeover, but rather than take control of an entire company as in a white knight strategy, the squire buys a large block of shares in the firm. Common practice in the white squire defense is for the firm to grant a white squire a favorable share price, generous dividends, and a board seat in exchange for its help in strengthening the position of incumbent managers (Gaughan, 2011). Warren Buffett has played a white squire, selling protection to nervous companies at a handsome return for himself by gaining equity from firms at below-market prices.[2] Berkshire Hathaway's purchase of Salomon Brothers preferred stock came in the fall of 1987, when Buffett was looking for a place to park cash with a good guaranteed return (a 9% dividend). This is, one of a number of white squire buys Berkshire made, where received generous terms in return for being a friendly investor that did not pose a takeover threat.[3] In 1989 Buffett approached Gillette as a white squire. In that deal, Berkshire's insurance subsidiaries gained $600 million in stock, and Buffett filled a vacant seat on Gillette's twelve-member board.[4] Another example is Polaroid's preferred dividend payment of $10.1 million to Corporate Partners LP, a white squire investment fund that helped Polaroid fend off a takeover in 1989.[5]

Despite the many examples, empirical study of the white squire defense is rare. There is some research on employee stock ownership plans (ESOPs), a classic method of white squire defense. Pagano and Volpin (2005) argue that in this case employees are the active players, coming to the rescue of incumbent management as white squires to avert the risk that a raider might cut wages. If workers own shares, they can reduce the chances of a successful outside takeover defense by their own response to the bid. Setting up an ESOP is a way for managers to protect their own control. Rauh (2006) shows that employee ownership in

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[2] "Buffett's savior role lands him deals other holders can't get," Wall Street Journal, August 14, 1989, and "Buffet takes stock," New York Times, April 1, 1990.

[3] "Company news; Buffett wants more shares of Salomon," New York Times, August 17, 1993.

[4] "Gillette sells 11% stake to Buffett," New York Times, July 21, 1989.

[5] "American brief: Polaroid Corp.," Asian Wall Street Journal, July 16, 1992.

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defined-contribution plans reduces takeover probabilities. Yet, except for ESOPs, there is little evidence about other possible white squire defenses.

Beyond the ESOP, another white squire defense is private investment in public equity (PIPE). Firms can place shares with privately specific investors who promise to vote in favor of management. PIPEs generally involve the transfer of a block of shares, about 16% of total shares outstanding after an issue according to Hertzel and Smith (1993). Researchers have found large price discounts to the exchange price in PIPEs, averaging around 13% (Huson et al., 2010; Chakraborty and Gantchev, 2013; Finnerty, 2013).

In the U.S., PIPEs are private placements by public companies to accredited investors following Section 4 (2) and/or Regulation D of the Securities Act of 1933, which exemptions issuers from Section 5 registration may as long as the seller complies with a set of listed requirements.[6] The motives for issuing PIPEs include monitoring of managers, information asymmetry, managerial entrenchment, and cost considerations (see Dai, 2009, for a good survey). In this paper, we ask whether a PIPE can be an effective white squire defense.

What factors motivate firms to adopt a takeover defense? Rauh (2006) finds that companies with a higher probability of takeover are more likely to choose employee ownership in defined-contribution plans. Billett and Xue (2007) suggest that open market share repurchases are associated with the probability of takeover at a firm, and that the likelihood of takeover is a key driver of a takeover defense. Accordingly, firms that face a high likelihood of takeover may be likely to engage in a PIPE as a white squire defense. Our empirical results show that firms in the highest two quintiles of takeover probability that issue PIPEs will reduce the likelihood of receiving a takeover bid after stock issuance, indicating firms can effectively stave off outside takeover bids using this tactic when they face high takeover pressure.

What kinds of firms would prefer to issue PIPEs as a white squire defense? In an examination of choice of white squire method, the results show that firms with poor performance and that are over-leveraged prefer to use a PIPE over an ESOP as a white squire defense when they are classified in the top two quintiles of takeover probability.

In a typical squire defense, a firm grants to the squire a large block of shares at a favorable price together with generous dividends and a board seat. To examine whether PIPEs are a white squire defense, we test the relation between the probability of takeover and these characteristics. The results indicate a positive relation between the PIPE fraction placed and the takeover probability, suggesting that takeover pressure leads firms to sell more shares in the form of a PIPE. The empirical results also indicate that PIPE issuers facing a higher probability of takeover provide investors with favorable prices (price discounts), generous dividends, and board seats.

A white squire acts as an ally in the takeover process. PIPE issuers should be more likely to grant shares to friendly investors if the issuer is operating in a high-takeover environment. While friendly investors are difficult to define, we examine two particular types of investors that are likely to be friendly: managerial investors and strategic alliance partners. Selling shares to current managers or to strategic alliance partners can be an anti-takeover device if the main purpose is for a firm to place some of its stock in stable and friendly hands (Stulz, 1988; Rauh, 2006; Moffett et al., 2008; Johnson et al., 2015).[7] We find a significantly positive relation between the probability of takeover and the likelihood that a PIPE firm will place shares with managerial investors or strategic alliance investors. The results indicate that strong takeover pressure motivates PIPE issuers to place more shares with friendly investors.

The use of PIPEs as a takeover defense may diminish or enhance shareholder wealth. The managerial entrenchment hypothesis argues that takeover defenses serve primarily to entrench managers at shareholders' expense (e.g., Masulis et al., 2007; Bebchuk et al., 2009). This hypothesis suggests a negative relation between the probability of takeover and firm performance after the PIPE issuance. The shareholder interest hypothesis, on the other hand, suggests a positive relation. Takeover defenses can create shareholder value because they make managers more able to extract higher premiums in the event of takeover (DeAngelo and Rice, 1983; Morck et al., 1988; Stein, 1988; Comment and Schwert, 1995). We find that PIPE firms with a higher probability of takeover experience poorer post-issue stock returns and operating performance. The results are robust to use of different benchmarks. Our evidence suggests that the motivation for managers to conduct PIPEs is better explained by the managerial entrenchment hypothesis than by the shareholder interest hypothesis.

Two empirical issues must be addressed. One is why we treat PIPEs as a pre-offer takeover defense. The other deals with endogeneity. First, why do we treat PIPEs as a pre-offer takeover rather than post-offer takeover defense?[8] The answer is that typical PIPE issuers are troubled firms with high levels of information asymmetry and poor operating performance (Dai, 2007; Brophy et al., 2009; Chaplinsky and Haushalter, 2010; Chen et al., 2010; Chakraborty and Gantchev, 2013). These characteristics may make it more likely that a firm will be acquired (DeAngelo, 1988; Nuttall, 1999; Billett and Xue, 2007; Cremers et al., 2009; DePamphilis, 2011; Oberhofer, 2013). PIPE issuers thus face strong takeover pressure from the market before equity issuance even if no formal bid is made. To limit the sample to issuers that are a takeover target may ignore the takeover deterrence effect of PIPE issue for firms that face strong takeover pressure but do not receive a takeover bid. PIPEs also give a firm greater flexibility to act without shareholder approval and without the need for public registration.[9,10] This may effectively deter would-be acquirers, as the potential target can respond quickly by issuing private equity. Finally, the trade press has reported that as poison pills and staggered boards have dropped to their lowest levels in more than a decade, firms face investor pressure against the institution of broad takeover defenses, even while they feel some need to have weapons at the ready to fight

[6] (1) The offer must be made to a limited number of accredited investors or financially sophisticated investors (those with, sufficient knowledge and experience in financial and business matters to make them capable of evaluating the merits and risks of the prospective investment); (2) offer must not involve any general advertising or general solicitation; and (3) investors are given information relevant to the investment.

[7] Unlike Krishnamurthy et al. (2005) who suggest that placements to incumbent managers can improve the alignment between manager and shareholder objectives, we recognize that selling shares to incumbent managers can be a takeover defense in the presence of high takeover pressure.

[8] A pre-offer takeover defense is used to slow the pace of a takeover attempt and make it more costly for an acquirer. A post-offer takeover defense is a defense adopted once a possible acquirer has approached a firm.

[9] If more equity is authorized in a firm's certificate of incorporation than is outstanding, the firm can issue common stock without shareholder approval unless common stock or securities exercisable or convertible into common stock on the NYSE, AMEX, or Nasdaq represent at least 20% of the common stock or at least 20% of voting power outstanding prior to issuance, and the offering is sold for less than the greater of book or market value of the stock. See Rule 312.03 of the NYSE Listed Company Manual, Section 713 of the AMEX Company Guide, and Nasdaq Marketplace Rule 4350 (i).

[10] PIPEs are private placements by public companies to accredited investors made in reliance on Section 4 (2) and/or Regulation D of the Securities Act of 1933. In contrast to a traditional private placement, such a closing does not depend upon the SEC review process, making PIPE issuance a time-efficient mechanism by which small companies that would have difficulty paying for SEC registration can raise capital.

off undesirable offers.[11] This gives firms more incentives to assume pre-offer takeover defenses in the form of PIPEs.

Second, the relation between takeover probabilities and PIPE issuances may be endogenous because of common responses to shocks and simultaneity. Common responses to shocks can influence both takeover probability and the decision to issue shares via private placement. To deal with this problem, we include both year and industry fixed effects in the main regressions to capture common time-varying and industry shocks. Our results may also be confounded if PIPE issuances contemporaneously affect the takeover likelihood. To control for simultaneity bias, we follow Khan et al. (2012) and use the one-year lag between the closing date of a PIPE issuance and the takeover likelihood. We also estimate a recursive bivariate probit model that jointly estimates the PIPEs and the takeover target to address this simultaneity problem. Our empirical results are robust after controlling for the endogeneity issue.

Our study contributes to the literature in several ways. First, we add more generally to the literature on white squire defenses. Pagano and Volpin (2005) and Rauh (2006) concentrate on the effects of employee ownership; we explore instead whether PIPEs can play a white squire role. Second, studies of the defensive role of PIPEs argue that managers are more likely to place shares privately with friendly investors in order to protect their management positions (Barclay et al., 2007). They do not explore why investors would be willing to support the incumbent CEO. We try to answer the question by investigating how PIPE issuers compensate their investors. Our work is this distinguishable from PIPE studies on the management entrenchment motive (Dann and DeAngelo, 1988; Wruck, 1989; Barclay et al., 2007). Third, we test the exact motivation for managers to issue PIPEs. That is, we test the managerial entrenchment hypothesis versus the shareholder interest hypothesis by examining the relation between takeover probability and post-issue firm performance. Finally, our work answers the question of how managers defend themselves as investors resist the institution of takeover defenses. As firms have substantially reduced their use of such pre-offer takeover defenses as poison pills and staggered boards in the past decade, private equity placement seems to have assumed a critical role for pre-offer takeover defense.

The paper is organized as follows. Section 2 provides a literature review and develops the hypotheses. Section 3 lays out the identification strategy. Section 4 describes the data and methodology. Section 5 presents the empirical evidence supporting PIPEs as a form of white squire defense. Section 6 addresses the endogeneity bias. The final section concludes the paper.

2. Literature review and hypotheses development

2.1. Market for corporate control

Rauh (2006) and Billett and Xue (2007) demonstrate that the prospect of takeover prompts managers to adopt takeover defenses such as employee ownership in defined-contribution plans and open-market share repurchases. Therefore, a firm would most likely adopt some defenses if it faces severe takeover pressure. PIPEs can play a white squire defense role, because issuers can privately place blocks of shares with particular investors chosen to favor the issuer, and can compensate the investors with price discounts, generous dividends, and board seats in exchange for their support. That is, issuance of PIPEs can discourage potential takeover bids and thus reduce the probability of takeover. The first hypothesis is thus:

H1. Issuance of PIPEs can reduce issuers' takeover probability when they face higher takeover probability.

2.2. White squire choice

To determine the choice of white squire method, we compare PIPE and employee stock ownership plans (ESOPs), which has recognized a method of white squire defenses (Pagano and Volpin, 2005; Rauh, 2006). Two characteristics of PIPE issuers, poor firm performance and higher leverage ratio, can be used to differentiate the choice of the two defenses.

A company recognizes compensation expense ratably over the year based upon its estimate of the number of shares expected to be allocated by an ESOP. That is, a firm adopting an ESOP will lower its earnings. Dahya et al. (2002), Gibson (2003), and Jenter and Kanaan (2015) indicate that firm performance is likely a dominant determinant of CEO turnover, a CEO at a poor-performance firm is less likely to defense him- or herself by conducting ESOP. In contrast, PIPE is a source of financing that does not reduce earnings. Hence, a poor-performance firm is more likely to use PIPE as white squire defense instead of ESOP when it faces severe takeover pressures. An overleveraged firm is also less likely to use ESOP as a white squire defense.[12] Firms with high leverage exhibit volatile cash flows (Arditti, 1967; Diamond, 1991; Jagannathan and Wang, 1996), which would make it more difficult to handle the management and administration of an ESOP.[13] Rather, PIPE raising total equity leads an overleveraged firm toward its optimal leverage. Considering these benefits and costs associated with white squire choice, an overleveraged firm would prefer PIPE over ESOP to be the white squire defense when it suffers from large takeover threat. The second and third hypotheses follow:

H2. Poorly performing firms prefer PIPE over ESOP as a white squire defense when they face severe takeover pressure.

H3. Overleveraged firms prefer PIPE over ESOP as a white squire defense when they face severe takeover pressure.

2.3. Characteristics of the white squire defense

A white squire is a firm that purchases a block of shares without gaining control. Firms facing strong takeover pressure can reward white squires in three ways in exchange for their support. First, the firm gives the squire a favorable price on the stock. Chang (1990) finds that ESOPs are one takeover defense tactic. They offer employees shares at a discount, usually limited to 15% of the market price. Large shareholders may also buy in at a discounted price in exchange for an implicit or explicit promise to support management against a takeover bid, "white squire investing" (Bhagat et al., 2004). Barclay et al. (2001) suggest that price discount of private placements often reflects compensation to external blockholders for helping to entrench management. Second, PIPE issuers can pay generous dividends to investors. DePamphilis (2011) shows that Arcelor, a European steel company, mounted a takeover defense by doubling its dividend to motivate its shareholders not

[11] "Poison pills drop to lowest level in 20 years," Reuters, March 30, 2010, and "Defenses down, US firms vulnerable to hostile bids," Reuters, December 9, 2011.

[12] Overleverage is defined as the firm's book leverage less the median book leverage for firms in a two-digit SIC industry for the fiscal year before the offering.

[13] "Strategic Planning for ESOP Companies," Stout Risius Ross, Spring 2011.

to tender their shares to Mittal in 2006. Third, firms can conduct PIPEs using board seats. Arena and Ferris (2007) argue that entrenched managers will more likely circumvent the shareholder election process and appoint friendly investors to the board if there is any probability at all that shareholders will oppose their slate of board candidates. The next four hypotheses deal with characteristics of a white squire defense:

H4. The probability of takeover is positively correlated with the ratio of shares placed in PIPEs to shares outstanding.

H5. The probability of takeover is positively correlated with the price discount of PIPEs.

H6. The probability of takeover is positively correlated with a change in dividends after PIPE issuances.

H7. The probability of takeover is associated with a higher likelihood that PIPEs include board seats.

2.4. Friendly investors

The white squire acts as an ally in the takeover process. In the most extreme case, the firm would sell shares to its current top managers. As management ownership is an anti-takeover mechanism (Stulz, 1988; Rauh, 2006), managerial placement, which defines incumbent managers or officers as placement investors, generally increases ownership concentration and makes it less likely that the firm will receive a takeover bid. Other possible friendly investors are strategic alliance partners. A strategic alliance can be part of a takeover defense if its prime purpose is to get some of the firm's stock into stable and friendly hands (Moffett et al., 2008).[14] Strategic alliance partners would support takeover defenses that protect their partner in the alliance from a takeover in order not to jeopardize their established business relationships (Johnson et al., 2015). Thus we have the next two hypotheses:

H8. The probability of takeover is associated with a higher likelihood that firms will place shares with managerial investors.

H9. The probability of takeover is associated with a higher likelihood that firms will place shares with strategic alliance investors.

2.5. Post-issue firm performance

Takeover defenses may either destroy or enhance shareholder value. The managerial entrenchment hypothesis proposes that nonparticipating stockholders are harmed when managers take actions to deter attempts to take control of a firm. For example, both Corporate Partners, the white squire fund run by Lazard Frères & Co. to offer equity capital to companies making strategic changes, and Warren Buffett often obtain preferred stock paying hefty dividends in exchange for protecting companies from takeovers. This has prompted criticism that they are making money at the expense of other shareholders.[15] This theory asserts that self-interested CEOs take advantage of corporate funds to maintain their positions through the use of takeover defenses (e.g., Masulis et al., 2007; Bebchuk et al., 2009). The shareholder interest hypothesis (also called the convergence of interest hypothesis), however, suggests that takeover defenses convey benefits to shareholders (Morck et al., 1988; Comment and Schwert, 1995). Takeover defenses allow managers to fend off opportunistic bids while improving shareholder outcomes during the merger and acquisition negotiating process (DeAngelo and Rice, 1983; Stein, 1988). They can also protect valuable firm projects from undervaluation by uninformed or myopic investors in financial markets (Stein, 1988; Chemmanur and Jiao, 2012). We test the motives of managers to engage in PIPEs by investigating post-issue firm performance. There are two competing hypotheses:

H10a. There is a negative relation between the probability of takeover and post-issue firm performance if managers conducting PIPEs are motivated by managerial entrenchment.

H10b. There is a positive relation between the probability of takeover and post-issue firm performance if managers conducting PIPEs are motivated by shareholder interest.

3. Identification

Endogeneity between takeover probability and the issuance of PIPE is potentially introduced from two sources, namely common responses to shocks and reverse causality. We deal with this issue in several ways. First, common responses to shocks can influence both takeover probabilities and the decision to issue shares via private placements. To control for the possibility that common time-varying shocks and shocks specific to an industry may contaminate our results, we follow Chhaochharia and Grinstein (2009) and Kaustia and Knüpfer (2012) to control for the potential effects of industry-specific and year-specific differences by including two-digit SIC and year dummies throughout the analysis.[16]

Second, not only does an increase in takeover probability potentially affect the decision to issue PIPE, but PIPE issuance may influence takeover probability. We address this simultaneity bias in several ways. First, we examine the relation between PIPE issuances and lagged takeover probabilities to avoid confounding inferences through any reverse causality (Khan et al., 2012). Next, we estimate the relation between takeover likelihood and PIPE issuance using the recursive bivariate probit model (Greene, 1998; Byrd et al., 2012; Huang et al., 2014; Yermack, 2014), which assumes that the binary dependent and independent variables are each determined by latent linear models with jointly normal error terms (Evans and Schwab, 1995) that can produce an consistent estimator (Greene, 1998).[17] In this model, the probit equations on the takeover target dummy and the PIPE issuance dummy are estimated simultaneously using the maximum likelihood method, in which the instrumental variable, namely industry takeover (*ITO*), is used in the estimation model of takeover target. The estimation results are reported in Section 6.

[14] For example, Posco, a multinational steel-making company in the Fortune Global 500, expanded its strategic alliance with Japanese steel mills to defend against a takeover, while trying to have friendly shareholders own more of its shares ("2nd update: Nippon Steel, Posco mulling expanding tie-up," Dow Jones International News, September 4, 2006.)

[15] "Dillon Read, J.P. Morgan set up new 'white-squire' equity fund," The Wall Street Journal, November 6, 1991.

[16] Dai (2009) shows that PIPEs are common in some industry sectors such as healthcare, communications, industrial, and technology, and we use these four industry sectors as simply industry dummies. The results are similar if we replace the industry dummies by these four industry sectors in all regressions throughout the paper.

[17] In the two-stage IV (instrumental variable) approach, when the endogenous regressor is binary, using the predicted probability from a non-linear model in the second stage does not generate consistent estimates unless the non-linear model is exactly correct (Angrist, 2001; Angrist and Krueger, 2001).

4. Data and methodology

4.1. Data

Our sample of private equity placements by NYSE, AMEX, and Nasdaq companies is collected from the PlacementTracker database of Sagient Research from January 1995 through December 2010. PlacementTracker provides detailed information about the terms of each PIPE contract including the type of private placement, legal structure, gross proceeds, dilution, discount to market price, warrant coverage, and various other specifics. We follow Chaplinsky and Haushalter (2010) in using the closing date of the PIPE issue as the event date.[18] Following Chakraborty and Gantchev (2013), we exclude foreign, 144-A, and Regulation-S issuers. We focus on common stock private equity placements in order to compare them with the common ESOP obligations. We also exclude observations if data are not available from the Center for Research in Security Prices (CRSP) and Compustat files, and we eliminate utilities and financial firms (Standard Industrial Classification (SIC) codes 4800–4829, 4910–4949, and 6000–6999). These filters result in a final sample of 1,634 PIPE issuances.

Table 1 presents sample transactions and proceeds of PIPE issuances by year (Panel A) and descriptive statistics (Panel B). Variable definitions are provided in the Appendix. Panel A shows that number of PIPE issues increased sharply from 21 in 1995 to 200 in 2004 before a gradual decline between 2005 and 2010 to as few as 75 issues. The average proceeds raised through PIPE issues remained relatively flat from 1995 through 2004. There were steady increases starting in 2005, to reach a maximum of $38.098 million in 2009. This pattern is consistent with the finding in Dai et al. (2010) that the PIPE market has been growing in recent years.

Panel B shows that the issuers are small, with mean total assets of $63.651 million (median $33.147 million). The mean (median) firm age is 6.338 (5.000) years. The mean number of equity analysts following the firms (*Analyst*) is 1.247 (median 1.000). Mean return on assets (*ROA*) is −0.559 (median −0.235). The mean (median) *Z-score* is 2.852 (1.710). 66.9% of PIPE firms have a high probability of default (Altman *Z-score* under 1.81) is 66.9%. The evidence overall shows that typical PIPE issuers are small and young, with high levels of information asymmetry and likelihood of distress, and poor operating performance (Hertzel et al., 2002; Dai, 2007; Brophy et al., 2009; Chaplinsky and Haushalter, 2010; Chen et al., 2010; Chakraborty and Gantchev, 2013; Finnerty, 2013).

Table 1
Sample distribution. This table shows the sample distribution from January 1995 through December 2010. Panel A shows transactions and proceeds of PIPE issuances by year. Panel B shows descriptive statistics. Variable definitions are provided in the Appendix.

Year	*N*	% of sample	Mean value of proceeds ($ millions)
Panel A. PIPEs by year			
1995	21	1.285	3.708
1996	35	2.142	3.700
1997	38	2.326	7.582
1998	47	2.876	5.030
1999	106	6.487	7.452
2000	152	9.302	12.346
2001	142	8.690	12.223
2002	128	7.834	10.559
2003	175	10.710	9.921
2004	200	12.240	10.841
2005	127	7.772	13.680
2006	109	6.671	16.516
2007	121	7.405	21.222
2008	75	4.590	27.012
2009	83	5.080	38.098
2010	75	4.590	20.913
Total	1634	100.000	220.803

Variable	*N*	Mean	Median	Std. Dev.
Panel B. Summary statistics				
Proceeds ($ millions)	1634	14.230	7.000	20.958
Fraction placed	1588	0.108	0.111	0.058
Total assets ($ millions)	1634	63.651	33.147	65.708
Analyst	1634	1.247	1.000	1.809
Firm age	1634	6.338	5.000	5.218
ROA	1634	−0.559	−0.235	0.771
BHIR(−60, −1)	1402	0.116	0.053	0.301
Z-score	1411	2.852	1.710	11.904

4.2. Estimation of takeover probability

To estimate the *ex ante* takeover probability (*TProb*), we use the universe of firms listed on NYSE, AMEX, and Nasdaq over 1994–2010 for which research data are available from CRSP and Compustat, excluding the firms in the industries we have noted. Following Billett and Xue (2007), we measure the *ex ante* takeover probability by estimating a probit model with standard errors adjusted for heteroscedasticity:

$$TDum_{i,t} = a + b_1 ROAIA_{i,t-1} + b_2 SIZEEQ_{i,t-1} + b_3 LEVBIA_{i,t-1} + b_4 MKBK_{i,t-1} + b_5 SALEGR_{i,t-1} + b_6 NPPE_{i,t-1} + b_7 ITO_{i,t-1} + e_{i,t} \quad (1)$$

where i and t denote firm and year, respectively. The dependent variable *TDum* is a dummy variable conditional on whether a firm receives a takeover bid as reported by the Securities Data Company's (SDC) Mergers and Acquisitions database in a given fiscal year t. The independent variables are identified from earlier studies of the estimation of takeover probability (Palepu, 1986; Comment and Schwert, 1995; Billett, 1996). The independent variables include industry-adjusted return on assets (*ROAIA*); the logarithm of the market value of equity (*SIZEEQ*); the industry-adjusted book value of leverage (*LEVBIA*); the equity market-to-book ratio (*MKBK*); sales growth (*SALEGR*); fixed assets (*NPPE*); and an industry takeover dummy (*ITO*). Complete independent variable definitions are in the Appendix.[19] The model estimates the probability a firm will become a target in the next year, using values of the independent variables as of the end of the previous year.[20] The models also control for year fixed effects. The independent variables are winsorized at the 1st and 99th percentiles because extreme observations may bias the estimation result. We assign our PIPE sample firms an estimated takeover probability at the end of the year immediately preceding the closing date. To ensure that equity issuances are in anticipation of possible bids, we exclude observations where equity issuance occurs after a takeover announcement within the same year.

[18] The closing date is either: (1) the date the Purchase Agreement/Subscription Agreement for the private placement transaction was signed by both parties or (2) the date the actual funding of the private placement took place, depending on the information the company provided in its public filings. Prior to the release of a Purchase Agreement/Subscription Agreement or Indenture, the closing date is the date of the press release or the SEC filing most accurately describing the closing of the private placement transaction.

[19] We define the industry by the primary two-digit SIC code in Compustat. We also repeat empirical analyses using the probability of takeover as estimated by Eq. (1) plus a dummy for state antitakeover laws. Our conclusions remain unchanged.

[20] To address the look-ahead bias, we also estimate the probability of takeover using rolling 10-year estimation windows. We obtain similar results. We further perform out-of-sample analyses. We use the probability of takeover estimated over 1994–2000, and test whether our results hold over 2001–2010. Again conclusions remain unchanged.

Table 2
Estimation of *ex ante* takeover probability. This table measures the *ex ante* takeover probability by estimating a probit model with standard errors adjusted for heteroscedasticity. The universe is common stock traded on the NYSE, AMEX, and Nasdaq with research data available from CRSP and Compustat. The dependent variable equals one if the firm is a takeover target in a given year, and zero otherwise. Independent variables are defined in the Appendix. *t*-statistics are reported in parentheses. *** represents 1% significance level.

Variable	(1)
Intercept	−1.878***
	(−28.23)
ROAIA	−0.545***
	(−4.43)
SIZEEQ	0.002
	(0.27)
LEVBIA	0.001
	(0.01)
MKBK	−0.061***
	(−3.97)
SALEGR	0.060
	(0.90)
NPPE	0.594***
	(2.75)
ITO	0.187***
	(8.47)
Year dummies	Yes
N	69,321
Likelihood ratio	813.77

Table 2 reports the estimation results. In general, our results are similar to those reported by Palepu (1986), Ambrose and Megginson (1992), Billett and Xue (2007), and Cremers et al. (2009). We find that the probability of takeover significantly declines with *ROAIA* and *MKBK*. The coefficient on *ROAIA* is −0.545 with a *t*-statistic of −4.43. This result shows that an underperforming firm tends to be a target. The negative coefficient on *MKBK* also implies that firms with low market-to-book value ratios tend to be a target. The probability of takeover also significantly increases with *NPPE* (coefficient 0.594), indicating that firms rich in plant, property, and equipment are more likely to receive takeover bids. There is a significantly positive relation between *ITO* and a firm that receives a takeover bid. This shows that a firm subject to an active takeover market is more likely to be a target.

Panel A of Table 1 shows that number of PIPE issues increased sharply from 21 in 1995 to 200 in 2004 before a gradual decline between 2005 and 2010 to 75 issues. One factor that may explain the popularity of PIPEs is takeover probability. We sort firms into quintile portfolios on the basis of their takeover probability in year $t-1$. *Quintile 1* (*Quintile 5*) represents the lowest (highest) quintile of the empirical distribution. The Fig. 1 describes the population of PIPEs within five different quintiles. The numbers of PIPE issuances in *Quintile 5* (thick line) rise in 1995, reaching the highest point in 2004, and then decline from that point until 2010. There is a similar pattern of the numbers of PIPE issuances in *Quintile 4* (thin line). There is nothing so dynamic in PIPEs in the other quintiles. Therefore, we conclude that firms facing a high probability of takeover cause the popularity of PIPEs.

5. Empirical analysis

5.1. PIPE issuance and the market for corporate control

If firms that face more severe takeover pressure mount a white squire defense, they will be subject to a lower probability of takeover after PIPE issuance. To test this conjecture, we use Eq. (1) for the universe of Compustat-CRSP firms, adding interaction terms between a PIPE dummy and a dummy for each quintile of takeover

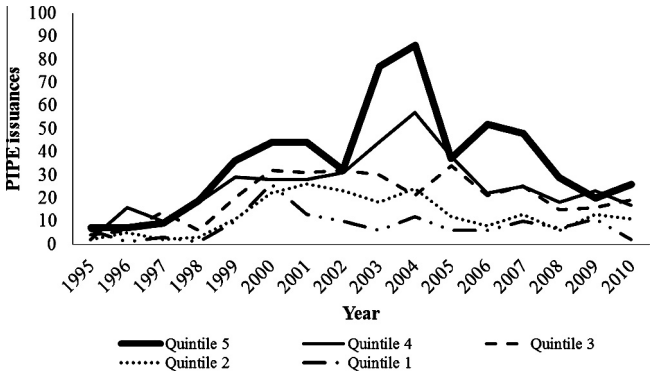

Fig. 1. PIPE issuance and takeover probability. This figure presents the frequency of PIPE issuances for each quintile of takeover probability from 1995 to 2010. *Quintile 1* (*quintile 5*) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date.

probability. The probit models with standard errors adjusted for heteroscedasticity are estimated as follows:

$$TDum_{i,t} = \alpha + \beta PIPE_{i,t-1} + \gamma'(PIPE_{i,t-1} \times \boldsymbol{I}_{i,t-1}) + \eta' \boldsymbol{I}_{i,t-1} + \omega' \boldsymbol{X}_{i,t-1} + e_{i,t} \quad (2)$$

where $TDum_{i,t}$ equals one if firm i in year t is a takeover target, and zero otherwise. *PIPE* equals one if a firm conducts a private equity placement in year $t-1$ or before the takeover announcement in year t. $\boldsymbol{I}$ is a (5×1) vector of quintile of takeover probability dummies. We sort firms into quintile portfolios on the basis of their takeover probability in year $t-1$. *Quintile 1* (*Quintile 5*) represents the lowest (highest) quintile of the empirical distribution. $\boldsymbol{X}$ is a vector of control variables used in Eq. (1). The models further control for year fixed effects.

Panel A of Table 3 shows the results for the effectiveness of PIPEs in avoiding a takeover bid. Quintile 1 is the group with the lowest takeover probability, and quintile 5 is the group with the highest takeover probability. The percentage of firms receiving a takeover bid rises from 5.323% in quintile 1 to 10.638% in quintile 5. When we separate firms into two groups, PIPE firms and non-PIPE firms, there is an increase of non-PIPE firms receiving a takeover bid from 5.308% in quintile 1 to 11.067% in quintile 5. The result is different for PIPE firms. In quintiles 4 and 5, the percentage of PIPE firms receiving a takeover bid is significantly lower than in non-PIPE firms; the mean is 1.232% in quintile 4, and 0.698% in quintile 5. There is not a significantly lower average of receiving a takeover bid in PIPE firms in quintiles 3 to 1, (7.669%, 7.035% and 6.923%, respectively). That is, firms conducting PIPEs when they face severe takeover pressure can guard against outside takeover bids. Our result is similar to result in Barclay et al. (2007), which suggest the incidence of an acquisition declines following a private placement.

Panel B of Table 3 presents the probit model results. In Model (1), we see a negative association between *PIPE* and the likelihood a firm will be a target. The coefficient on *PIPE* is −0.630, which is statistically significant at the 1% level. This implies that PIPE issuance can effectively deter takeover bids. In Model (2), moreover, we find that this negative association has come largely from the top two quintiles of takeover probability. That is, firms conducting PIPEs when they face severe takeover pressure can guard against outside takeover bids. To highlight the economic significance of our results, we also estimate the implied probabilities of takeover. Holding the control variables used in Eq. (1) equal to the population means, firms in quintiles 5 and 4 that conduct a private equity placement experience 10.140% and 7.738% declines in the implied probabilities of takeover, respectively, both statistically significant

Table 3
PIPE issuance and the market for corporate control. This table presents results of the takeover deterrent effect of PIPE issuance. Panel A shows the univariate analyses for the proportion of PIPEs in avoiding a takeover bid using the universe of Compustat-CRSP firms. *Quintile 1* (*quintile 5*) represents firms in the lowest (highest) quintile of takeover probability in year $t-1$. We use Fisher's exact test to test the significance of differences in proportions. Panel B shows results of the takeover deterrent effect of PIPE issuance for probit models with standard errors adjusted for heteroscedasticity using the universe of Compustat-CRSP firms. The dependent variable equals one if the firm is a takeover target in year *t*, and zero otherwise. *PIPE* is equal to one if a firm conducts a private equity placement in year $t-1$. Other variables are defined in the Appendix. *t*-Statistics are reported in parentheses. *** represents 1% significance level.

Takeover probability	All firms			PIPE firms			Non-PIPE firms			Difference	
	N	*TDum*	%	*N*	*TDum*	%	*N*	*TDum*	%	%	*p*-Values
Panel A. Univariate analysis											
Quintile 5	13,865	1475	10.638	573	4	0.698	13,292	1471	11.067	−10.369	0.001
Quintile 4	13,864	1355	9.774	406	5	1.232	13,458	1350	10.031	−8.799	0.001
Quintile 3	13,864	1279	9.225	326	25	7.669	13,538	1254	9.263	−1.594	0.383
Quintile 2	13,864	1013	7.307	199	14	7.035	13,665	999	7.311	−0.276	0.999
Quintile 1	13,864	738	5.323	130	9	6.923	13,734	729	5.308	1.615	0.428

Variable	(1)	(2)
Panel B. Multivariate analysis		
Intercept	−1.757***	−1.658***
	(−45.92)	(−33.67)
PIPE	−0.630***	
	(−5.82)	
PIPE × Quintile 5		−1.633***
		(−5.85)
PIPE × Quintile 4		−0.971***
		(−4.77)
PIPE × Quintile 3		−0.466
		(−1.60)
PIPE × Quintile 2		−0.051
		(−0.27)
PIPE × Quintile 1		0.130
		(0.52)
Quintile 5		0.175***
		(3.64)
Quintile 4		−0.053
		(−1.45)
Quintile 3		0.003
		(0.08)
Quintile 2		−0.006
		(−0.19)
ROAIA	−0.398	−0.635***
	(−1.63)	(−5.00)
SIZEEQ	−0.026	−0.034***
	(−1.63)	(−3.31)
LEVBIA	−0.006	0.074
	(−0.01)	(0.24)
MKBK	−0.051***	−0.062***
	(−3.37)	(−4.82)
SALEGR	0.068	0.179
	(0.83)	(1.08)
NPPE	−0.262	−0.322
	(−1.04)	(−1.61)
ITO	0.223***	0.276***
	(9.69)	(10.18)
Year dummies	Yes	Yes
N	69,321	69,321
Likelihood ratio	486.65	560.47

at the 1% level. The declines in the implied takeover probabilities for firms in quintiles 3 through 1 are 1.243%, 0.367%, and 0.069%, respectively, which are not statistically significant at conventional levels. PIPEs thus have less of an effect as a takeover defense when issuers are less vulnerable to takeover threat. Both Models (1) and (2) also show that the probability of takeover declines with market-to-book ratio but rises with industry takeover activities.

5.2. Determinants of white squire choice and takeover probability

A poorly performing and highly overleveraged firm prefers to sell shares through PIPEs over ESOPs when it is aware of strong takeover pressure. To test this hypothesis, we propose a heteroscedastic logistic model that examines the association between the choice of white squire defense and the probability of takeover. Our ESOP sample is collected from Compustat over 1995 through 2010. We focus on the common ESOP obligations in order to compare them with common stock private equity placements. Application of these criteria gives us a final set of 1078 ESOP obligations. The heteroscedastic logistic model is expressed as:

$$\begin{aligned} Prob(PIPE_i = 1) = {} & a + b_1 HighTProb_i + b_2 HighTProb_i * ROAIA_i \\ & + b_3 ROAIA_i + b_4 HighTProb_i * LEVBIA_i + b_5 LEVBIA_i \\ & + b_6 Ln(Analyst)_i + b_7 Ln(MV)_i + b_8 RD/Assets_i \\ & + b_9 EV/Assets_i + b_{10} Cash/Assets_i \\ & + b_{11} Intangible/Assets_i \\ & + b_{12} Low\ Z\text{-}score\ dummy_i + e_i \end{aligned} \tag{3}$$

where *i* indicates the firm, and *PIPE* is an indicator variable that equals one for private placements and zero for ESOP obligations.

The hypothesized variable *HighTProb* is a dummy for firms in the top two quintiles of takeover probability for the year before the offering.[21] *ROAIA* and *LEVBIA* are industry-adjusted return on assets and leverage ratio. We control for a battery of issuer characteristics that may correlate with PIPE and ESOP structures (Wu, 2004; Chakraborty and Gantchev, 2013; Dai, 2014; and Kim and Ouimet, 2014) defined in the Appendix. All control variables are winsorized at the 1st and 99th percentiles. The regressions also control for industry and year fixed effects. The number of observations varies across models because of data availability.

Panel A of Table 4 shows the summary statistics of *ROAIA* and *LEVBIA* for PIPE issuers and ESOP firms. Differences in mean and median are assessed using a two-tailed *t*-test and a two-tailed Wilcoxon rank-sum test. The mean difference in *ROAIA* and *LEVBIA* between PIPE issuers and ESOP firms are −0.369 and 0.028, both statistically significant at the 1% level. These results hold in the difference tests in medians. This evidence indicates that PIPE issuers have poorer performance and higher leverage than ESOP firms.

Panel B presents the results for heteroscedastic logistic model. In Model (1), the explanatory variables are *HighTProb*, *HighTProb*ROAIA*, and *ROAIA*. There is a significantly positive coefficient on *HighTProb* at the 1% level after controlling for industry and year effects. Thus, firms under severe takeover pressure prefer to use PIPE rather than ESOP as a white squire defense. The negative coefficient on *ROAIA* indicates that firm performance has a significant impact on firms' white squire decisions. The interaction term between takeover probability and performance is negative and significant at the 1% level, implying that firms facing high takeover pressure are more likely to use PIPE over ESOP if their performance is poor. Model (2) explanatory variable are *HighTProb*, *HighTProb*LEVBIA*, and *LEVBIA*. There are positive and statistically significant coefficients on these three variables at the 1% level after controlling for industry and year effects. The significantly positive relation between leverage and white squire choice can be explained by that firms with high leverage exhibit a great volatility of cash flows, making it more difficult for them to maintain the management and administration of an ESOP. Further, the significantly positive coefficient on *HighTProb*LEVBIA* indicates that firms with a high probability of takeover are less likely to use an ESOP as a white squire defense if their leverage is above the industry median. Model (3) combines Models (1) and (2). The two interaction terms are still statistically significant, suggesting that both firm performance and leverage are important factors in linking takeover probability and the white squire defense choice.

In Model (4), the results hold when we control for other potential determinants of a white squire choice. Firms with characteristics consistent with greater information asymmetry (proxied by low analyst coverage and small firm size), and highly R&D-intensive firms are more likely to conduct PIPE offerings. The sign of these control variables are consistent with the findings in Wu (2004), Dai (2007, 2009), Brophy et al. (2009), Chaplinsky and Haushalter (2010), Chen et al. (2010), and Brown and Floros (2012).

5.3. PIPE characteristics and takeover probability

In a white squire defense a firm places a large block of shares with an investor, offering a favorable price, generous dividends, and a board seat. If PIPEs adoption enables a white squire defense when issuers face a higher probability of takeover, these characteristics of a white squire defense would be expected to be positively correlated with the probability of takeover.

[21] The results are similar if we replace the dummy variable *HighTProb* by the probability of takeover in all regressions throughout the paper.

5.3.1. PIPE fraction placed and takeover probability

The white squire defense generally involves transfer of a block of shares, so we expect a positive relation between the PIPE fraction placed and takeover probability. To test this conjecture, we estimate the model:

$$\begin{aligned} \textit{PIPE fraction placed}_i = {} & a + b_1 \textit{HighTProb}_i + b_2 \textit{Ln(Analyst)}_i \\ & + b_3 \textit{CAR}(-12,-1)_i + b_4 \textit{Ln(Volatility)}_i \\ & + b_5 \textit{Ln(MV)}_i + b_6 \textit{EBITDA/Assets}_i \\ & + b_7 \textit{DEBT/Assets}_i + b_8 \textit{EV/Assets}_i \\ & + b_9 \textit{Cash/Assets}_i + b_{10} \textit{RD/Assets}_i \\ & + b_{11} \textit{Intangible/Assets}_i \\ & + b_{12} \textit{Low Z-score dummy}_i + e_i \end{aligned} \tag{4}$$

where *i* indicates the firm, and the dependent variable is *PIPE fraction placed*, the ratio of shares placed in a PIPE to shares outstanding after the issue. We lose 46 observations because the number of shares placed is not available in the PlacementTracker database. The hypothesized variable *HighTProb* is a dummy for firms in the top two quintiles of takeover probability for the year before the PIPE event date. The control variables *Ln(Analyst)*, *CAR(−12,−1)*, *Ln(Volatility)*, *Ln(MV)*, *EBITDA/Assets*, *DEBT/Assets*, *EV/Assets*, *Cash/Assets*, *RD/Assets*, *Intangible/Assets*, *Low Z-score dummy* are as suggested by Wu (2004), Chakraborty and Gantchev (2013), and Dai (2014) (full definitions are in the Appendix).[22] We winsorize control variables at the 1st and 99th percentiles. The regressions also control for industry and year fixed effects.

Panel A of Table 5 shows the univariate results for the PIPE fraction placed. Quintile 1 is the group with the lowest takeover probability and quintile 5 is the group with the highest takeover probability. Differences in mean and median are assessed using a two-tailed *t*-test and a two-tailed Wilcoxon rank-sum test. The PIPE fraction placed rises with takeover probability; for example, the average (median) fraction placed rises from 6.868% (7.032%) in quintile 1 to 13.049% (13.516%) in quintile 5. The mean difference in the PIPE fraction placed between the top two quintiles and the bottom two quintiles is 4.679%, statistically significant at the 1% level. The difference in median is 5.232%, also significant at the 1% level. Results remain unchanged for differences between the top and bottom quintiles.

Panel B of Table 5 shows the cross-sectional ordinary least squares (OLS) regression results with heteroscedasticity-robust standard errors (White, 1980). Model (1) shows that the coefficient on *HighTProb* is positive and statistically significant at the 1% level after controlling for industry and year effects. The evidence indicates that takeover pressure leads equity issuers to sell more shares through private placements. In Model (2), which includes control variables except for *Low Z-score dummy*, *HighTProb* remains significantly positively related to the PIPE fraction placed after controlling for other potential variables. The result is robust to including all the control variables. The increase of 0.03 in the adjusted R-squared from Model (4) to Model (3) shows a significant net effect of adding takeover probability. The *p*-value for the *F*-test on the change in *R*-squared values is less than 0.001.

5.3.2. PIPE discount and takeover probability

The next test is whether firms with higher takeover probability give their white squires a more favorable share price. We would expect the coefficient on *HighTProb* to be significantly positively correlated with the price discount in Eq. (5):

[22] In this equation, we control these 11 variables above except *Ln(Proceeds)*, the natural log of gross proceeds of the private placement, because the dependent variable, *PIPE fraction placed*, the ratio of shares placed in a PIPE to shares outstanding after the issue, is similar to *Ln(Proceeds)*.

Table 4
Choice of white squire method and takeover probability. This table presents univariate and multivariate results of the choice of white squire defense. Panel A shows the univariate analyses for *ROAIA* and *LEVBIA*. Differences in mean and median are assessed using a two-tailed *t*-test (*t*-statistics are reported parentheses) and a two-tailed Wilcoxon rank-sum test (*p*-values are reported in brackets). Panel B shows estimation results for the heteroscedasticity logistic model. The dependent variable *PIPE* equals one if a firm issues shares via private placements, and zero if a firm offers employee share ownership plan. *HighTProb* describes a firm ranked in the top two quintiles of takeover probability for the year before the offering. Other variables are defined in the Appendix. *p*-Values are reported in parentheses. The number of observations varies across regressions because of data availability. *** and ** represent 1% and 5% significance level, respectively.

	PIPE			ESOP			Difference	
	N	Mean	Median	*N*	Mean	Median	Mean	Median
Panel A. Univariate analyses								
ROAIA	1634	−0.335	−0.242	1078	0.034	0.032	−0.369***	−0.274***
							(−40.54)	[<0.001]
LEVBIA	1634	0.048	0.044	1078	0.020	0.028	0.028***	0.016***
							(5.42)	[<0.001]

Variable	(1)	(2)	(3)	(4)
Panel B. Multivariate analyses				
Intercept	2.262	3.176	1.947	6.913
	(0.987)	(0.982)	(0.989)	(0.936)
HighTProb	1.054***	1.560***	0.584**	2.718***
	(<0.001)	(<0.001)	(0.031)	(<0.001)
*HighTProb*ROAIA*	−5.942***		−8.524***	−7.587***
	(<0.001)		(0.003)	(<0.001)
ROAIA	−15.414***		−13.171***	−3.384**
	(<0.001)		(<0.001)	(0.014)
*HighTProb*LEVBIA*		3.421***	2.129***	11.873***
		(0.001)	(0.001)	(<0.001)
LEVBIA		3.187***	2.158**	7.910***
		(<0.001)	(0.046)	(<0.001)
Ln(Analyst)				−2.550***
				(<0.001)
Ln(MV)				−0.643***
				(<0.001)
RD/Assets				15.231***
				(<0.001)
EV/Assets				0.055
				(0.813)
Cash/Assets				−1.420
				(0.482)
Intangible/Assets				0.536
				(0.669)
Low Z-score dummy				0.591
				(0.107)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	2712	2712	2712	2250
PIPE	1634	1634	1634	1316
ESOP	1078	1078	1078	934
Likelihood ratio	2713.43	2158.16	2817.28	2704.00

$$\begin{aligned} PIPE\ discount_i = {} & a + b_1 HighTProb_i + b_2 Ln(Proceeds)_i + b_3 Ln(Analyst)_i \\ & + b_4 CAR(-12,-1)_i + b_5 Ln(Volatility)_i + b_6 Ln(MV)_i \\ & + b_7 EBITDA/Assets_i + b_8 DEBT/Assets_i + b_9 EV/Assets_i \\ & + b_{10} Cash/Assets_i + b_{11} RD/Assets_i \\ & + b_{12} Intangible/Assets_i \\ & + b_{13} Low\ Z\text{-}score\ dummy_i + e_i \end{aligned} \tag{5}$$

where *i* indicates the firm, and the dependent variable is the PIPE discount, measured by dividing the difference between the closing price of a PIPE firm 10 days after the event date (P_{10}) and the offer price by P_{10} (Hertzel and Smith, 1993).[23] We lose one observation because the offer price is not available in the PlacementTracker database. The hypothesized variable *HighTProb* is a dummy for firms in the top two quintiles of takeover probability for the year before the PIPE event date. The control variables *Ln(Proceeds), Ln(Analyst), CAR(−12,−1), Ln(Volatility), Ln(MV), EBITDA/Assets, DEBT/Assets, EV/Assets, Cash/Assets, RD/Assets, Intangible/Assets, Low Z-score dummy* are as suggested by Wu (2004), Chakraborty and Gantchev (2013), and Dai (2014) (full definitions are in the Appendix). We winsorize control variables at the 1st and 99th percentiles. The regressions also control for industry and year fixed effects.

Panel A of Table 6 shows the univariate analyses for PIPE discounts. Quintile 1 (quintile 5) represents the lowest (highest) quintile of takeover probability. The mean (median) difference of PIPE discount between the top two quintiles and the bottom two quintiles is 2.785% (1.855%), both significantly positive at the 1% level. The results are similar for the difference between quintiles 1 and 5.

Panel B shows the cross-sectional OLS regression analyses. All models show that the coefficients on *HighTProb* are significantly positively correlated with the price discount. This implies that PIPE issuers provide investors with greater price discounts when they face more severe takeover pressure. There is a substantial increase in the adjusted *R*-squared from 0.08 for Model (4) to 0.12 for Model (3), and the *p*-value for the *F*-test on the change in *R*-squared values is less than 0.001. This suggests that including takeover probability helps explain more variations in PIPE discounts.

[23] We find similar results when we calculate the PIPE discount using the closing price on the event date (Silber, 1991), the closing price one day prior to the event date (Wruck, 1989), or the closing price one month prior to the event date (Hertzel et al., 2002).

Table 5
PIPE fraction placed and takeover probability. This table presents univariate and regression results of the relation between PIPE fraction placed and takeover probability. PIPE fraction placed is equal to the ratio of shares placed to shares outstanding after the issue. Panel A shows the univariate analyses for PIPE fraction placed. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. Differences in mean and median are assessed using a two-tailed *t*-test (*t*-statistics are reported the parentheses) and a two-tailed Wilcoxon rank-sum test (*p*-values are reported in brackets). Panel B shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is PIPE fraction placed. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *t*-Statistics in parentheses are adjusted for heteroscedasticity. The number of observations varies across regressions because of data availability. *** and * represent 1% and 10% significance level, respectively.

Takeover probability	*N*	Mean (%)	Median (%)	Top two quintiles minus bottom two quintiles		Quintile 5 minus quintile 1	
				Mean (%)	Median (%)	Mean (%)	Median (%)
Panel A. Univariate analyses							
Quintile 5	555	13.049	13.516	4.679***	5.232***	6.181***	6.484***
Quintile 4	390	10.791	11.156	(15.18)	[< 0.001]	(14.56)	[< 0.001]
Quintile 3	320	10.188	10.404				
Quintile 2	195	7.813	7.492				
Quintile 1	128	6.868	7.032				

Variable	(1)	(2)	(3)	(4)
Panel B. Regression analyses				
Intercept	0.123***	0.093	0.128	0.145
	(2.72)	(0.71)	(0.97)	(1.08)
HighTProb	0.030***	0.027***	0.024***	
	(9.53)	(7.20)	(5.93)	
Ln(Analyst)		−0.002	−0.004	−0.007
		(−0.62)	(−0.93)	(−1.54)
CAR(−12,−1)		0.002	0.003	0.003
		(0.63)	(0.83)	(1.10)
Ln(Volatility)		−0.127*	−0.120*	−0.132*
		(−1.88)	(−1.70)	(−1.85)
Ln(MV)		0.001	0.001	0.001
		(0.01)	(0.01)	(0.01)
EBITDA/Assets		−0.017*	0.002	0.001
		(−1.67)	(0.13)	(0.01)
DEBT/Assets		−0.006	−0.023	−0.004
		(−0.47)	(−1.58)	(−0.31)
EV/Assets		−0.006	−0.006	−0.007
		(−1.29)	(−1.21)	(−1.40)
Cash/Assets		−0.012	−0.001	0.002
		(−1.43)	(−0.10)	(0.22)
RD/Assets		0.001	0.002	0.001
		(0.09)	(0.26)	(0.08)
Intangible/Assets		−0.025	−0.022	−0.017
		(−1.25)	(−1.04)	(−0.77)
Low Z-score dummy			0.018***	0.023***
			(4.21)	(5.37)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1588	1255	1096	1096
Adjusted R^2	0.13	0.12	0.12	0.09

5.3.3. Change in dividends and takeover probability

To test whether PIPE issuers pay higher dividends to investors when the firm is more likely to be a target, we estimate the heteroscedastic logistic model in Eq. (6):

$$\begin{aligned} Change\ in\ DPS_i = {} & a + b_1 HighTProb_i + b_2 Ln(Proceeds)_i + b_3 Ln(Analyst)_i \\ & + b_4 CAR(-12,-1)_i + b_5 Ln(Volatility)_i + b_6 Ln(MV)_i \\ & + b_7 EBITDA/Assets_i + b_8 DEBT/Assets_i \\ & + b_9 EV/Assets_i + b_{10} Cash/Assets_i \\ & + b_{11} RD/Assets_i + b_{12} Intangible/Assets_i \\ & + b_{13} Low\ Z\text{-}score\ dummy_i + e_i \end{aligned} \quad (6)$$

The dependent variable equals one if the percentage change in dividends per share (DPS) for a given period is positive, and zero otherwise. The percentage change in DPS is measured from year $t-1$ to either years t or $t+1$.[24] t represents the year of PIPE issuance. *HighTProb* is a dummy for a firm in the top two quintiles of takeover probability for the year before the PIPE event date. Control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. The regressions also control for industry and year fixed effects.

The results for the univariate analyses are in Panel A of Table 7. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability. The mean percentage changes in DPS from years $t-1$ to t are significantly positive for the top two quintiles and significantly negative for the bottom three quintiles, based on two-tailed *t*-tests. The mean difference between the changes in DPS for the top two quintiles and the bottom two quintiles is 0.064, statistically significant at the 1% level. Results are unchanged for differences between the top and bottom quintiles. The results are similar for the measure of change in DPS from years $t-1$ to $t+1$.

Panel B presents the results for the heteroscedasticity logistic model analyses of the percentage changes in DPS from years $t-1$ to t in Models (1) through (4) and from years $t-1$ to $t+1$ in Models (5) through (8). Models (1) and (5) include *HighTProb* and industry and year dummies, and Models (3) and (7) use the full model. All the coefficients on *HighTProb* are positive and statistically significant at the 1% level. To compare the relative performance of models with and without *HighTProb*, a likelihood ratio

[24] The same measure for the change in dividends is used in Benartzi et al. (1997), and Nissim and Ziv (2001).

Table 6
PIPE discount and takeover probability. This table presents univariate and regression results of the relation between PIPE discount and takeover probability. PIPE discount is measured by dividing the difference between the closing price of a PIPE firm 10 days after the event date (P_{10}) and the offer price by P_{10}. Panel A shows the univariate analyses for PIPE discounts. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. Differences in mean and median are assessed using a two-tailed *t*-test (*t*-statistics are reported in parentheses) and a two-tailed Wilcoxon rank-sum test (*p*-values are reported in brackets). Panel B shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is PIPE discount. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *t*-Statistics in parentheses are adjusted for heteroscedasticity. The number of observations varies across regressions because of data availability. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

Takeover probability	*N*	Mean (%)	Median (%)	Top two quintiles minus bottom two quintiles		Quintile 5 minus quintile 1	
				Mean (%)	Median (%)	Mean (%)	Median (%)
Panel A. Univariate analyses							
Quintile 5	573	14.055	12.844	2.785***	1.855***	3.583**	2.144**
Quintile 4	405	12.406	12.096	(2.72)	[0.008]	(2.23)	[0.034]
Quintile 3	326	10.186	11.192				
Quintile 2	199	10.662	10.666				
Quintile 1	130	10.472	10.700				

Variable	(1)	(2)	(3)	(4)
Panel B. Regression analyses				
Intercept	−0.048	0.637	0.231*	0.849
	(−0.57)	(1.41)	(1.94)	(1.64)
HighTProb	0.059***	0.057***	0.053***	
	(9.23)	(6.60)	(5.68)	
Ln(Proceeds)		−0.001	−0.001	0.009
		(−0.13)	(−0.08)	(1.01)
Ln(Analyst)		0.007	0.003	0.005
		(0.28)	(0.09)	(0.16)
CAR(−12,−1)		1.032	0.195	1.538
		(1.06)	(1.54)	(1.39)
Ln(Volatility)		−0.007	−0.006	0.002
		(−0.88)	(−0.71)	(0.23)
Ln(MV)		−0.009	−0.015	−0.008
		(−0.73)	(−1.08)	(−0.52)
EBITDA/Assets		−0.028**	−0.034**	−0.074***
		(−1.99)	(−2.09)	(−4.71)
DEBT/Assets		−0.049	0.021	0.010
		(−0.65)	(0.72)	(0.99)
EV/Assets		−0.001	−0.001	−0.001
		(−0.06)	(−0.81)	(−1.58)
Cash/Assets		−0.149	−0.046	−0.255**
		(−1.36)	(−1.17)	(−2.03)
RD/Assets		−0.019	−0.016	−0.019
		(−1.31)	(−0.99)	(−1.34)
Intangible/Assets		0.011	0.013	−0.022
		(0.53)	(0.59)	(−0.89)
Low Z-score dummy			−0.012	0.002
			(−1.36)	(0.19)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1633	1289	1125	1125
Adjusted R^2	0.12	0.12	0.12	0.08

test shows that adding takeover probability significantly increases the explanatory power of the model. These results suggest that when issuers face strong takeover pressure, they will pay higher dividends to investors in order to encourage their support. We also find that firms with higher earnings tend to pay higher dividends.

5.3.4. Board seats and takeover probability

To examine whether firms have more of an incentive to provide board seats to white squires via private placements when there is a higher probability of takeover, we estimate the model:

$$\begin{aligned} Prob(Board\ set_i = 1) = {} & a + b_1 HighTProb_i + b_2 Ln(Proceeds)_i \\ & + b_3 Ln(Analyst)_i + b_4 CAR(-12,-1)_i \\ & + b_5 Ln(Volatility)_i + b_6 Ln(MV)_i \\ & + b_7 EBITDA/Assets_i + b_8 DEBT/Assets_i \\ & + b_9 EV/Assets_i + b_{10} Cash/Assets_i \\ & + b_{11} RD/Assets_i + b_{12} Intangible/Assets_i \\ & + b_{13} Low\ Z\text{-}score\ dummy_i + e_i \end{aligned} \quad (7)$$

The dependent variable equals one if a PIPE provides investors with board seats, and zero otherwise. *HighTProb* is a dummy for a firm in the top two quintiles of takeover probability for the year before the PIPE event date. The control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. The models also control for industry and year fixed effects.

Panel A of Table 8 shows the univariate analyses for the proportion of PIPEs offering board seats in each quintile of takeover probability. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability. The difference in the proportion of PIPEs offering board seats between the top two quintiles and the bottom two quintiles is 3.094%, statistically significant at the 5% level using a Fisher's exact test. The result is similar for the proportion difference between quintile 5 and quintile 1.

Panel B of Table 8 shows estimation results for the heteroscedastic logistic model. Model (1) includes *HighTProb* and industry and year dummies, and Model (3) includes *HighTProb* and all control variables. In Model (1) the coefficient on *HighTProb* is positive and statistically significant at the 5% level after controlling for industry and year effects. In Models (2) and (3) the coefficients

Table 7
Change in dividends and takeover probability. This table presents univariate and multivariate results of the relation between the percentage change in dividends per share (DPS) and takeover probability. The percentage change in DPS is measured from year $t-1$ to either years t or $t+1$. t represents the year of PIPE issuance. Panel A shows the univariate analyses. Quintile 1 (quintile 5) represents firms sorted in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. t-tests are used to test the hypothesis that the means are equal to zero. Differences in mean are assessed using a two-tailed t-test (t-statistics are reported in parentheses). Panel B shows the heteroscedastic logistic regression analyses. The dependent variable *Change in DPS* equals one if the percentage change in DPS for a given period is positive, and zero otherwise. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. p-Values are reported in parentheses. The number of observations varies across regressions because of data availability. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

Takeover probability	Change in DPS ($t-1$ to t)		Change in DPS ($t-1$ to $t+1$)	
	N	Mean	*N*	Mean
Panel A. Univariate analyses				
Quintile 5	573	0.038**	573	0.011**
Quintile 4	406	0.014*	406	0.001**
Quintile 3	326	−0.038***	326	−0.060***
Quintile 2	199	−0.038***	199	−0.040***
Quintile 1	130	−0.034**	130	−0.063***
Difference				
Top two quintiles minus bottom two quintiles		0.064***		0.056***
t-statistic		(4.47)		(5.02)
Quintile 5 minus quintile 1		0.071***		0.074***
t-statistic		(3.18)		(3.88)

Variable	Change in DPS ($t-1$ to t)				Change in DPS ($t-1$ to $t+1$)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel B. Multivariate analyses								
Intercept	−7.777	−5.747	−17.083	3.783	−13.272	−21.627	−21.286	−5.077
	(0.984)	(0.131)	(−0.976)	(0.241)	(0.950)	(0.889)	(0.880)	(0.948)
HighTProb	3.210***	4.949***	8.987***		10.346***	13.330***	13.451***	
	(<0.001)	(<0.001)	(<0.001)		(0.001)	(<0.001)	(<0.001)	
Ln(Proceeds)		0.289	0.771	−0.279		0.530	0.489	−0.067
		(0.552)	(0.183)	(0.523)		(0.363)	(0.438)	(0.884)
Ln(Analyst)		0.906	0.821	0.339		0.374	0.393	0.252
		(0.111)	(0.191)	(0.533)		(0.604)	(0.590)	(0.646)
CAR(−12,−1)		0.049	−0.319	−0.175		0.160	−0.138	−0.140
		(0.853)	(0.328)	(0.554)		(0.544)	(0.676)	(0.630)
Ln(Volatility)		0.127	0.104	0.243		−0.578	−0.743	−0.301
		(0.784)	(0.848)	(0.556)		(0.286)	(0.223)	(0.474)
Ln(MV)		−0.304	−0.204	−0.292		0.395	0.470	−0.301
		(0.223)	(0.471)	(0.280)		(0.183)	(0.153)	(0.184)
EBITDA/Assets		2.333***	3.042***	1.876**		2.114**	2.710**	4.589***
		(0.006)	(0.005)	(0.027)		(0.020)	(0.032)	(0.002)
DEBT/Assets		−0.800	−1.240	1.750		0.022	−0.828	−0.970
		(0.577)	(0.478)	(0.215)		(0.988)	(0.648)	(0.264)
EV/Assets		0.228**	0.359***	−0.165		0.503***	0.492***	−0.170
		(0.016)	(0.006)	(0.189)		(<0.001)	(0.001)	(0.173)
Cash/Assets		0.589	0.059	1.311		−0.932	−1.451	1.354
		(0.568)	(0.961)	(0.212)		(0.448)	(0.346)	(0.209)
RD/Assets		−0.143	0.904	0.892		−1.118	0.218	−0.449
		(0.856)	(0.527)	(0.445)		(0.187)	(0.922)	(0.751)
Intangible/Assets		0.943	0.472	0.513		−1.525	−2.619	0.463
		(0.452)	(0.745)	(0.707)		(0.335)	(0.142)	(0.767)
Low Z-score dummy			0.373	−0.033			−0.107	−0.478
			(0.518)	(0.948)			(0.865)	(0.350)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1634	1289	1125	1125	1634	1289	1125	1125
Likelihood ratio	345.90	295.93	293.27	230.96	481.49	403.61	368.95	282.44

on *HighTProb* remain statistically significantly positive at the 10% and 5% level, respectively. The likelihood ratio test shows that Model (3) with takeover probability has higher explanatory power than with Model (4) without takeover probability (chi-square p-value = 0.008). These results suggest that takeover pressure leads PIPE issuers to offer more board seats to their investors.

5.4. PIPEs placed with managerial investors and with SA investors and takeover probability

The white squire acts as an investor ally in the takeover process. PIPE issuers should be more likely to place shares with such friendly investors when firms face strong takeover pressure. We examine two types of friendly investors: the issuing firm managers or officers (managerial investors), and strategic alliance partners (SA investors). First, we test the relation between PIPEs placed with managerial investors and the probability of takeover by estimating the model:

$$\begin{aligned} Prob(Managerial\,investor_i = 1) = {} & a + b_1 HighTProb_i + b_2 Ln(Proceeds)_i \\ & + b_3 Ln(Analyst)_i + b_4 CAR(-12,-1)_i \\ & + b_5 Ln(Volatility)_i + b_6 Ln(MV)_i \\ & + b_7 EBITDA/Assets_i + b_8 DEBT/Assets_i \\ & + b_9 EV/Assets_i + b_{10} Cash/Assets_i \\ & + b_{11} RD/Assets_i + b_{12} Intangible/Assets_i \\ & + b_{13} Low\,Z\text{-}score\,dummy_i + e_i \end{aligned} \quad (8)$$

The dependent variable equals one if a PIPE places shares with a managerial investor, and zero otherwise. *HighTProb* is a dummy for a firm in the top two quintiles of takeover probability for the year before the PIPE event date. Control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. The models also control for industry and year fixed effects.

Panel A of Table 9 shows the univariate analyses for the proportion of PIPEs placed with managerial investors in each quintile of takeover probability. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability. The difference in the proportion of PIPEs placed with managerial investors between the top two and the bottom two quintiles is 3.709%, statistically significant at the 1% level. The result is robust to the proportion difference between the most extreme two quintiles.

Panel B shows the estimation results for four heteroscedastic logistic models: (1) including *HighTProb* and industry and year dummies; (2) including *HighTProb* and all control variables except for *Low Z-score dummy*; (3) including all control variables (with *HighTProb* and without *HighTProb*). Model (1) shows that the coefficient on *HighTProb* is positive and statistically significant at the 1% level after controlling for industry and year effects. After we control for other potential influences on PIPEs placed with managerial investors, the coefficients on *HighTProb* in Models (2) through (3) are also positive and statistically significant at the 5% level. The likelihood ratio test shows that Model (3) with takeover probability has higher explanatory power than Model (4) without takeover probability (chi-square p-value = 0.007). Taken all together, the results suggest that a strong takeover probability motivates issuers to place more shares with managerial investors.

To test the association between the takeover probability and PIPEs placed with strategic alliance investors, we estimate the model:

$$\begin{aligned} Prob(SA\ investor_i = 1) = {} & a + b_1 HighTProb_i + b_2 Ln(Proceeds)_i \\ & + b_3 Ln(Analyst)_i + b_4 CAR(-12,-1)_i \\ & + b_5 Ln(Volatility)_i + b_6 Ln(MV)_i \\ & + b_7 EBITDA/Assets_i + b_8 DEBT/Assets_i \\ & + b_9 EV/Assets_i + b_{10} Cash/Assets_i \\ & + b_{11} RD/Assets_i + b_{12} Intangible/Assets_i \\ & + b_{13} Low\ Z\text{-}score\ dummy_i + e_i \end{aligned} \quad (9)$$

The dependent variable equals one if a PIPE places shares with the SA investor, and zero otherwise. *HighTProb* is a dummy for a firm in the top two quintiles of takeover probability for the year before the PIPE event date. Control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. Again, we also control for industry and year fixed effects.

Panel A of Table 10 shows the univariate analysis for the proportion of PIPEs placed with SA investors in each quintile of takeover probability. There is a significant difference in the proportion of PIPEs placed with the SA investor between the two top and bottom quintiles of takeover probability. A similar result is found in the proportion difference between the two extreme quintiles.

Panel B of Table 10 shows estimation results of the heteroscedastic logistic model. In all models, we find a positive association between takeover probability and the likelihood that a PIPE will be placed with SA investors. The coefficients are statistically significant. To compare goodness-of-fit between Models (3) and (4), we show that the p-value of the likelihood-ratio test is 0.017, indicating that the inclusion of takeover probability significantly improves explanatory power. The evidence supports our expectation that a high probability of takeover makes issuers more likely to place shares with SA investors.

Table 8
Board seats and takeover probability. This table presents univariate and multivariate results of the relation between PIPEs offering board seats and takeover probability. Panel A shows the univariate analyses for the proportion of PIPEs offering board seats in each quintile of takeover probability. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. We use Fisher's exact test to test the significance of differences in proportions. p-Values are reported in parentheses. Panel B shows estimation results for the heteroscedastic logistic model. The dependent variable *Board seat* equals one if a PIPE provides investors with board seats, and zero otherwise. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. p-Values are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

Takeover probability	*N*	Proportion of firms (%)	Top two quintiles minus bottom two quintiles (%)	Quintile 5 minus quintile 1 (%)
Panel A. Univariate analyses				
Quintile 5	573	6.457	3.094**	4.918***
Quintile 4	406	7.143	(0.018)	(0.001)
Quintile 3	326	6.442		
Quintile 2	199	5.025		
Quintile 1	130	1.539		

Variable	(1)	(2)	(3)	(4)
Panel B. Multivariate analyses				
Intercept	−7.410	−2.461	−9.596	−8.420
	(0.991)	(0.771)	(0.291)	(0.345)
HighTProb	0.927**	0.885*	0.983**	
	(0.014)	(0.069)	(0.047)	
Ln(Proceeds)		0.512	1.433	1.371
		(0.676)	(0.271)	(0.284)
Ln(Analyst)		0.039	−0.205	−0.213
		(0.912)	(0.611)	(0.601)
CAR(−12,−1)		0.111	−0.071	−0.080
		(0.618)	(0.800)	(0.776)
Ln(Volatility)		0.058	−0.125	−0.114
		(0.846)	(0.711)	(0.731)
Ln(MV)		0.145	0.321	0.217
		(0.285)	(0.138)	(0.292)
EBITDA/Assets		−0.142	−0.284**	−0.329***
		(0.123)	(0.028)	(0.008)
DEBT/Assets		−0.660	−1.907	−1.528
		(0.505)	(0.173)	(0.266)
EV/Assets		2.070	1.802	1.329
		(0.413)	(0.497)	(0.608)
Cash/Assets		−1.195*	−1.564**	−1.403*
		(0.082)	(0.039)	(0.063)
RD/Assets		0.573	0.624	0.545
		(0.256)	(0.271)	(0.338)
Intangible/Assets		0.007	0.382	0.539
		(0.993)	(0.660)	(0.529)
Low Z-score dummy			0.274	0.325
			(0.444)	(0.363)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1634	1289	1125	1125
Likelihood ratio	148.48	147.80	152.04	145.00

5.5. Post-issue firm performance and takeover probability

5.5.1. Operating performance

If PIPE serves to effect a white squire defense, it is interesting to ask what motivates managers conducting a PIPE when they face strong takeover pressure. We test managerial entrenchment versus shareholder interest hypotheses by examining the relation between the probability of takeover and post-issue operating performance.

Panel A of Table 11 reports the median changes in operating performance, industry-adjusted operating performance, and performance-adjusted operating performance over twelve quarters after the event quarter (quarter 0) for each quintile of takeover probability. We measure the change in operating performance as quarterly ROA averaged over the twelve-quarter horizon minus

Table 9
PIPEs placed with managerial investors and takeover probability. This table presents univariate and multivariate results of the relation between PIPEs placed with managerial investors and takeover probability. Panel A shows the univariate analyses for the proportion of PIPEs placed with managerial investors in each quintile of takeover probability. We define managerial investors as issuing firm managers or officers. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. We use Fisher's exact test to test the significance of differences in proportions. *p*-Values are reported in parentheses. Panel B shows the estimation results of the heteroscedasticity logistic model. The dependent variable *Managerial investor* equals one if a PIPE places shares with managerial investors, and zero otherwise. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *p*-Values are reported in parentheses. The number of observations varies across models because of data availability. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

Takeover probability	*N*	Proportion of firms (%)	Top two quintiles minus bottom two quintiles (%)	Quintile 5 minus quintile 1 (%)
Panel A. Univariate analyses				
Quintile 5	573	8.377	3.709***	6.838***
Quintile 4	406	6.650	(0.007)	(< 0.001)
Quintile 3	326	6.135		
Quintile 2	199	5.528		
Quintile 1	130	1.539		

Variable	(1)	(2)	(3)	(4)
Panel B. Multivariate analyses				
Intercept	−2.772***	11.494	11.269	18.103***
	(<0.001)	(0.251)	(0.261)	(0.009)
HighTProb	0.293***	0.859**	0.823**	
	(<0.001)	(0.019)	(0.027)	
Ln(Proceeds)		−1.369	−1.338	0.458
		(0.182)	(0.193)	(0.901)
Ln(Analyst)		−0.471	−0.479	0.455
		(0.652)	(0.647)	(0.556)
CAR(−12,−1)		−0.421	−0.450	−0.214
		(0.269)	(0.243)	(0.457)
Ln(Volatility)		−0.529	−0.565	−0.340
		(0.111)	(0.150)	(0.167)
Ln(MV)		0.489	0.541	0.337
		(0.226)	(0.190)	(0.270)
EBITDA/Assets		−8.134*	−8.250*	−3.127***
		(0.065)	(0.062)	(< 0.001)
DEBT/Assets		5.158	5.458	1.787
		(0.418)	(0.393)	(0.562)
EV/Assets		0.042	0.042	0.023
		(0.456)	(0.452)	(0.218)
Cash/Assets		−3.785	−3.912	−6.183
		(0.484)	(0.470)	(0.148)
RD/Assets		1.072	1.017	0.310
		(0.115)	(0.143)	(0.228)
Intangible/Assets		−0.218	−0.221	−0.621
		(0.773)	(0.769)	(0.343)
Low Z-score dummy			0.198	0.411*
			(0.549)	(0.099)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1634	1289	1125	1125
Likelihood ratio	177.57	159.50	159.87	152.68

ROA for quarter 0.[25] Industry-adjusted operating performance is defined as the issuer's ROA less the median ROA for firms with the same two-digit SIC code. Performance-adjusted operating performance of issuers is measured by computing the issuer's ROA minus the ROA of its matching firm. We select matching firms using a procedure similar to that in Lie (2005). For each issuer, we select all non-issuing firms in the same industry and in the same takeover probability quintile whose operating performance for the issuance quarter is within ±20% or within ±0.01; whose operating performance for the four quarters ending with quarter 0 is within ±20% or within ±0.01; and whose pre-issuance market-to-book value of assets is within ±20% or within ±0.1. If no firms meet these criteria, we relax the industry criterion to a one-digit SIC. Finally, if still no firms meet the criteria, we disregard all the criteria. From these firms, we select the firm with the lowest sum of absolute performance difference, defined as[26]:

$$\left|\mathrm{ROA}_{\text{four quarters ending with quarter 0, sample firm}} - \mathrm{ROA}_{\text{four quarters ending with quarter 0, matching firm}}\right| + \left|\mathrm{ROA}_{\text{quarter 0, sample firm}} - \mathrm{ROA}_{\text{quarter 0, matching firm}}\right|.$$

[25] We obtain similar results when we measure the change in operating performance relative to the average performance over quarter −3 to quarter 0 instead of just the performance in quarter 0.

[26] If operating performance figures are missing for any of the four quarters ending with quarter 0, we disregard the first term.

Table 10
PIPEs placed with strategic alliance investors and takeover probability. This table presents univariate and multivariate results of the relation between PIPEs placed with strategic alliance (SA) investors and takeover probability. Panel A shows the univariate analyses for the proportion of PIPEs placed with SA investors in each quintile of takeover probability. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. We use Fisher's exact test to test the significance of differences in proportions. *p*-Values are reported in parentheses. Panel B shows the estimation results of the heteroscedastic logistic model. The dependent variable equals one if a PIPE places shares with SA investors, and zero otherwise. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *p*-Values are reported in parentheses. The number of observations varies across models because of data availability. *** and ** represent 1% and 5% significance level, respectively.

Takeover probability	*N*	Proportion of firms (%)	Top two quintiles minus bottom two quintiles (%)	Quintile 5 minus quintile 1 (%)
Panel A. Univariate analyses				
Quintile 5	573	10.646	6.557***	6.800***
Quintile 4	406	6.650	(< 0.001)	(0.001)
Quintile 3	326	4.908		
Quintile 2	199	1.508		
Quintile 1	130	3.846		

Variable	(1)	(2)	(3)	(4)
Panel B. Multivariate analyses				
Intercept	−12.799	0.729	1.856	2.892
	(0.945)	(0.997)	(0.993)	(0.989)
HighTProb	1.462***	1.155**	1.119**	
	(<0.001)	(0.014)	(0.030)	
Ln(Proceeds)		−1.428	−1.800	−1.799
		(0.149)	(0.102)	(0.104)
Ln(Analyst)		1.337	1.581	1.484
		(0.154)	(0.121)	(0.142)
CAR(−12,−1)		−0.122	−0.075	−0.086
		(0.530)	(0.737)	(0.699)
Ln(Volatility)		0.190	0.103	0.142
		(0.477)	(0.729)	(0.629)
Ln(MV)		−0.136	−0.048	−0.078
		(0.516)	(0.838)	(0.740)
EBITDA/Assets		3.988	2.621	2.363
		(0.116)	(0.321)	(0.365)
DEBT/Assets		2.202**	2.224**	2.527***
		(0.004)	(0.012)	(0.004)
EV/Assets		−0.212	−0.247	−0.358
		(0.352)	(0.323)	(0.145)
Cash/Assets		−1.174***	−1.341**	−1.405**
		(0.031)	(0.021)	(0.016)
RD/Assets		0.514	−1.079	−1.461
		(0.808)	(0.703)	(0.605)
Intangible/Assets		−0.266	−0.280	−0.237
		(0.735)	(0.740)	(0.779)
Low Z-score dummy			0.085	0.136
			(0.786)	(0.668)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1634	1289	1125	1125
Likelihood ratio	126.47	120.59	108.07	102.41

Wilcoxon signed-rank tests are used to test the hypothesis that the median changes are equal to zero because these tests are more powerful than *t*-tests in detecting abnormal operating performance (Barber and Lyon, 1997; Loughran and Ritter, 1997).

Panel A of Table 11 shows the univariate analyses for post-issue operating performance in each quintile of takeover probability.[27] Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. The median changes in unadjusted ROA and industry-adjusted ROA over the twelve-quarter post-issue period are significantly negative for the top two quintiles and statistically insignificant for the bottom three quintiles. The median differences between the changes in ROA and industry-adjusted ROA for the top two quintiles and the bottom two quintiles are −1.074% and −0.980%, both statistically significant at the 1% level. Results are similar for differences between the top and bottom quintiles of takeover probability. Panel A also shows that the median changes in performance-adjusted ROA are negative in all quintiles. These changes are statistically significant except for the bottom two quintiles. Again, post-issue operating performance is significantly poorer for the top two quintiles than for the bottom two quintiles and for the top quintile than for the bottom quintile. The results in Panel A indicate a negative relation between takeover probability and post-issue operating performance, which supports the managerial entrenchment hypothesis over the shareholder interest hypothesis.

Panel B of Table 11 shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is the percentage change in performance-adjusted ROA over the twelve-quarter post-issue period.[28] Control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. All models in Panel B show a significantly negative relation between takeover probability and post-issue abnormal operating performance. Comparing Models (3) with (4), we also find a significant increase in the adjusted *R*-squared when adding takeover probability in the regression model (*F*-test *p*-value <0.001). Again, the results in Panel B favor the managerial entrenchment hypothesis.

[27] The samples in Table 11 are smaller because of data availability.

[28] When we replace performance-adjusted ROA by unadjusted ROA or industry-adjusted ROA, our conclusion does not change.

Table 11
Post-issue operating performance and takeover probability. This table presents univariate and regression results of the relation between post-issue operating performance and takeover probability. Operating performance is measured by return on assets (ROA), which is the ratio of net income over total assets. Industry-adjusted operating performance is defined as the issuer's operating performance less the median of operating performance for firms with the same two-digit SIC code. We measure performance-adjusted operating performance of issuers by computing the issuer's ROA minus the ROA of its matching firm. Matching firms are identified according to the procedure described in Section 5.5.1. Panel A shows the univariate analyses for the median changes in operating performance over twelve quarters after the event quarter (quarter 0). We measure the change in operating performance as quarterly ROA averaged over the twelve-quarter horizon minus ROA for quarter 0. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. Wilcoxon signed-rank tests are used to test the hypotheses that the median changes are equal to zero. Differences in median changes are assessed using a Wilcoxon rank-sum test. *p*-Values are reported in parentheses. Panel B shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is the percentage change in performance-adjusted ROA over the twelve-quarter post-issue period. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *t*-Statistics in parentheses are adjusted for heteroskedasticity. The number of observations varies across regressions because of data availability. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

	Change in ROA		Change in industry-adjusted ROA		Change in performance-adjusted ROA	
	N	Median (%)	*N*	Median (%)	*N*	Median (%)
Panel A. Univariate analyses						
Quintile 5	404	−0.630**	404	−0.668***	369	−1.795***
Quintile 4	316	−0.820**	315	−0.701***	293	−1.381***
Quintile 3	251	−0.440	251	−0.428	239	−1.040***
Quintile 2	146	0.388	146	0.321	102	−0.551
Quintile 1	102	0.319	102	0.265	81	−0.223
Difference						
Top two quintiles minus bottom two quintiles		−1.074***		−0.980***		−1.206***
p-Value		(0.001)		(0.001)		(<0.001)
Quintile 5 minus quintile 1		−0.949**		−0.933**		−1.572***
p-Value		(0.016)		(0.014)		(<0.001)

Variable	(1)	(2)	(3)	(4)
Panel B. Regression analyses				
Intercept	5.129	−10.457	−10.316	−10.510
	(0.51)	(−1.17)	(−1.16)	(−1.15)
HighTProb	−2.600***	−2.410**	−2.447**	
	(−3.69)	(−2.54)	(−2.58)	
Ln(Proceeds)		0.682	0.657	0.451
		(0.74)	(0.71)	(0.49)
Ln(Analyst)		0.782	0.788	0.530
		(0.86)	(0.87)	(0.58)
CAR(−12,−1)		0.860	0.845	0.849
		(1.37)	(1.34)	(1.34)
Ln(Volatility)		−0.422	−0.417	−0.376
		(−0.52)	(−0.51)	(−0.46)
Ln(MV)		−0.035	−0.003	0.457
		(−0.08)	(−0.01)	(1.05)
EBITDA/Assets		9.377*	9.667*	9.634*
		(1.72)	(1.73)	(1.73)
DEBT/Assets		16.024	15.580	7.076
		(1.57)	(1.51)	(0.72)
EV/Assets		0.402	0.403	0.575
		(1.64)	(1.58)	(1.53)
Cash/Assets		−3.014	−2.943	−2.919
		(−1.59)	(−1.55)	(−1.31)
RD/Assets		5.005***	5.043***	4.955***
		(3.54)	(3.55)	(3.47)
Intangible/Assets		0.599	0.554	0.199
		(0.28)	(0.26)	(0.09)
Low Z-score dummy			0.301	0.152
			(0.36)	(0.18)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1084	895	789	789
Adjusted R^2	0.13	0.19	0.19	0.17

5.5.2. Stock performance

We also examine the relation between the probability of takeover and post-issue stock performance. To measure long-run return performance of a PIPE issuer, we use buy-and-hold abnormal returns (BHARs) (e.g., Barber and Lyon, 1997; Lyon et al., 1999; Mitchell and Stafford, 2000). We calculate buy-and-hold returns (BHRs) for both issuers and their matching firms from the first year following the event date to the third anniversary or to a firm's delisting date. Each year is defined as a uniform block of 252 trading days. Matching firms must not have had a PIPE announcement in the three years before and after the closing date of the PIPE, and they must be within the same size decile, book-to-market (B/M) quintile, and takeover probability quintile as the PIPE issuer.[29] Among all firms meeting the criteria, we then select a matching firm on the basis of the closest B/M ratio to the PIPE issuer.[30] The BHAR is the difference in buy-and-hold returns of a PIPE issuer and its matching firm.

[29] We find similar results when we include only firms with no PIPE announcement in the three years before the closing date of the PIPE, that is, no look-ahead bias (Loughran and Vijh, 1997).

[30] Conclusions remain unchanged when we select five matching firms based on the closest B/M ratio to the PIPE issuer.

Table 12
Post-issue stock performance and takeover probability. This table presents univariate and regression results of the relation between post-issue stock performance and takeover probability. We calculate buy-and-hold returns (BHRs) for both issuers and their matching firms from the first year following the event date to the third anniversary or to a firm's delisting date, where each year is defined as a uniform block of 252 trading days. The buy-and-hold abnormal return (BHAR) is the difference in buy-and-hold returns of a PIPE issuer and its matching firm. Matching firms are identified according to the procedure described in Section 5.5.2. Panel A shows the univariate analyses for BHRs and BHARs. Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. *t*-Tests are used to test the hypothesis that the means are equal to zero. Differences in mean are assessed using a two-tailed *t*-test (*t*-statistics are reported in parentheses). Panel B shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is the BHAR. *HighTProb* describes a firm in the top two quintiles of takeover probability. Other variables are as defined in the Appendix. *t*-Statistics in parentheses are adjusted for heteroskedasticity. The number of observations varies across regressions because of data availability. ***, **, and * represent 1%, 5%, and 10% significance level, respectively.

Takeover probability	Buy-and-hold returns		Buy-and-hold abnormal returns	
	N	Mean	*N*	Mean
Panel A. Univariate analyses				
Quintile 5	501	−0.473***	370	−0.357***
Quintile 4	356	−0.333***	302	−0.144***
Quintile 3	274	−0.230***	241	−0.141***
Quintile 2	163	−0.112	104	−0.022
Quintile 1	111	−0.130	85	−0.082
Difference				
Top two quintiles minus bottom two quintiles		−0.296***		−0.212***
t-Statistic		(−5.11)		(−2.91)
Quintile 5 minus quintile 1		−0.343***		−0.275**
t-statistic		(−5.77)		(−2.44)

Variable	(1)	(2)	(3)	(4)
Panel B. Regression analyses				
Intercept	−0.365*	0.826	0.588	0.507
	(−1.77)	(1.13)	(0.75)	(0.64)
HighTProb	−0.090**	−0.102**	−0.129**	
	(−2.05)	(−1.97)	(−2.30)	
Ln(Proceeds)		0.047	0.044	0.048
		(0.90)	(0.79)	(0.86)
Ln(Analyst)		0.124**	0.131**	0.117**
		(2.30)	(2.22)	(1.97)
CAR(−12,−1)		−0.045	0.007	0.007
		(−1.02)	(0.14)	(0.15)
Ln(Volatility)		−0.086	−0.071	−0.079
		(−1.44)	(−1.35)	(−1.49)
Ln(MV)		−0.044	−0.045	−0.031
		(−1.55)	(−1.54)	(−1.06)
EBITDA/Assets		0.188	0.179	0.179
		(1.52)	(0.65)	(0.65)
DEBT/Assets		0.040	0.053	0.047
		(0.63)	(0.81)	(0.71)
EV/Assets		−0.012**	−0.009	−0.012*
		(−2.25)	(−1.46)	(−1.90)
Cash/Assets		−0.077	−0.072	−0.060
		(−0.69)	(−0.59)	(−0.49)
RD/Assets		0.105	0.081	0.105
		(1.45)	(0.64)	(0.83)
Intangible/Assets		0.150	−0.011	−0.076
		(0.97)	(−0.07)	(−0.46)
Low Z-score dummy			−0.015	−0.021
			(-0.26)	(−0.36)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1102	966	844	844
Adjusted R^2	0.22	0.13	0.14	0.13

Panel A of Table 12 shows the univariate analyses for post-issue stock performance in each quintile of takeover probability.[31] Quintile 1 (quintile 5) represents firms in the lowest (highest) quintile of takeover probability for the year before the PIPE event date. The mean BHRs over the three-year post-issue period are significantly negative for the top three quintiles and statistically insignificant for the bottom two quintiles. The mean difference in BHRs between the top two quintiles and the bottom two quintiles is −0.296, statistically significant at the 1% level. The result remains unchanged if we compare the mean difference in BHRs between quintile 5 and quintile 1. Panel A also reports the results for BHARs. Again, the mean BHARs over the three-year post-issue period are significantly negative only for the top three quintiles. The mean difference between the top two quintiles and the bottom two quintiles is −0.212 for the three-year BHAR, statistically significant at the 1% level. The conclusion holds for the mean difference in BHARs between the two most extreme quintiles.

Panel B of Table 12 shows the cross-sectional OLS regression results with heteroscedasticity-robust standard errors. The dependent variable is the BHAR.[32] Control variables are defined in the Appendix. We winsorize control variables at the 1st and 99th percentiles. All models in Panel B show a significantly negative relation

[31] We have smaller samples in Table 12 because of data availability.

[32] Our conclusion is unchanged when the dependent variable is the BHR.

Table 13
Recursive bivariate probit models of PIPE issuance and takeover targets. This table presents the estimation results of the recursive bivariate probit model for the common stock traded on the NYSE, AMEX, and Nasdaq with research data available from CRSP and Compustat. The dependent variable in Models (1) is an indicator for the firm is a takeover target in year t. The dependent variable in Models (2) is an indicator for PIPE issuance in year t. Independent variables are measured in year $t-1$ and defined in the Appendix. Standard errors are adjusted for serial correlation, and heteroscedasticity. t-Statistics are reported in parentheses. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Dependent variable = Variable	Takeover target (1)	PIPE (2)
Intercept	−1.323***	−1.843***
	(−44.69)	(−42.10)
Takeover target		0.244**
		(2.07)
ROAIA	−0.123***	−1.365***
	(−3.33)	(−32.16)
SIZEEQ	−0.032***	−0.093***
	(−9.16)	(−15.34)
LEVBIA	0.346***	0.156**
	(8.72)	(2.40)
MKBK	−0.007***	−0.024***
	(−3.63)	(−11.78)
SALEGR	0.009	−0.193***
	(0.47)	(−7.14)
NPPE	0.064**	−0.255***
	(2.09)	(−4.76)
ITO	0.132***	
	(8.72)	
Year dummies	Yes	Yes
N	69,321	
Log Pseudo−Likelihood	−26,163.097	
Rho	−0.066 (p−value = 0.226)	

between takeover probability and post-issue abnormal stock returns. In addition, the inclusion of takeover probability can significantly increase the goodness-of-fit of the model (F-test p-value <0.001). Overall, the results in Table 12 imply that the higher the probability of takeover that PIPE issuers face, the lower their shareholder value.

To assess the robustness of our results, we also apply Carhart's (1997) adaptation of the Fama and French (1993) method to estimate long-run stock performance. The regression model is based on the calendar-time regression approach suggested by Fama (1998) and Mitchell and Stafford (2000). The estimated intercept from this regression captures the average monthly abnormal return over the three-year period relative to the event date. The results are similar to those using buy-and-hold abnormal returns to estimate long-run stock performance, so to save space we do not report them here.

6. Endogeneity bias

The relation between takeover likelihood and PIPE issuance may suffer from endogeneity problems. Hence, in Table 13, we estimate the recursive bivariate probit model with an instrument of industry takeover to account for the endogeneity bias.

Table 13 presents the bivariate probit estimates for the two-equation model of takeover targets and PIPE issuance, with the takeover target variable modeled as endogenous using an instrument of industry takeover. Both dependent variables are measured as of the end of the next year. Consistent with the hypothesized relation between the instrument and takeover target, Model 1 shows a positive and significant coefficient on *ITO*, indicating that firms operating in industries with higher takeover activities tend to be a takeover target. Model 2 reports the coefficients from the second equation of the PIPE issuance dummy on the takeover target dummy and the corresponding exogenous control variables. The coefficient on the takeover target dummy is statistically significantly positive, implying that even after accounting for the endogeneity problem, the takeover pressures appear to have a significant and positive relation with the likelihood that firms will issue shares via private placements. The estimated correlation between the residuals of the two equations, shown by the coefficient Rho at the bottom of the table, is not statistically significant at the conventional level, implying that the endogeneity correction is not important.

7. Conclusion

This study takes the viewpoint that private equity placement is a form of white squire defense. We provide a comprehensive analysis of the motives for and the consequences of defensive private equity placement. We conclude that private investment in public equity can effectively reduce the probability of takeover. PIPE issuers facing strong takeover pressure place larger blocks of shares, provide greater price discounts, pay higher dividends, and tend to give board seats to investors. Takeover pressure also leads issuers to place more shares with managerial investors and strategic alliance investors. The evidence is consistent with the regular methods of the white squire defense.

While empirical study of the white squire defense is concentrated on changes in employee stock ownership (Pagano and Volpin, 2005; Rauh, 2006), our study suggests that private equity placement appears to be a valid white squire defense. In addition, we find that firms with poor performance and that are overleveraged prefer to use a PIPE over an ESOP as a white squire defense.

We also examine the motives of white squire defense through tests of post-issue firm performance. PIPE issuers tend to experience poorer operating performance and stock returns when there is a greater likelihood they are a takeover target. This is consistent with the managerial entrenchment hypothesis, implying that private equity placement will raise agency conflicts between management and shareholders. As several studies have indicated that private equity placement can mitigate agency problems (Wruck, 1989; Hertzel and Smith, 1993; Chakraborty and Gantchev, 2013), the agency problem with regard to PIPEs remains an issue to be resolved through empirical testing.

Appendix A. Variable definitions

Variable	Definition
BHIR(−60, −1)	Mean buy-and-hold returns from value-weighted industry indexes in the 60 trading days before the equity offering, where industry indexes are the equity values of the value-weighted portfolios of firms in the same industry (excluding equity-issuing firms)
CAR(−12,−1)	The equal-weighted market adjusted cumulative abnormal returns (CARs) 12 months prior to the PIPE
Cash/Assets	Ratio of total cash to total assets for the fiscal year prior to the PIPE/ESOP
DEBT/Assets	Ratio of long term debt to total assets for the fiscal year prior to the PIPE
EBITDA/Assets	Ratio of EBITDA to total assets for the fiscal year prior to the PIPE/ESOP
EV/Assets	Ratio of enterprise value, which is the sum of market capitalization and debt minus cash to total assets for the fiscal year prior to the PIPE/ESOP

(*continued on next page*)

Variable definitions (*continued*)

Variable	Definition
Firm age	Amount of time between IPO date and equity offering date
Fraction placed	Ratio of shares placed to shares outstanding after the PIPE issue
Intangible/Assets	Ratio of intangible assets to total assets for the fiscal year prior to the PIPE/ESOP
ITO	One if at least one firm in the same industry is a takeover target in the previous year, and zero otherwise
LEVBIA	Book value of debt divided by total assets in the previous year, minus the median ratio for firms within the same industry
Ln(Analyst)	The natural logarithm of the maximum number of analysts following the PIPE/ESOP issuer over the 12 months prior to the PIPE/ESOP
Ln(MV)	The natural logarithm of the issuer's market capitalization in millions for the fiscal year prior to the PIPE/ESOP
Ln(Proceeds)	The natural logarithm of gross proceeds of the private placement
Ln(Volatility)	The natural logarithm of the volatility, which is measured as the standard deviation of the daily returns over the 12 months prior to the PIPE
Low Z-score dummy	This dummy is set equal to one if the *z*-score is below 1.8 and to zero otherwise
MKBK	Ratio of market value (book value of assets minus book value of equity plus year-end price times common shares outstanding) to book value of assets in the previous year
NPPE	Net plant, property, and equipment divided by total assets in the previous year
R&D/Assets	Ratio of the R&D expense to total assets for the fiscal year prior to the PIPE/ESOP
ROAIA	Operating income before depreciation divided by total assets in the previous year, minus the median ratio for firms in the same industry
SALEGR	The natural logarithm of the ratio of sales over the sales of the previous year
SIZEEQ	The natural logarithm of common equity, calculated as the number of shares outstanding times the previous year-end price
Z-score	$1.2 \times$ (working capital/book assets) + $1.4 \times$ (retained earnings/book assets) + $3.3 \times$ (earnings before interest and taxes/book assets) + $0.6 \times$ (market value of equity/total liabilities) + $0.999 \times$ (net sales/book assets) for the fiscal year prior to the PIPE/ESOP

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