The Economics of PIPE Investing

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Abstract

This paper investigates the pricing of private investments in public equities (PIPEs). We consider a sample of 4,648 investments in public companies by hedge funds and private equity funds. Issuing firms tend to be small and poorly performing, so they have limited access to traditional sources of finance. To attract capital, they offer shares at a substantial discount to the market price, along with warrants and a collection of other rights. Because of the discount and attached warrants, the average unregistered PIPE investment earns a 22.6% return in the year following the investment, in spite of the 0.6% return on the underlying stock during this period. The returns to investors depend heavily on the investment horizon, with longer holding periods leading to lower returns. We provide new evidence on registration terms and the liquidity of PIPE investments that indicates PIPE investors are short-term shareholders who earn abnormal returns. Our findings confirm that PIPEs are an expensive source of capital for small firms.

JEL classification: G23, G32, G12

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1. Introduction

Private equity funds and hedge funds often invest in the equity of public companies through private placements in public equities, commonly referred to as "PIPEs." According to *PrivateRaise*, a leading database on PIPE transactions, between 2001 and 2015, hedge funds and private equity funds participated in 4,648 private placements of common stock by U.S. listed firms that raised $114.5 billion. Firms raising funds through PIPEs tend to be small, with 96% of common stock PIPE issuers having market capitalization below $1 billion. Figure 1 shows that annual PIPE issuance by small firms is comparable to SEO issuance by these firms from 2001 to 2015. PIPE issuers come from various industries including healthcare (25% of issuers), technology (18%), and basic materials (17%). PIPE investments by hedge funds and private equity funds appear to be an important source of corporate finance, especially for small public firms.

Hedge funds and private equity funds charge substantial fees, usually a 2% management fee plus a 20% share of the profits. After these fees are paid, these funds have high required rates of return because of their risk and illiquidity. Consequently, it would seem very costly for firms to raise capital by issuing PIPEs to hedge funds and private equity funds, while it is not obvious that limited partners in these funds benefit by paying intermediation fees to invest in public equities. Yet, the volume of PIPEs suggests that private placements from hedge funds and private equity funds are the market solution to the capital-raising problem for a large number of publicly traded firms.

This paper seeks to understand the economics of PIPE investing by addressing several questions. Why, despite the costs of intermediation, are PIPE investments by hedge funds and private equity funds a common source of capital for small public firms? How much do investors in PIPE transactions earn on average? What is the distribution of PIPE returns? In particular, how dependent are the returns to a portfolio of PIPEs on "home run" deals? Finally, do PIPE investors become long-term shareholders who help improve the governance of issuing firms, or are they short-term investors who exit as quickly as possible?

To address these questions, this paper considers a comprehensive sample of 4,648 common stock PIPE transactions by U.S. firms in which hedge funds or private equity funds invested between 2001 and

2015.[1] In this sample, the median investment is $11.5 million, which equals 12% of the market value of the issuing firm's equity. In 78% of the sample, the firm issues unregistered equity, which means that investors cannot sell their positions until the issuing firm registers the equity, which occurs an average of 86 days following the closing date of the offering. PIPE investors negotiate a discount so pay an average of 8.4% lower than the market price when they purchase the equity. In addition, investors receive warrants in 47% of the transactions in our sample. If one values the warrants using standard techniques, these warrants are worth an average of 17.4% of the value of the equity purchased. Including the value of the warrants, PIPE investors receive an average discount of 14.5% relative to the total value of the package of securities they acquire.

In addition, investors receive a number of other rights when they purchase a PIPE. These rights include the right to participate in future financings (25% of the transactions), the right to reform the issuer's management team (15%) and rights that limit the issuer's future issuance (30%). While we cannot explicitly price these rights, they have some value, implying that the average discount we report understates the value offered to investors to induce them to provide capital.

Why do public firms raise capital under such costly terms? Examining the characteristics of PIPE issuers, it appears that their options are limited. Even though these firms are publicly traded, they are relatively small, with median book assets of $43 million. Their operating performance in the year prior to the PIPE issuance tends to be very poor, with a median ratio of EBITDA to Book Assets of -26%. They likely do not have access to public debt markets and appear to have limited access to bank loans, as the median firm has a leverage ratio of only 6.5%. Finally, as has been argued previously (e.g. Hertzel and Smith (1993)), these are firms for which information asymmetry is likely severe, suggesting that the issuance cost of an SEO would be substantial for the reasons outlined by Myers and Majluf (1984).

How do these investments perform for hedge funds and private equity funds? The prior literature shows that subsequent to a private placement, issuing firms' equities tend to underperform (Hertzel et al.

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[1] Our sample consists of all PIPEs for which there is at least one hedge fund or private equity fund among the reported investors. PIPEs are usually syndicated, so various other investor types may present in a given offering.

(2002)). Our sample firms have similarly weak performance, although it is less pronounced than in the prior literature, with the average issuer's stock returning 0.6% in the year subsequent to issuance. PIPE investors earn higher returns than other investors for two reasons. First, they purchase shares at a discount to the market price. Second, they often receive warrants in addition to the equity. The average return on the discounted equity is 11.8% over one year after issuance. When we include the value of warrants, the average return over one year increases to 22.6%. Even after accounting for management fees, these returns are likely attractive to the limited partners in hedge funds and private equity funds.

However, the distribution of returns to PIPE investing is highly skewed. To start out, the returns to the issuer's stock are skewed, with a median return of -20.1% over the year after issuation but several extremely positive return observations. On top of this, the warrants offered to PIPE investors amplify the right tail of the return distribution while having no effect on the losing deals. Thus, while the average returns to PIPE investors receive are attractive, the median one-year return is -6.6%. As such, PIPE investing is much like venture capital investing in that the key driver of returns is the number of "home run" investments in the portfolio.

One key consideration that is unexplored in prior research on PIPE transactions is the holding period of investors. The offering discount accrues to investors immediately when the transaction closes, while any attached warrants can be held until expiration with no exposure to downside risk. However, the long-run performance of the issuer's stock is expected to be poor, as evidenced by the prior literature (e.g. Hertzel et al. (2002); Brophy, Ouimet, and Sialm (2009)). Conversations with practitioners indicate that it is prohibitively expensive to short sell the stock of PIPE issuers to lock in the discount and hedge against downside risk. Therefore, PIPE investors have an incentive to exit their stock positions as quickly as possible to capture the discount and mitigate exposure to the issuer's downside risk.

There are two factors that limit the ability of PIPE investors to exit their positions quickly. First, most PIPE shares are unregistered at issuance and cannot be sold to the public until they are registered with the SEC. In our sample, the average time to registration is 86 days after the offering closes. Second, the shares of PIPE issuers tend to be fairly illiquid, so they cannot be sold immediately after registration without

putting substantial downward pressure on the stock price. Immediately following registration, the average deal exhibits a spike in trading volume and a decrease in the stock price, suggesting that PIPE investors begin to exit their positions as soon as the securities can be sold. However, considering both the size of the investments (20% of the pre-offering shares outstanding, on average) and the limited trading volume in the issuers' shares, we estimate that investors in unregistered PIPEs retain stock exposure for at least one year after registration, while investors in registered PIPEs are exposed to the issuer's stock for at least six months.

To evaluate whether PIPEs earn abnormal returns in a framework robust to the statistical problems with long-run event studies, we form value-weighted portfolios that simulate the performance of an investor who bought every dollar of PIPE issuance from 2001 to 2015 and held each position for a fixed horizon. Consistent with the intuition outlined above, the abnormal returns relative to the Fama and French (1993) three factor model are sizable for short holding periods of three months and six months, but become statistically insignificant at a holding period of two years. We estimate that the abnormal returns to investing in unregistered PIPEs are between 0.29% and 0.98% per month, while the abnormal returns to investing in registered direct offerings are between 0.93% and 1.59% per month. Overall, our results suggest that PIPEs are an expensive source of capital for small firms.

Our view of the PIPE market is that hedge funds and private equity funds earn rents for investing in companies that cannot obtain financing from alternative sources. These investors earn their rents by purchasing shares at a discount to the market price and obtaining warrants, which amplify the upside of successful investments. Two predictions of this argument are that returns should be higher for smaller issuers and when the *ex ante* financial situation of the issuer is worse, as the issuer is in a worse negotiating position and investors potentially bear more risk. We find evidence consistent with both predictions. PIPEs issued by firms with market capitalization under $100 million offer an average abnormal return of 25.9%, whereas PIPEs by larger firms offer an insignificant abnormal return of 6.6%. PIPEs issued by firms with severely negative operating profits over the quarter prior to issuance offer significantly higher abnormal returns than PIPEs issued by healthy firms.

The paper most closely related to ours is Brophy, Ouimet, and Sialm (2009), who analyze a large sample of PIPEs between 1995 and 2002. These authors study the underperformance of firms issuing PIPEs to hedge funds, showing that issuers of "structured" PIPEs, with variable conversion rates to protect investors from downside risk, have particularly poor post-issuance performance. They argue that hedge funds are investors of last resort who provide capital to poor quality firms. We build on Brophy, Ouimet, and Sialm's (2009) analysis in a number of ways. First, we calculate deal level returns for PIPE investments, measuring the returns to PIPE investors and the issuer's cost of capital, whereas they restrict attention to the performance of the underlying stock. Second, we show that the distribution of returns to PIPE issuers is highly skewed and that warrants amplify this skewness, leading to a returns distribution for hedge funds and private equity funds that relies on "home run" deals to provide acceptable returns to limited partners. Third, we examine the extent to which the time to registration and the illiquidity of the issuer's stock limits the ability of investors to exit their positions, which is important in light of the underperformance in the issuer's stock and the investors' desire to capture the offering discount.

Our work is also related to the broader literature on private placements. [2] This literature began with Wruck (1989), who argues that the resulting increase in shareholder concentration creates value by aligning the interests of managers and shareholders. Subsequent research on private placements has focused on the finding that issuers' post-issuance long-run returns are extremely poor (Hertzel et al. (2002)), which stands in puzzling contrast to the positive returns around private placement announcements. Our paper adds to the private placement literature in several ways. We are the first to estimate the returns to the package of securities offered to investors, which provides an estimate of private placement issuers' cost of capital. We show that the returns to PIPE investors depend heavily on their holding periods and that abnormal returns become statistically insignificant as the holding period extends beyond one year. We also document significantly negative abnormal returns to unregistered PIPE issuers when the registration statement

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[2] See Hertzel and Smith (1993), Hertzel et al. (2002), Wu (2003), Chaplinsky and Haushalter (2005), Cronqvist and Nilsson (2005), Gomes and Phillips (2005), Krishnamurthy et al. (2005), Barclay, Holderness, and Sheehan (2007), Wruck and Wu (2009), Wu, Wang, and Yao (2009), and Chakraborty and Gantchev (2013) for contributions to the literature on private placements.

becomes effective, offsetting the positive announcement return an average of three months after the transaction closes. These findings indicate that PIPE investors are short-term shareholders who are unlikely to play a role in improving corporate governance.

This paper is also broadly related to work that has documented the sources of the returns to various strategies used by private equity funds and hedge funds. This work dates to Kaplan (1989a,b) and Smith (1990), who find that LBOs are associated with cash flow improvements and reductions in corporate taxes, both of which are likely sources of value. Jiang, Li and Wang (2012) and Lim (2015) consider the sources of value in distress-oriented hedge funds. These papers find that they acquire securities and using their consequent bargaining ability to facilitate reorganizations, creating value by reducing the contracting costs associated with a restructuring characterized by Gertner and Scharfstein (1991). Mitchell and Pulvino (2001) examine the sources of value associated with merger arbitrage strategies. Mitchell, Pedersen, and Pulvino (2007) and Aggarwal, Fung, Loon, and Naik (2011) address convertible arbitrage strategies. Our paper continues with this approach, documenting how PIPE investors earn returns through the discounted shares and warrants they receive for providing capital to firms that could not raise capital from other sources.

2. Investments in Public Firms by Hedge Funds and Private Equity Funds

2.1. Motivation/Magnitude of Investment

Hedge funds and private equity funds often contribute capital to public firms. These investments are different from other types of private placements for a number of other reasons. First, they are temporary investments; private equity funds have a fiduciary responsibility to return capital to their investors, and hedge funds, while infinitely lived, tend to turn over positions relatively quickly. In contrast, private placements to individuals or other corporations can be held for very long periods of time and can substantially change the operations of the company.[3] Second, many large investments by individuals are

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[3] Wruck (1989) argues that private placements can affect issuing firms' ownership structures and resulting management incentives in a meaningful way.

likely motivated by private benefits associated with control (e.g. Barclay and Holderness (1989)). In contrast, hedge fund and private equity fund investments are more likely driven strictly by returns because of both the very strong pecuniary incentives to maximize returns that they face,[4] as well as the temporary nature of the investments. Investments by hedge funds and private equity funds therefore are unlikely to be associated with commonly discussed reasons for blockholdings: aligning incentives of management or providing private benefits to the blockholder.

Hedge fund and private equity fund investments in public stock are often common stock, but can also be of other securities.[5] Table 1 characterizes such investments during the period from 2001 to 2015. Common stock investments are most common, with 4,648 issues totaling $114.5 billion. In addition, syndicates including hedge funds and private equity funds provided equity lines ($17.6 billion), which are commitments to purchase equity from the issuer in the future. They also purchased $103.8 billion of convertible or preferred debt and $23.0 billion of other types of securities.[6] In total, investments involving hedge funds and private equity funds provided $258.8 billion in capital to firms from 2001 to 2015. Because we are interested in the returns earned by investors, we focus on the common stock investments because returns for these investments are straightforward to calculate. However, we emphasize that hedge funds' and private equity funds' private investments in public companies go well beyond the common stock investments in the sample discussed below.

2.2. A Typical Investment

Even "common stock" PIPE investments involve more than just common stock. To illustrate the way these investments are structured, in Table 2 we provide details about a typical investment, the December 2006 investment of $6.5 million in the equity of a medical device company called United

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[4] See Lim, Sensoy and Weisbach (2016) for estimates of the direct and indirect estimates of hedge fund managers' incentives, and Chung, Sensoy, Stern and Weisbach (2012) for comparable estimates for private equity funds.
[5] In addition, hedge funds often lend directly to firms or contribute to syndicated loans when they receive sufficiently attractive terms. See Chernenko, Erel, and Prilmeier (2016) and Lim, Minton, and Weisbach (2014).
[6] Note that in the run-up to the 2008 Financial Crisis, there were large convertible preferred offerings totaling over $32 billion by financial institutions including Barclays, Citigroup, Merrill Lynch, and Washington Mutual.

American Health Corporation (UAHC). We choose this particular investment because it is close to the median investment size in our sample and has a number of features common to other PIPE deals.

In this investment, a syndicate of investors led by a private equity firm called Heights Capital Management purchased exactly one million shares of UAHC for $6.50 per share. Heights Capital put in 20% of the capital ($1.3 million) and the remaining 80% was split between a group of investors made up of 5 hedge funds, an asset manager and a collection of individual investors, trusts and pension plans. This purchase occurred at a 21% discount to the market price of $8.20, which is larger than average discount for this period (see Table 4 below). In addition to the equity, investors also received 100,000 warrants on UAHC's equity, equal to one warrant for every 10 shares of common equity they purchased. The warrants had a strike price of $8.50 per share and a term of 5 years, so applying the Black-Scholes model adjusted for dilution with volatility capped at 50%, each warrant is worth $3.92.

Another way of viewing the warrants is that they effectively increase the discount investors receive. For every share with a market value of $8.20, investors receive one tenth of a warrant, increasing the total value to $8.59. Relative to this value, the price of $6.50 per share represents a discount of 24.4%.

One reason for the discount is that the shares were unregistered, so could not be sold to the public until the firm registered them with the SEC. Unregistered PIPEs generally contain a provision requiring the firm to register the securities within a specified period of time. In this case, the provision stated that UAHC had to file a registration statement within 30 days and that the registration would become effective by the 90th day, or the 120th day if there was an SEC review. In the UAHC PIPE, the registration statement was filed on January 11, 2007 and was declared effective on January 26, 2007, 44 days after the transaction closed.

Figure 2 shows that after this day when the shares were registered, there was a large increase in trading volume in UAHC: during the 5 trading days prior to the registration becoming effective, a total of 297,422 shares were traded, while in the 5 trading days subsequent to the effective registration date, more than three times as many shares, 983,504, were traded. If the additional trading volume represents selling by PIPE investors, then the difference of 686,082 shares represents more than two thirds of the 1 million

shares issued in the PIPE. Consistent with PIPE investors selling their shares immediately after they became registered, the return on UAHC stock over the 5 trading days after registration was -16.3%.

In addition to the equity and warrants, investors in the PIPE received a number of other rights. The warrants had anti-dilution protection, which means that if there was another equity issue at a lower price, the strike price of the warrants would be adjusted downwards. The issuing firm was prohibited from issuing other securities for 60 days, and the investors had the right of first refusal for 40% of any other equity or equity-linked securities that UAHC issued during the subsequent year. It is difficult to put a monetary value on these rights, but they clearly offer some value, suggesting that the 24% discount is understated relative to the true value that investors received.

While the investors in the PIPE received a number of rights that ordinary investors do not have, it is notable that they do *not* have any "control rights". In venture capital deals, it is common for investors to have rights that allow them to influence the firm's operations, such as board representation, the right to approve compensation arrangements, etc.[7] In contrast, in PIPE deals, these features rarely occur. In our sample, there are control related provisions in less than 10% of PIPEs. These are usually cases in which the investors' provision of capital is contingent on a management change, either the CEO or the board of directors. However, even in these cases, the provisions do not give explicit control rights to the investors. The fact that control rights are not typically negotiated suggests that unlike most private equity investments, PIPEs appear to be passive investments in which the investors do not play an active role in the management of the issuing company.

3. Sample

3.1. Selection Process

The starting point for our sample is the universe of 22,728 PIPE transactions covered in *PrivateRaise*, a leading provider of data on PIPE transactions. *PrivateRaise* began collecting data in 2001,

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[7] See Kaplan and Stromberg (2003) for a detailed description of the provisions in contracts between venture capitalists and their portfolio firms.

so our sample covers the period 2001 to 2015. We exclude 1,403 Rule 144A issuances and 637 confidentially marketed public offerings (CMPOs), which are included in the *PrivateRaise* database but are not truly PIPE transactions. Most of the Rule 144A offerings in the *PrivateRaise* database are convertible bonds issued by large firms (e.g. Verizon Communications) to hedge funds. A CMPO is a hybrid between a PIPE and an SEO, in which registered stock is first marketed to institutional investors, then a prospectus is filed and the offering is opened to the public.[8] We are interested in measuring the performance of PIPE investments by hedge funds and private equity funds, so we exclude 11,022 transactions in which neither hedge funds nor private equity funds are among the reported investors.

PIPE transactions involve a variety of security types, many of which are difficult to value. To ease the calculation of returns, we restrict our focus to common equity investments without price reset features, including PIPEs with attached warrants as long as there is only one warrant with a fixed strike price. These restrictions exclude 5,018 investments for which the primary security is not common stock, 81 transactions with contingent adjustments to the purchase price, 260 transactions with multiple warrants, and 96 transactions for which the attached warrant did not have a fixed strike price. Finally, we exclude eight large transactions that are not PIPE investments by hedge funds or private equity funds, but rather are strategic partnerships, asset purchases with stock as currency, or transactions contingent on the completion of an IPO or a merger. After applying these exclusion criteria, the sample includes 4,203 PIPE transactions.

PrivateRaise provides limited information on the subsequent performance of PIPE issuers, so we merge the *PrivateRaise* sample with stock price data from *CRSP*. Doing so restricts our sample additionally to firms on NYSE or NASDAQ for analyses that use stock return data.[9] We hand-match issuer names in

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[8] Specifically, a typical CMPO involves an underwriter confidentially marketing a takedown of an effective S-3 shelf registration statement to a small number of investors. Before the underwriter discloses the name of the issuer, the investor must indicate interest in receiving confidential information and agree not to trade the issuer's stock until the offer is either completed or canceled. After the investors confirm interest, the issuer, underwriter, and investors negotiate terms including the offering amount, discount, and warrant coverage. Then the offering is made public and a prospectus is filed with the SEC, allowing outside investors to participate in the transaction. Typically, these documents are filed after the market close and the offering closes before the subsequent market open.

[9] We focus on single warrant transactions for simplicity. In future versions of this paper, we will include multiple warrant deals. We also plan to expand our sample to include OTC firms using stock price data from *Bloomberg* and to include PIPE investments by investor types other than hedge funds and private equity funds. The hand-matching between PrivateRaise and CRSP is labor intensive, so we focus on this sample to start out.

PrivateRaise with CUSIP identifiers from *CRSP* for 2,179 transactions. To ensure quality of the stock return data, we exclude transactions for which the pre-closing price in *CRSP* is different than the pre-closing price in *PrivateRaise*, reducing our sample to 2,058 observations. Finally, we merge the data on PIPE terms and stock returns with accounting data from *Compustat* in the year prior to the closing date of each PIPE.

3.2. Sample Description

There are two types of transactions in our sample, Unregistered PIPEs and Registered Direct Offerings (RDOs). These two transaction types are alike in that they are privately negotiated with a small set of accredited investors, but they differ in the ability of investors to sell their shares in a timely manner.

Unregistered PIPEs involve the issuance of unregistered shares under Regulation D of the Securities Act of 1933. In these transactions, the firm promises to file a registration statement with the SEC in a contractually specified timeframe (30 days for the median deal). Investors in unregistered PIPEs can sell their shares after the registration becomes effective, but they cannot trade their shares before that time.

RDOs involve the issuance of shares previously registered under a shelf registration statement, so investors can sell the shares immediately after purchasing them in the offering, if they wish. The warrants attached to RDOs are sometimes unregistered, with terms of registration specified as in an unregistered PIPE. Table 4 (below) shows that the proportion of registered PIPEs in our sample jumped up from 16% from 2001 to 2007 to 32% from 2008 to 2015. This change in the composition of PIPE offerings followed an SEC amendment to Form S-3, referred to by practitioners as the "baby shelf" rule, which allowed listed companies below $75 million in public float to file shelf registration statements.

Table 3 provides statistics on the sample of issuing firms and the PIPE transactions.[10] Statistics for firms issuing unregistered PIPEs are presented separately from registered PIPEs. Most PIPEs are

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[10] Note that these statistics are for the issuing firms who have data available on *Compustat* and are thus traded on NYSE and NASDAQ. The firms whose stock trades over-the-counter are likely even smaller and less leveraged than the ones described in Table 3.

unregistered, with 1,607 unregistered PIPEs and 456 registered direct offerings meeting the selection criteria, although the sample size declines for *Compustat* data items since some variables are missing.

These firms are much smaller than the typical *Compustat* firm, with median book assets of about $40 million and market capitalization around $100 million. Firms issuing unregistered and registered PIPEs are similar sized, with firms issuing unregistered PIPEs being slightly younger (median of 6.2 years since IPO compared to 8.3 years for firms issuing registered shares). At the time of the PIPE, the firms are not performing well, with the median unregistered PIPE issuer having a negative ratio of EBITDA to Assets of -19% and the median registered PIPE issuer having an even lower ratio of -46%. Consequently, it seems unlikely that most of our sample firms could access the public debt market, or even borrow much from banks. The firms in our sample are not highly leveraged, with the median firm having a market leverage ratio around 5%. It appears that the typical PIPE firm is performing poorly and has limited access to debt markets, which suggests that PIPE issuers are unlikely to have low cost alternative sources of external financing.

The PIPE offerings have a mean size of about $28 million and a median size of about $12 million. The most prominent difference between unregistered and registered PIPEs is the liquidity of the issuing firms. The shares issued in the average unregistered PIPE equal 83 times the average daily volume for the issuer's stock over the three months prior to issuance, whereas the typical registered PIPE issues shares equivalent to 26 days of average volume. The contractually specified time for the issuer to file a registration statement is 30 days for the median transaction. For the offerings for which we can find registration data, the mean (median) time to filing was 50 (29) days, while the time until the registration became effective was 86 (59) days. Finally, about half of the PIPEs of each type have attached warrants, which have a typical maturity of 5 years.

4. PIPE Discounts and Announcement Returns

As illustrated by the example of United American Health Corporation, PIPEs are generally sold at a price that differs from the current market price. In this section, we describe how we value the package of

securities offered in a PIPE transaction and summarize the discounts and announcement returns for our sample of PIPEs.

4.1. Measuring PIPE Discounts

Conceptually, the discount on a PIPE investment equals the price paid relative to the true value of the package of securities the investor receives. Since nearly half (47%) of the PIPEs in our sample have attached warrants, it is important to include the value of the warrants in the calculation of PIPE discounts. For this reason, we add the value of any warrants associated with a PIPE to the market price of the equity when estimating the value of the securities the investor receives. We value each warrant using the Black-Scholes warrant pricing formula that adjusts for the dilution that occurs when the firm issues new shares upon exercise of the warrants:

$$\frac{N}{N+M} C(S_t, K, T, \sigma_t, r_t)$$

where N is the number of shares outstanding, M is the number of warrants outstanding, the function C is the Black-Scholes call option pricing model, S_t is the stock price, K is the strike price, T is the time to expiration, σ_t is the stock volatility, and r_t is the risk-free rate for maturity T. We estimate the conditional volatility σ_t using the annualized standard deviation daily returns for the three months prior to the valuation date. The risk-free rate r_t is measured with the interpolated maturity-matched swap rate.

Since many PIPE issuers are infrequently traded, bid-ask bounce could potentially cause the estimate of realized volatility to overstate the market's expectation of volatility, which would lead us to overstate the valuation of the warrants and the calculation of the discounts. For this reason, we set a ceiling of 50% for the volatility input, which reduces the estimated value of the warrants and the PIPE discounts.

4.2. Estimates of PIPE Discounts

Table 4 summarizes the estimated discounts for the PIPEs in our sample. We estimate the discount as one minus the price paid per share, divided by the sum of the market price of the stock and the estimated

value of any attached warrants. Table 4 presents means and median discounts for our sample of PIPEs, with the sample broken down in a number of ways. We present the discounts by year of issuance, as well as for all years pooled.

The mean discount for all PIPEs is 14.5%, which is close to the median of 13.4%. The discount is much higher for PIPEs with warrants than without, with an average 20.4% discount for PIPEs with warrants and 9.4% for PIPEs without warrants. Recall that the warrant valuation sets a conservative ceiling on volatility at 50%, otherwise the discounts for PIPEs with warrants would be even larger. Similar to the prior literature, we find that discounts are higher for unregistered PIPEs than for registered ones, with an average discount of 15.7% for unregistered PIPEs and 10.3% for registered direct offerings. The average discount on PIPEs declines from 15.7% from 2001 to 2008 to 11.9% from 2009 to 2015, primarily because the proportion of registered direct offerings doubles from 16% to 32% and the proportion of transactions with warrants declines slightly from 48% to 44%.

Panel B of Table 4 examines the extent to which discounts vary across PIPEs split by firm and transaction characteristics. The second panel suggests that percentage discounts are larger for PIPE offerings by smaller firms. The average discount is 18.6% for investments of under $5 million and 9.5% for investments over $50 million. Discounts also decline with issuer size. The average PIPE issued by a firm with market capitalization under $50 million has a discount of 17.9%, while the average PIPE issued by a firm with market capitalization over $500 million has a discount of 10.9%. These patterns are consistent with the view that the discounts represent compensation for information gathering costs, some of which are fixed. Smaller investments have a higher per share fixed cost of information gathering and hence a larger discount.

Discounts are positively related to the issuer's recent stock performance. Firms that have performed poorly have slightly smaller discounts than the average firm. PIPEs by firms whose equity returned less than -50% in the prior year have an average discount of 13.5%. In contrast, firms that have performed very well have relatively large discounts. PIPEs by firms whose equity returned more than 100% in the prior year offer an average discount of 17.9%. This pattern potentially comes from the timing of the discounts.

Usually the price is set at the time the investors and the firm reach an agreement, but the discount is measured at the time the transaction closes. If the price has gone up during this period, the discount increases, and if it has gone down, the discount decreases.

Finally, the discount on PIPEs is unrelated to the liquidity of the issued shares, measured by the ratio of issued shares to average daily volume over the quarter prior to the offering. The discount across four buckets sorted by liquidity is about 15% for unregistered PIPEs and 10% for registered PIPEs. Thus, the immediate ability to trade the shares appears to matter more for the up-front cost of the investment than the underlying liquidity of the stock, conditional on the ability to trade.

Not all PIPEs are sold at a discount. In 10.5% of the transactions in the sample, shares are sold at a premium to the prevailing market price. Investors could in principle be willing pay a premium to be able to gather a large stake in a company they expect to do well over time. One example of such an investment occurred when a group of investors led by Apollo and Blackstone made an equity investment in Sirius XM. When these parties reached an agreement on October 17, 2002, the investors agreed to pay a 23% premium to the market price. By the time the deal closed on March 7, 2003, Sirius XM's stock price had declined sufficiently that the premium had increased to 112%. However, Apollo and Blackstone were rewarded for their investment; over the subsequent two years, Sirius' stock price went up by more than a factor of 10, providing Apollo and Blackstone with a sizable profit despite the premium they paid for the PIPE investment.

4.3. Announcement Returns to Shareholders

Much of the literature on private placements has focused on the initial stock price reactions to their announcement. The consensus finding is that the market reaction is positive. Potential explanations for this finding are that uncertainty about the firm's ability to obtain financing is resolved, that investors provide certification of the firm's quality (Hertzel and Smith (1993); Krishnamurthy et al. (2005)), and that the subsequent increase in ownership concentration potentially leads to improved monitoring (Wruck (1989)).

Table 5 summarizes the abnormal returns from four trading days before to five trading days after the announcement date of the PIPEs in our sample.[11] Similar to other studies, we find a positive and statistically significant average abnormal return of 2.3% ($t = 4.2$). However, the median announcement return is -0.7%, indicating that the positive mean return is driven by some observations for which returns are particularly high.

Strikingly, there is a substantial difference in the abnormal announcement returns between registered and unregistered PIPEs. The abnormal announcement return for unregistered PIPEs is 3.5% ($t = 6.0$), whereas the abnormal announcement return for registered direct offerings is -1.9% ($t = -1.6$). This difference suggests that the announcement return for a PIPE transaction can reflect multiple effects. First, there is likely to be resolution of uncertainty about the firms' capital raising and investment decisions. Since issuing firms are generally small and poorly performing, there is probably uncertainty as to whether they can raise capital and continue their investment policies. The announcement of a PIPE would provide positive news that the firm was able to raise capital and the investment indicates confidence in the firm from an informed investor who is leading the PIPE syndicate. Second, there is a dilution effect because shares are issued at a discount to the market price. In addition, PIPE investors selling their shares could exert downward pressure on the issuer's stock price.

An unregistered PIPE has only the first (positive) effect, since the issued shares cannot be sold immediately, which is reflected in the positive announcement return. However, shares offered in a registered PIPE can be sold immediately, so the announcement return reflects both effects, with the second effect appearing to dominate in this sample. The negative announcement effect for registered PIPEs is similar to that for seasoned equity offerings, for which many studies have documented negative announcement day returns (e.g. Asquith and Mullins (1986)).

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[11] Some of the PIPEs have missing data on the announcement date, in which case we use the closing date. The median difference between announcement and closing is two days, so stock price changes around closing dates are likely to capture the announcement day stock price reaction.

Table 5 reports other divisions of the sample that shed additional light on the economics underlying the announcement returns. For both unregistered and registered PIPEs, the announcement returns to transactions with attached warrants are significantly lower than the announcement returns to transactions without warrants. This likely results from the larger effective discount that comes with attaching warrants, or possibly the expectation that exercise will dilute existing shareholder' stakes if the firm performs well subsequent to the offering. Consistent with the results in Wruck (1989), announcement returns are significantly positive for offerings of small ($< 5\%$) or large ($> 15\%$) numbers of shares relative to the firm's current number of outstanding shares, but insignificant for intermediate sized offerings.

Finally, announcement returns are associated with the liquidity of the offering, measured by the ratio of issued shares to average daily volume over the quarter prior to the offering. For unregistered PIPEs, the abnormal announcement return is 3.8% ($t = 2.6$) if the firm issues shares equivalent to less than 10 days of volume, while the abnormal announcement return is 6.2% ($t = 5.2$) if the firm issues more than 80 trading days' worth of shares. The association has the opposite direction for registered PIPEs, as the abnormal announcement return is -1.0% ($t = -0.5$) if the firm issues less than 10 days of volume and -5.6% ($t = -2.2$) if the firm issues shares equivalent to more than 80 days of average volume. These different patterns may result from differences in the investment strategies underlying each type of offering. Investors may rush to sell the shares they purchased in a registered direct offering, which places more downward pressure on a less liquid stock. In contrast, unregistered PIPEs require the investor to hold the stock until it is registered, so any downward pressure from selling is not realized until the firm registers the shares.

5. Registration and the Holding Periods of PIPE Investors

One potential reason for the difference in the announcement day abnormal returns between registered and unregistered PIPEs is that the purchasers of registered PIPEs can sell their stocks immediately, while purchasers of unregistered PIPEs must wait until the shares are registered before they can sell them to the public. The extent to which selling depresses prices at the time of registration depends on the intended holding periods of the investors. If they hold the stocks for a long period of time, then there

will not be any price pressure at the time of registration, but if investors sell immediately, then price pressure could be substantial. In addition, the holding periods of the investors provide insights as to the motivations for the PIPE investors. Much of the prior literature on private placements presumes that one benefit of private placements is to improve managerial incentives by increasing monitoring by an outside shareholder (e.g. Wruck (1989)). To accomplish this goal, an investor must not only acquire a substantial stake in the issuing firm, but must hold onto this stake for a meaningful period of time.

There are reasons to suspect that the PIPE investors in our sample, who are hedge funds and private equity funds, are likely to have shorter horizons for their investments than when management or another type of outside investor purchases a stake. First, hedge funds and private equity funds have substantial pecuniary incentives to increase returns, and also to return capital to their investors relatively quickly. Higher returns affect their compensation directly through profit sharing plans and indirectly through its effect on their ability to raise future capital. Second, the investors in our sample generally do *not* negotiate control rights in the issuing firms. Presumably, if their interest was in influencing the firms' operations, they would have done so by negotiating these rights in the manner common by to venture capital investors. Finally, the investments in our sample are usually syndicated, which serves to dilute the incentives of any one investor to make changes in the issuing firm as well as his ability of him to consume private benefits. For example, in the UAHC case, while the overall PIPE investment of $6.5 million represents 10% of the firm's post-investment equity, the largest investor in the syndicate, Heights Capital Management, has only 20% of these shares, leaving their stake at 2% of UAHC's equity. In this case, the increase in volume and decline in UAHC's share price immediately following the PIPE's registration suggests that the investors in UAHC's PIPE began selling immediately following the registration of their shares.

We evaluate the extent to which the phenomenon of selling as soon as possible is a general pattern in our sample of PIPE investments. To do so, we measure abnormal volume and price movements in issuing firms' stocks immediately following the first date that investors can sell their shares. For the registered PIPEs, this date is the transaction's closing date, and for the unregistered PIPEs, it is the day that the

registration statement becomes effective. In our sample, the registration statement for the average unregistered PIPE becomes effective 86 days after the closing date (see Table 3).

Table 6 summarizes the trading volume around the first date PIPE investors can sell their shares. Both unregistered and registered PIPEs average substantially higher trading volume around this date. Relative to the quarter prior to the registration date, the equities of firms issuing unregistered PIPEs have an average daily trading volume that is 27% higher ($t = 5.4$) in the week following registration, 28% ($t = 6.3$) in the two weeks following registration and 35% ($t = 6.4$) higher in the month following registration. The daily trading volume of firms issuing registered PIPEs increases even more, by 71% ($t = 6.9$) in the week following the closing date, 60% ($t = 6.7$) in the two weeks after closing, and 56% ($t = 5.7$) in the month after closing. However, these large average jumps in trading volume appear to be driven by very large increases for a minority of firms, as the median firm with an unregistered PIPE actually experiences a decline in volume around registration and the median registered PIPE issuer sees only a small increase in volume in the period after the offering.

It is impossible to know with publicly available information what fraction of the abnormal volume following PIPE offerings represents selling by PIPE investors or how long these investors actually hold the shares they acquire. However, we can observe changes in stock prices around the time of registration. The abnormal return to unregistered PIPEs around the effective registration date is -3.3% ($t = -7.5$) and the abnormal return to registered PIPEs around the transaction's closing date is -3.1% ($t = -2.5$). The most plausible reason for these negative returns is the selling of PIPE investors. Interestingly, the negative abnormal return around registration almost mirrors the positive abnormal return (3.5%, $t = 6.0$) around the announcement date of unregistered PIPEs, implying that the gains to PIPE issuers last no longer than the time to register the shares, typically three months.

Consequently, it appears that some PIPE investors sell their shares as soon as they can. However, we cannot tell how long it takes them to exit their positions completely. Investors clearly have incentives to exit their equity positions fairly quickly, since they benefit from the discount regardless of how long they hold the shares, and historical long-run performance of PIPE issuers has been poor (Hertzel et al. (2002)).

In addition, even if investors sell their shares, they can keep the attached warrants until expiration, without any downside exposure. Indeed, conversations with practitioners indicate that PIPE investors sometimes follow the strategy of exiting their equity positions immediately as a way of locking in the discount while keeping some upside by retaining the warrants, which are difficult to sell without offering a substantial discount to the Black-Scholes value.

An important issue facing PIPE investors is that the stocks they purchase, are relatively illiquid, since they were issued by small companies with poor operating performance. Table 6 presents an illustrative calculation of how actively PIPE investors would need to trade to exit their positions. For unregistered PIPEs, there are on average 3.74 times as many shares issued in the PIPE as transact in the first month following registration. The median ratio is lower, with 1.33 times as many shares issued in the PIPE as transact in the first month. Nonetheless, it is impossible for PIPE investors to have sold all of their shares during the first month following registration in the majority of deals in our sample.

Panels B and C of Table 6 provide average estimates of this ratio by deciles to offer more detail on the illiquidity of PIPE investments, because the investor's holding period is an important consideration in computing the returns to PIPE investing. If the PIPE investors account for 20% of post-registration trading volume, then it is possible to exit less than 20% of unregistered PIPEs in one month, less than 30% in two months, less than 40% in three months, less than 60% in six months, less than 80% in 12 months, and over 90% in 24 months. Investors in registered direct offerings are able to exit more quickly. If these investors accounted for 20% of post-closing volume, they would be able to sell all of their shares in less than 30% of offerings in one month, in less than 50% of offerings in two months, in less than 60% of offerings in three months, in less than 80% of offerings in six months, in over 90% of offerings in 12 months, and in nearly 100% of offerings in 24 months. In the next section, we evaluate the importance of

investors' holding periods by calculating buy-and-hold returns and value-weighted portfolio returns for

holding periods of three, six, 12, and 24 months.[12]

6. Returns on PIPE Investments

The return a PIPE investor receives over a particular holding period is equal to the change in the

values of both the equity investment and the attached warrants over that period. The equity portion of this

investment is affected by the discount negotiated by the investor and the return on the stock over the holding

period. If the PIPE contains warrants, the change in warrant valuation will be affected by the change in the

stock price and underlying parameters of the Black-Scholes valuation, including the strike price, time to

expiration, and the stock volatility. In this section, we compute buy-and-hold abnormal returns to PIPE

investors over various horizons, then we calculate the returns on a value-weighted portfolio that invests in

every dollar of PIPE issuance in our sample period and holds the investment for a fixed horizon.

6.1. Average Returns to Ordinary Investors and PIPE Investors

We summarize the buy-and-hold returns to PIPE investors in Table 7. Panel A contains the returns

for unregistered PIPEs and Panel B contains the returns for registered PIPEs. Abnormal returns are

calculated relative to a matched firm, which is obtained by considering all firms in the same 2-digit SIC

industry, then selecting the firm with the minimum sum of the absolute differences between the

standardized equity book-to-market ratio and the standardized log market capitalization. Statistical

inference is based on the bootstrapped skewness-adjusted *t*-statistic, following Lyon, Barber, and Tsai

(1999).

In each panel, we first present the market returns, which are the returns to an ordinary investor

who buys shares at the market price on the PIPE closing date and holds them for a fixed horizon. These

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[12] In future work, we plan to incorporate heterogeneous holding periods into the return calculations. Given the
substantial heterogeneity in the ability of investors to exit their positions, it is important to understand how the returns
to PIPE investors, and therefore the issuer's cost of capital, differ by the effective holding period.

returns are somewhat low relative to that of the matched firms. For unregistered PIPEs, the average return for the PIPE issuer minus the matched firm over the three months after closing is -1.7%, for six months is -2.9%, and for one year is -3.1%. For registered PIPEs the average abnormal return is -1.1% for three months, -4.4% for six months, and -4.9% for one year following the PIPE's closing. These average returns are buoyed by some very high returns, as the median abnormal return over the year after issuance is -25.3% for unregistered PIPE issuers and -26.6% for registered PIPE issuers.

The shares of firms that obtain PIPE investments from hedge funds and private equity funds tend to underperform (albeit not statistically significantly) following the offering.[13] This pattern suggests that the Sirius XM example discussed above is unusual and that most firms issuing PIPEs tend to perform poorly afterwards. If the issuing firms in our sample did not offer discounts and warrants, they would likely have trouble finding investors willing to hold long positions in a large quantity of newly issued equity. Relatedly, conversations with practitioners indicate that because PIPE issuers tend to be small and not actively traded, it is very difficult to short sell their shares to hedge the discount and the warrants. Thus, we consider only the returns to a long position in the PIPE investment or the underlying stock, rather than a hedged trade.

The effect of the discounts and warrants on the return to PIPE investors is illustrated in the middle portion of each panel, in which we report the PIPE investor's return (relative to that of a matched firm's equity). In contrast to ordinary investors holding long positions, PIPE investors earn abnormally high returns. Investors in unregistered PIPEs receive an average abnormal return of 21.2% ($t = 9.9$) over the three months following the PIPE's closing, 19.3% ($t = 7.0$) over six months, and 18.9% ($t = 4.1$) over the first year. Investors in registered PIPEs receive a statistically significant 10.4% ($t = 3.8$) abnormal return for the first three months, but the abnormal return is an insignificant 6.8% ($t = 0.8$) over six months and 6.2% ($t = 0.9$) over one year after closing. If we only consider the equity portion of the PIPE (setting the

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[13] Our results contrast with prior literature that finds significantly negative abnormal returns following private placements. Hertzel et al. (2002) find average abnormal returns of -30% over the three years after private placements in a sample covering 1980 to 1996. Brophy et al. (2009) find average abnormal returns of -11% in the year after traditional PIPE offerings to hedge fund investors in a sample covering 1995 to 2002. It is possible that underperformance by PIPE firms is no longer pervasive in our sample, which covers 2001 to 2015. However, median returns in our sample are in line with the estimates in these earlier papers.

value of warrants to zero), the average abnormal return for unregistered PIPEs becomes 12.5% ($t = 7.5$) over three months, 9.8% ($t = 4.0$) over six months and 9.5% ($t = 2.3$) over one year. For registered PIPEs, the abnormal returns are statistically insignificant, equal to 2.8% ($t = 1.2$) for three months, -0.2% ($t = -0.1$) for six months and -1.1% ($t = -0.2$) for one year. This provides additional confirmation of the intuition that the investment strategy in registered direct offerings is to sell the shares immediately and hold onto the warrants to enjoy the upside for the subset of successful issuers.

6.2. Warrants and Skewness in the Return Distribution

An important characteristic of the returns is their skewness, since mean returns are always substantially higher than median returns. This pattern occurs due to the skewness of the underlying stock returns and is amplified by the warrants. When the issuer performs poorly, the warrants have little value and expire worthless. However, when the issuer performs well, the firm's stock price will exceed the exercise price, so warrants become valuable. The increase in warrant valuation when the underlying stock price increases magnifies the returns PIPE investors receive when equity values increase.

This effect is illustrated in Figure 3, which reports kernel density estimates of the one year buy-and-hold returns to market investors (blue dotted line), PIPE investors setting warrant value to zero (red dashed line), and PIPE investors with the Black-Scholes value of warrants (solid green line). The peak of the density is far into negative territory for all three distributions of returns, consistent with the negative median returns for both market and PIPE investors in Table 7. However, as returns become positive, the density of the PIPE returns rises above the density of the market returns, reflecting the additional returns offered by the discount and warrants. In particular, the gap between the PIPE investor return and the PIPE investor return excluding warrants that begins to appear around the 80% return on the horizontal axis reflects the amplification of positive returns by the warrants.

This skewness of returns suggests that investing in PIPEs is much like venture capital investing. Positive average returns are driven by a small number of "home runs" in the portfolio, but median returns are significantly negative. Despite the poor returns for the median investment, investing in PIPEs can be

profitable because shares are purchased at a discount and the attached warrants magnify the returns of good investments. As a result, winning investments become sufficiently profitable to drive average abnormal returns to a high level of 18.9% for a one year holding period in our sample of unregistered PIPEs.

6.3. Do PIPE Investors Earn Abnormal Returns?

The returns to PIPE investors, especially for unregistered PIPEs, appear to be high relative to non-PIPE firms with similar characteristics. However, it is possible that even though we matched on industry, size, and book-to-market, that the risks our sample firms face are different from those of the matching firms. Moreover, Fama (1998) and Mitchell and Stafford (2000) highlight statistical problems with the buy-and-hold abnormal return approach of testing for outperformance. For this reason, we construct a value-weighted portfolio of PIPE investments and examine whether the returns of this portfolio are abnormally high relative to the benchmark of the Fama and French (1993) three factor model. This portfolio approach simulates the performance of an investor who purchased every dollar of PIPE issuance in our sample covering 2001 to 2015 and holding each investment for a fixed period.

Table 8 presents regression estimates based on these portfolio returns. These estimates indicate the abnormal returns to ordinary investors who buy the shares of PIPE issuers on the transaction closing date are mostly indistinguishable from zero. However, the performance of the portfolio of unregistered PIPE issuers worsens as the investment horizon extends to two years. The monthly abnormal return of -0.59% corresponds to annual underperformance of 7% relative to the three factor benchmark. As in our buy-and-hold return analysis, we find weaker evidence of long-run underperformance than the prior literature (e.g. Hertzel et al. (2002); Brophy, Ouimet, and Sialm (2009)).

Consistent with the results in Table 7, we find that PIPE investors earn statistically significant abnormal returns at short investment horizons that attenuate as the holding period becomes longer. This pattern is particularly pronounced for unregistered PIPEs, which offer monthly abnormal returns of 5.85% ($t = 6.9$) over a three month holding period, 2.30% ($t = 4.0$) over six months, and 0.98% ($t = 2.4$) over one year. The abnormal return to unregistered PIPE investing becomes statistically insignificant when the

holding period is extended to two years. Similarly, the portfolio of registered PIPEs earns monthly abnormal returns of 2.79% ($t = 2.9$) with a three month holding period and 1.59% ($t = 2.8$) over six months, but the abnormal returns are marginally significant over one year and two year holding periods.

The attenuation in abnormal returns occurs because the source of abnormal returns is the discount and warrants investors receive in the PIPE transaction. The discount accrues to the investor immediately, so the shorter the holding period, the higher the abnormal return. In addition to the incentive to lock in the discount, the weak long-run performance of PIPE issuers shown the results in Panel A of Table 8 and in the prior literature (e.g. Hertzel et al. (2002); Brophy, Ouimet, and Sialm (2009)) provides an additional impetus for PIPE investors to exit their stock positions as soon as practicable to mitigate downside risk.

What is the appropriate holding period for measuring the returns to PIPE investors? This is impossible to know with certainty without observing the trading activity of PIPE investors, but the information on the time to registration for unregistered PIPEs in Table 3 and the information on post-registration trading activity in Table 6 provide some guidance. Shares sold in registered direct offerings can be sold immediately, so the registration period is not a consideration for those transactions. The mean and median times to the effective registration date for unregistered PIPEs are 86 and 59 days, respectively, which means a three month holding period is out of the question for unregistered PIPEs.

The mean PIPE transaction results in a 20% increase in the issuer's shares outstanding. If we assume that PIPE investors account for a proportional amount of volume after registration, then we can use Panels B and C of Table 6 to home in on the appropriate holding period for unregistered and registered PIPEs. For unregistered PIPEs, about 80% of PIPE investments could be exited by selling 20% of the post-registration volume over one year after registration (or about 15 months after closing). However, PIPE investors would need to sell more than 50% of the post-registration volume to exit 80% of the investments in six months, which suggests that six months is an unrealisticly short holding period. For registered PIPEs, about 80% of positions could be exited in six months and over 90% of positions could be exited in one year by selling 20% of the post-closing volume. Thus, it seems that holding periods between one year and two

years, at a minimum, are appropriate for unregistered PIPEs, while holding periods between six months and one year are appropriate for registered PIPEs.

One other consideration in the return calculation is the valuation of warrants. We place a conservative 50% ceiling on annualized volatility when estimating the mark-to-market value of warrants in the PIPE portfolios, but this value could potentially still overstate the market value of these securities. Unlike exchange traded option contracts, the warrants attached to PIPE transactions are highly illiquid and it is unlikely investors would receive anything close to the Black-Scholes value if they attempted to sell them. In Panel C of Table 8 we place a lower bound on the returns to PIPE investors by setting the value of warrants to zero and calculating the returns to only the equity component of the PIPE. The same patterns hold as in Panel B, but the abnormal returns are lower. Unregistered PIPE investors earn monthly abnormal returns of 1.80% ($t = 3.4$) with a six month holding period, but the abnormal returns become marginally significant at 0.69% ($t = 1.8$) over one year and statistically insignificant at a two year holding period. Similarly, registered PIPE investors earn monthly abnormal returns of 1.10% ($t = 2.0$) over six months but insignificant abnormal returns at longer horizons.

The true returns to PIPE investors for each assumed holding period likely lie between the estimates in Panels B and C of Table 8. These estimates indicate that PIPE investors likely earn abnormal returns relative to the three factor benchmark, but that the returns are not as large as one might expect, given the discount and warrants offered in the transaction. Their returns are attenuated by the weak performance of the issuer's stock over a long horizon and the inability to immediately capture the discount and sell the warrants for fair value because of registration terms and illiquidity. One consequence of these findings is that the cost of a PIPE transaction to the issuer could not be as high as the offering terms would indicate, since the returns on the securities offered to investors can be interpreted as the issuer's cost of capital.

6.4. Cross-Sectional Differences in Returns

In this section, we examine the way in which the returns to PIPE investors differ across investments. Table 9 reports one-year buy-and-hold abnormal return for various subsets of the sample to illustrate how returns vary in the cross-section.

The first panel illustrates that the abnormal return earned by ordinary investors over the year following the PIPE is somewhat weaker for larger firms, but the returns are indistinguishable from zero in all of the size subsamples. In contrast, the second panel shows that the performance of PIPE investors depends on the size of the issuing firm. One-year abnormal returns are 31.3% ($t = 3.7$) for investments in firms under $50 million in market capitalization and 21.2% ($t = 2.7$) for investments in firms between $50 million and $100 million capitalization, whereas abnormal returns are an insignificant 0.6% for firms over $500 million. These higher returns for investments in relatively small firms potentially reflect the fact that these investments tend to occur at larger discounts than investments in larger firms (Table 4), although this variation in discounts does not appear sufficient to explain all of the variation in realized returns.

The next two panels of Table 9 present abnormal returns sorted by the discount on the PIPE. For negative discounts (premiums) and small discounts (under 10%), ordinary investors' returns are insignificantly positive for the year following the PIPE. This pattern could reflect the fact that some deals (e.g. Sirius XM) are offered at a premium because the investors perceive there to be a large upside to the investment, possibly because of the transmission of inside information on upcoming good news. In contrast, one-year returns are significantly negative when discounts are large, with ordinary investors earning abnormal returns of -13.2% ($t = -2.2$) when the discount is between 20% and 40% and -31.2% ($t = -1.7$) when the discount exceeds 40%. When the company provides a large discount to induce investors to provide capital, it likely reflects negative information about its future prospects, which leads to poor stock performance.

The returns to PIPE investors follow the opposite pattern, due to the mechanical effect of discounts on returns. When investors pay a premium, they do not perform well, earning an insignificant 4.7% abnormal return and losing money on the median deal. However, PIPE investors earn significant abnormal returns when they receive a discount on the issuer's shares, and when discounts are large, the returns can

be substantial. When discounts are larger than 40%, the average one-year abnormal return to PIPE investors is 48.6% ($t = 1.8$). Even if the underlying stock return is low, the high discount investors receive when they purchase the equity assures them of a large return.

The next panel explores whether the returns to PIPE investors, and therefore the PIPE issuer's cost of capital, depend on the financial health of the issuer. We sort issuers by the ratio of EBITDA to Assets over the quarter prior to issuance to proxy for the issuer's health and its negotiating power in the transaction. Many PIPE issuers have operating losses so severe that they may not be able to operate for much longer without an infusion of capital, while other PIPE issuers have reasonable operating performance but may be constrained in other ways. The results are consistent with the notion that PIPE returns reflect issuers' costs of capital, since when the issuer's EBITDA/Assets is less than -25% over the quarter prior to the offering, suggesting that they are in dire straits, the abnormal return to PIPE investors is 42.6% ($t = 4.2$). PIPE investors also earn abnormal returns when the issuer is performing better, but the returns are larger when the issuer is in worse shape.[14]

Finally, the bottom panels of Table 9 show that there is no statistically significant relation between the liquidity of the PIPE offering, as measured by the ratio of issued shares to pre-offering average daily volume, and the one-year abnormal returns to ordinary investors and PIPE investors. While the holding period is a consideration for PIPE investors interested in locking in the discount and exiting an underperforming issuer, the returns conditional on the investment horizon do not depend on the expected holding period.

7. Conclusion

Private investments in public equities (PIPEs) are common investments by hedge funds and private equity funds and are an important source of capital for small public firms. This paper sheds light on the economics of these investments, in terms of the returns they generate for hedge funds and private equity

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[14] Unreported regression analysis, controlling for month fixed effects, confirms that the returns to PIPE investors are significantly higher ($t = 2.2$) when EBITDA/Assets is less than -25% than when EBITDA/Assets is above -25%.

funds, the cost of capital for the issuer, and the nature of the relationship between the investors and the issuer.

Most of the PIPE investments go to relatively small public companies that have been performing poorly. In our sample of exchange listed PIPE offerings, 96% of the issuers have market capitalization under $1 billion and the median firm has book assets of $40 million. In addition to the firms in the current sample, an approximately equal number of PIPEs go to firms that are traded over-the-counter (OTC) and are even smaller. PIPE issuers typically have poor operating performance, which prevents them from raising capital from alternative sources like seasoned equity offerings or the public debt markets. Moreover, the post-issuance stock price performance of these firms is poor, as shown by Hertzel et al. (2002).

To attract PIPE investors, issuers offer a package of securities at an attractive price, which leads to abnormal short-term returns. First, in 90% of PIPE transactions, investors receive a discount on the equity relative to the market price. Second, in 47% of investments, investors receive warrants in addition to the equity. Third, investors receive additional rights such as the right to invest in future financings and anti-dilution protections for their warrants other investors do not receive. Adjusting for the discount on the equity and the value of the warrant (but not the additional rights), investors in PIPEs receive a 14.5% average discount relative to the value of the securities they receive.

Because of the discounts and warrants, investors in PIPEs receive a return averaging 22.6% in the year following the PIPE. They receive these returns despite the fact that the market return on issuing firms equity averages only 0.6% over the same period. Warrants are particularly important in driving these returns. The underlying distribution of returns to PIPE issuers is highly skewed and the warrants magnify the returns on successful investments, while having no impact when returns are negative. Even though the average PIPE investor receives a significant abnormal return in the year following the investment, the median investment has a -6.6% return over the same period. PIPEs appear to be like venture capital investments, in which the success of the portfolio is dependent on "home run" investments to offset the losing bets that comprise the majority of the portfolio.

There is much more to be learned about PIPEs. We make progress towards determining the cost of capital for PIPE issuers, but more work is necessary to pin down a precise estimate, due to the strong dependence of returns on the holding period of investors. Additional questions on the economics of PIPEs remain. Do more constrained firms offer higher discounts and more warrants? How do the returns to investments in OTC firms compare with investments in more established NYSE/NASDAQ firms? Do hedge funds and private equity funds earn higher returns on PIPE investments than other types of investors? In future versions of this paper, our intention is to provide answers to these and other related questions.

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Table 1

Time Series of PIPE Investments Involving Hedge Funds or Private Equity Funds

This table reports time series statistics on the number and dollar volume of PIPEs split by the type of securities issued. Only offerings involving hedge fund or private equity fund investors are included. Common Stock includes issuance of registered or unregistered shares of common stock. Equity Line is a commitment by the investor to purchase equity securities from the issuer over a set timeframe. Conv. Debt or Pref. includes issuance of convertible debentures or preferred stock. Other Types include other types of convertible securities, non-convertible debt, non-convertible preferred stock, and prepaid warrants. All categories may include warrants in the package of securities.

	Common Stock		Conv. Debt or Pref.		Equity Line		Other Types	
	Obs.	$ Bil.	Obs.	$ Bil.	Obs.	$ Bil.	Obs.	$ Bil.
2001	236	3.9	167	3.9	71	1.2	22	0.6
2002	215	2.8	166	2.1	42	0.5	14	0.2
2003	366	4.5	216	2.6	42	0.6	25	0.9
2004	510	6.4	369	3.8	92	1.1	22	0.6
2005	391	6.2	413	5.8	81	1.7	31	0.9
2006	458	9.0	428	5.3	69	1.9	72	3.4
2007	553	16.3	395	9.2	45	1.1	79	5.0
2008	269	17.5	256	38.9	39	1.1	61	2.5
2009	236	5.3	146	3.8	63	1.9	40	1.7
2010	286	11.5	155	5.8	111	1.7	33	0.8
2011	246	6.5	118	2.4	97	1.3	27	1.5
2012	188	5.1	118	3.1	82	1.1	34	2.6
2013	232	5.0	144	3.7	74	0.9	28	0.4
2014	245	6.3	150	5.6	66	0.7	32	1.5
2015	217	8.2	166	7.7	68	0.8	32	0.5
Total	4,648	114.5	3,407	103.8	1,042	17.6	552	23.0

Table 2

**A Typical PIPE: The December 2006 Private Placement of
United American Healthcare Corporation**

This table reports the terms of a representative PIPE transaction from our sample. United American Healthcare Corporation is a provider of contract manufacturing services to the medical device industry. On December 13, 2006, UAHC issued $6.5 million of common stock to raise capital to pay start-up costs associated with its subsidiary in Tennessee. This private placement was completed by a syndicate of 10 investors led by Heights Capital Management. At the time of issuance, UAHC was listed on NASDAQ.

Basic Information

Announcement date	12/14/2006	Issuance amount ($MM)	6.5
Placement type	Unregistered PIPE	Security type	Common Stock
Market cap. ($MM)	61.9	Market stock price	$8.20
Number of shares	1,000,000	PIPE issuance price	$6.50

Warrant Terms

Warrant type	Fixed	Number of warrants	100,000
Maturity	5 years	Strike price	$8.50
Other covenants	i)	Anti-dilution protection (weighted-average adjustment)	
	ii)	Cashless exercise	

Investor Allocations

Investor Name	Investor Type	Investment Amount
Heights Capital Management, Inc.	Private Equity	$1,300,000
Miscellaneous Trusts & Pension Funds	Miscellaneous	$1,027,000
Iroquois Capital Management, LLC	Hedge Fund	$877,500
Braeburn Financial Group	Asset Manager	$868,850
Hudson Bay Capital Management LP	Hedge Fund	$715,000
Stafford Capital Management, LLC	Hedge Fund	$500,500
Individual Investors	Individual	$455,000
Kensington Partners LP	Private Equity	$431,145
Joslynda Capital, LLC	Hedge Fund	$162,500
Nite Capital, LP	Hedge Fund	$162,500

Rights and Restrictions

i) Mandatory registration: Issuer has to file a Registration Statement no later than the 30th day after the Closing Date. Issuer has further agreed to use its best efforts to cause such Registration Statement to be declared effective no later than the 90th day (or 120th day if the Registration Statement is subject to review by the SEC) following the Closing Date.

ii) Limitation on future issuance of securities: During the period beginning on the Purchase Agreement date and ending on the Trigger Date (normally the 60th trading day following the Registration Statement is declared effective), the issuer will not be permitted to offer, sell, grant any option to purchase or otherwise dispose of any of its or its subsidiaries' equity or equity equivalent securities;

iii) Right of participation: If, from the Trigger Date until the 1-year anniversary of the Closing Date, the issuer proposes to issue securities convertible into common stock, the issuer is required to first give the investors a chance to purchase up to 40% of such securities on the same terms.

Table 3

Summary Statistics on PIPE Issuers and Transaction Terms

This table reports summary statistics on PIPE issuers and transaction terms. Each observation represents a distinct PIPE transaction. The sample consists of transactions involving common stock (registered or unregistered at issuance), with or without fixed strike price warrants, that involved hedge fund or private equity fund investors. The sample is restricted to transactions with stock price data in *CRSP* and excludes transactions for which the pre-closing price in *CRSP* is different than the pre-closing price in *PrivateRaise*. Accounting figures from the year prior to issuance are collected from *Compustat*. Market leverage is the ratio of total debt to total debt plus market capitalization. Asset Market-to-Book is market capitalization plus total debt divided by book assets. Daily Trading Volume is the average of daily share volume times closing price over the quarter prior to the closing date of the PIPE transaction. Days to File and Effect Registration are the contract terms requiring filing and effectiveness of a registration statement for PIPEs that are unregistered at issuance. The rows labeled Ex Post report the actual time to filing and effectiveness of the registration statement. Negative values of these variables are truncated at zero, affecting 6 observations. All ratios are winsorized at the 1% level to mitigate the impact of outliers. R&D expense is assumed to be zero when it is unreported in Compustat. The difference in means *t*-statistic is from a regression of the variable on an indicator for unregistered status and month of closing fixed effects, with standard errors clustered two ways by firm and month of closing.

Variables	Unregistered			Registered			Diff Means
	Mean	p50	Obs.	Mean	p50	Obs.	*t*-stat
Issuer Characteristics							
Revenue ($MM)	174	21.8	1,308	146	8.1	373	1.4
Book Assets ($MM)	799	43.9	1,312	364	42.3	373	1.6
Market Cap. ($MM)	243	94.9	1,607	279	117	451	-0.5
Market Leverage (%)	18.3	8.0	1,308	13.9	3.0	371	2.9
Cash/Assets (%)	32.9	20.1	1,312	47.1	51.3	373	-5.1
EBITDA/Assets (%)	-37.2	-18.8	1,294	-59.6	-45.9	351	4.2
PP&E/Assets (%)	21.3	9.5	1,306	19.6	8.7	349	1.5
CapEx/Assets (%)	5.9	2.3	1,292	4.5	1.2	373	2.7
R&D/Assets (%)	24.5	10.2	1,308	40.4	29.0	373	-3.8
Asset Market-to-Book	3.2	1.8	1,308	3.6	2.4	371	-1.7
Years since IPO	8.3	6.2	1,312	9.9	8.3	373	-2.6
Daily Trading Volume ($MM)	2.5	0.5	1,312	3.1	1.0	373	-0.2
PIPE Terms and Conditions							
Issue Amount ($MM)	28.6	11.3	1,607	24.6	12.0	451	1.5
Issued/Outstanding Shares (%)	21.9	14.1	1,607	15.1	11.3	451	4.9
Issued Shares/Daily Volume	83.9	26.0	1,312	25.4	13.6	373	8.3
Days to File Registration	43.2	30.0	1,153	0	0	451	21.1
Ex Post Days to Filing	50.0	29.0	676	0	0	451	17.1
Days to Effect Registration	107	90.0	1,071	0	0	451	40.6
Ex Post Days to Effective	86.4	59.0	669	0	0	451	22.5
Warrants Included	0.48	0	1,607	0.46	0	451	0.9
Warrant Expiration (Years)	4.7	5.0	762	4.8	5.0	208	0.5

Table 4

Summary of PIPE Discounts

This table reports summary statistics by issuance year of discounts on PIPE transactions. The discount is the difference between the market value of securities purchased in the transaction and the price paid by the investor, as a percentage of the market value of securities purchased. The sample is split into PIPEs without (Stock Only) and with (Stock and Warrant) warrants. Obs. is the total number of transactions in each year and % with Warrants is the percentage of transactions including warrants. Negative discounts mean the investor paid a premium to the market price. Market values are computed using the last closing price prior to the transaction closing. Warrants are valued using the Black-Scholes call option model adjusted for dilution, with annualized volatility estimated over the trailing three months and capped at 50% and the risk-free rate interpolated from the swap curve.

Panel A: Annual Summary Statistics

	All PIPEs		Stock Only		Stock and Warrant		% with	Unregistered		Registered			
	Mean	p50	Mean	p50	Mean	p50	Warrant	Mean	p50	Mean	p50	% Reg.	Obs.
2001	18.3	15.3	15.1	13.4	26.2	23.0	28.6	18.8	17.1	13.8	10.4	9.5	147
2002	14.5	13.4	8.8	9.7	21.8	20.6	44.0	16.4	14.6	6.8	2.9	20.0	150
2003	19.9	19.5	14.5	13.0	24.8	23.5	52.7	21.0	19.8	11.9	9.8	12.1	207
2004	16.0	15.0	11.0	10.9	20.7	20.7	51.3	17.3	15.9	8.5	7.9	14.2	197
2005	16.8	15.3	9.7	8.3	22.0	20.4	58.1	18.6	16.8	9.7	10.6	19.6	179
2006	14.7	13.5	7.2	7.6	21.6	22.0	52.2	16.3	15.9	9.3	8.2	21.9	178
2007	13.2	11.9	8.6	7.5	18.7	19.1	45.6	14.0	13.1	9.2	8.0	15.7	204
2008	10.3	10.3	5.6	8.3	16.1	15.2	44.7	10.0	10.9	10.8	9.2	27.2	114
2009	13.4	14.7	8.0	11.2	17.6	17.6	56.5	13.2	14.7	13.7	14.4	35.2	108
2010	15.8	14.1	10.4	8.3	21.3	18.6	49.5	17.5	15.7	11.7	13.2	29.3	99
2011	12.1	11.1	10.7	9.1	13.4	14.5	51.9	14.3	12.2	6.5	5.6	28.4	81
2012	8.7	6.9	3.6	3.8	20.9	17.5	29.3	8.7	7.0	8.6	6.5	25.3	75
2013	13.2	11.9	9.1	8.5	18.6	15.4	43.2	13.5	12.5	12.6	10.3	32.1	81
2014	10.4	8.9	6.9	5.7	16.5	14.4	36.6	10.3	9.7	10.6	8.7	36.6	101
2015	8.9	8.8	4.8	5.6	16.4	17.1	35.6	7.8	7.6	10.4	11.0	43.6	101
All Years	14.5	13.4	9.4	8.9	20.4	19.8	46.5	15.7	14.9	10.3	9.1	22.3	2,022

Panel B: Cross-Sectional Splits

	Mean	StDev	p5	p25	p50	p75	p95	Obs.
All PIPEs Split by Issue Amount ($)								
0 to 4.9 million	18.6	17.8	-5.4	6.8	17.8	30.4	47.0	460
5 to 9.9 million	15.6	17.0	-7.6	7.1	16.1	25.6	41.0	406
10 to 19.9 million	14.4	13.6	-5.3	7.0	13.5	21.9	35.9	499
20 to 49.9 million	11.8	13.1	-4.2	5.0	11.0	17.9	32.4	440
50 million and above	9.5	18.2	-10.3	4.8	8.8	15.4	36.3	217
All PIPEs Split by Market Capitalization ($)								
0 to 49.9 million	17.9	18.8	-9.2	7.2	17.6	27.7	50.0	517
50 to 99.9 million	16.5	15.7	-4.3	9.0	15.9	25.9	41.1	499
100 to 199.9 million	13.3	13.0	-4.2	5.3	12.4	20.4	36.5	474
200 to 499.9 million	10.1	15.9	-5.3	4.1	10.0	18.1	31.0	344
500 million and above	10.9	12.1	-1.6	5.0	8.8	14.7	31.2	188
All PIPEs Split by Ratio of Issued Shares to Old Shares Outstanding								
0% to 4.9%	13.8	15.9	-9.6	4.7	13.3	22.0	41.7	274
5.0% to 9.9%	14.4	17.1	-8.0	6.3	13.3	23.2	41.5	457
10.0% to 14.9%	14.4	14.5	-3.9	5.5	13.2	22.3	38.7	381
15.0% to 24.9%	15.0	16.9	-5.4	5.6	13.5	23.5	41.4	620
25.0% and above	14.5	14.3	-6.3	5.8	13.8	22.9	37.4	290
All PIPEs Split by Trailing One-Year Stock Return								
-50.0% and below	13.5	21.4	-14.4	3.0	13.4	22.8	46.6	363
-49.9% to -10.0%	13.9	15.9	-7.8	4.4	13.4	22.6	38.8	512
-9.9% to 9.9%	11.7	14.9	-9.4	4.2	9.9	20.5	37.0	253
10.0% to 49.9%	14.3	11.9	-2.1	5.4	12.5	21.6	35.5	335
50.0% to 99.9%	15.8	16.2	0	7.0	13.2	25.0	41.7	219
100% and above	17.9	12.7	0	9.9	16.4	25.0	42.9	340
Split by Registration Status and Issued Shares/Daily Volume								
Unregistered								
0 to 10 days	15.1	16.5	-10.4	6.6	14.3	25.8	39.6	380
10 to 30 days	15.4	17.3	-3.5	7.4	14.7	25.0	44.0	366
30 to 80 days	16.3	17.9	-3.8	7.4	15.9	23.9	46.9	287
80 days and above	15.7	16.6	-6.3	6.7	13.8	23.9	46.4	262
Registered								
0 to 10 days	10.4	11.1	-2.2	3.3	9.1	15.3	31.2	112
10 to 30 days	8.9	11.7	-9.6	0.7	8.3	15.0	31.9	97
30 to 80 days	9.9	12.2	-6.3	1.6	8.4	17.4	33.1	74
80 days and above	11.7	10.0	-3.4	4.3	10.1	19.7	28.6	75

Table 5

Summary of PIPE Announcement Returns

This table reports summary statistics of announcement returns for the PIPE transactions in our sample. The raw announcement return is the stock return from 4 trading days before to 5 trading days after the announcement date of the PIPE transaction. The abnormal return is the raw return minus the CAPM benchmark return from the realized market return over that window, with beta estimated using daily returns over the year prior to the announcement date. Betas are bound between -1 and 3, which impacts less than 1% of observations. Adjusted returns exclude the valuation impact of the issuance discount, following the procedure in the appendix Wruck (1989): $r_{Adj} = r/(1 - \alpha) + \alpha * d/(1 - \alpha)$, where r is the unadjusted announcement return, d is the issuance discount, and α is the ratio of issued shares to total shares outstanding after the transaction. 14 observations with new issuance more than 5 times the number of previously outstanding shares are excluded from the sample. t-stat is from a regression of the abnormal announcement return on a constant, with standard errors clustered two ways by firm and month of announcement. % Warr. is the percentage of transactions with attached warrants.

	Mean	StDev	t-stat	p25	p50	p75	% Warr.	Obs.
Raw Return	2.5	24.0	4.6	-9.7	-0.7	10.0	47.8	2,038
Abnormal Return	2.3	23.7	4.2	-9.5	-0.7	9.2	47.8	2,038
Adj. Return	6.4	33.3	7.7	-8.5	1.2	13.7	46.9	2,002
Adj. Abnormal Return	6.2	33.2	7.5	-8.4	1.0	13.1	46.9	2,002
Abnormal Return Split by Offering Type								
Unregistered	3.5	23.4	6.0	-7.9	-0.1	10.5	48.2	1,588
with Warrants	2.1	26.3	2.4	-11.5	-2.6	11.1	100	766
without Warrants	4.8	20.2	6.2	-4.7	1.6	10.3	0	822
Registered	-1.9	24.6	-1.6	-14.1	-4.3	5.5	46.2	450
with Warrants	-6.6	28.2	-3.3	-20.8	-11.5	-0.2	100	208
without Warrants	2.2	20.1	1.6	-7.0	0.0	7.1	0	242
Abnormal Return Split by Market Capitalization								
0 to 49.9 million	2.4	24.1	2.1	-12.3	-1.2	12.0	68.8	520
50 to 99.9 million	0.7	27.5	0.6	-11.6	-2.4	7.1	63.3	504
100 to 199.9 million	3.4	25.3	2.9	-7.9	-0.9	10.7	43.4	479
200 to 499.9 million	2.4	17.8	2.4	-6.3	0.2	8.4	20.2	347
500 million and above	3.5	16.5	2.9	-2.3	1.6	7.6	10.1	188
Abnormal Return Split by Issued Shares to Old Shares Outstanding								
0% to 4.9%	3.0	22.0	2.2	-6.6	-0.3	9.6	33.0	279
5.0% to 9.9%	0.6	18.5	0.7	-9.9	-0.9	7.7	48.0	467
10.0% to 14.9%	1.3	25.5	1.1	-10.9	-1.9	8.0	51.7	387
15.0% to 24.9%	2.4	24.6	2.4	-10.7	-1.2	8.7	47.8	626
25.0% and above	5.7	28.1	3.2	-7.7	2.7	15.1	57.0	279

Table 5 continued:

	Mean	StDev	*t*-stat	p25	p50	p75	% Warr.	Obs.
Abnormal Return Split by Issued Shares/Daily Volume								
Unregistered								
0 to 10 days	3.8	30.0	2.6	-8.5	-0.9	10.3	45.8	365
10 to 30 days	2.3	16.9	2.7	-8.1	-0.4	11.1	50.8	370
30 to 80 days	3.4	26.1	2.3	-8.3	-0.0	9.6	49.3	290
80 days and above	6.2	20.2	5.2	-4.7	2.0	12.0	43.8	281
Registered								
0 to 10 days	-1.0	26.3	-0.5	-13.0	-2.4	7.4	38.8	139
10 to 30 days	-2.5	16.9	-1.6	-14.8	-3.6	7.6	43.8	96
30 to 80 days	-4.7	18.3	-1.9	-15.4	-4.2	3.4	44.4	72
80 days and above	-5.6	17.6	-2.2	-16.9	-5.7	1.5	50.9	55

Table 6

Summary Statistics on Trading Volume around Registration

This table reports summary statistics on trading volume in PIPE stocks. Each observation represents a distinct PIPE transaction. The registration date is defined as the effective date of the registration statement for unregistered PIPEs and the closing date of the transaction for registered PIPEs. Abnormal Volume is defined as the difference between the average daily volume in a window after registration and the average daily volume over the three months prior to registration. Abnormal Volume as Fraction of Issued Shares describes how much of the issuance could be sold in the post-registration window if all of the abnormal volume were PIPE sellers. Fraction of Post-Registration Volume Required to Sell Issued Shares is the ratio of issued shares to realized volume over various windows after registration and describes the amount of daily volume the PIPE investors would need to trade to exit their positions. Panels B and C report more detailed statistics, providing the average ratio of issued shares to post-registration volume within each decile for each horizon and subsample, expressed as a percentage. Raw Return around Registration Date is the stock return from 4 trading days before to 5 trading days after the registration date. Abnormal Return is the raw return minus the market return over that window. All ratios are winsorized at the 1% level to mitigate the impact of outliers. t-stat is from a regression of the abnormal announcement return on a constant, with standard errors clustered by month of closing. The difference in means t-statistic is from a regression of the variable of interest on an indicator for unregistered status and year fixed effects, with standard errors clustered two ways by firm and month of closing.

Panel A: Summary Statistics

Variables	Unregistered				Registered				Diff Means
	Mean	p50	t-stat	Obs.	Mean	p50	t-stat	Obs.	t-stat
Abnormal Volume after Registration (%)									
1 week	27.4	-10.1	5.4	669	51.4	7.1	6.9	451	-2.1
2 weeks	27.9	-5.4	6.3	669	46.6	4.5	6.7	451	-1.9
1 month	35.1	-5.4	6.4	669	44.1	1.9	5.7	451	-1.2
Abnormal Volume as Fraction of Issued Shares (%)									
1 week	-5.7	-0.8	-1.7	666	13.5	1.5	2.3	450	-2.8
2 weeks	-13.0	-1.4	-1.9	666	24.5	1.9	2.2	450	-2.8
1 month	-28.1	-2.0	-1.9	666	39.3	1.7	1.5	450	-2.6
Percentage of Post-Registration Volume Required to Sell Issued Shares (%)									
1 month	374	133	12.4	666	111	61.8	14.7	450	5.5
2 months	170	65.1	13.0	666	54.3	31.2	14.7	450	5.3
3 months	109	45.2	13.0	666	36.1	20.2	14.4	450	5.4
6 months	44.5	20.5	15.5	666	17.7	9.4	14.5	450	5.3
12 months	19.7	9.1	14.8	666	8.3	4.4	12.7	450	4.7
24 months	8.6	4.1	16.7	666	3.7	1.8	10.4	450	4.1
Returns around Registration Date (%)									
Raw Return	-3.2	-2.5	-6.5	669	-2.5	-4.5	-2.0	451	0.4
Abnormal Ret.	-3.3	-2.9	-7.5	669	-3.1	-5.0	-2.5	451	0.7

Panel B: Percentage of Post-Registration Volume Required to Sell Issued Shares - Unregistered PIPEs

Horizon	Decile of Issued Shares/Post-Registration Volume									
	1	2	3	4	5	6	7	8	9	10
1 month	11.5	30.4	49.8	76.8	110	169	263	391	622	2038
2 months	5.6	14.5	24.8	38.8	55.1	81.7	122	181	291	893
3 months	3.8	9.0	16.3	25.0	37.5	53.2	77.3	115	182	574
6 months	1.9	4.5	7.5	11.8	17.1	24.5	36.1	51.2	78.2	213
12 months	0.9	2.2	3.7	5.2	7.4	11.0	15.4	21.2	35.1	95.7
24 months	0.4	1.0	1.7	2.5	3.4	4.7	7.0	9.8	15.4	40.2

Panel C: Percentage of Post-Registration Volume Required to Sell Issued Shares - Registered PIPEs

Horizon	Decile of Issued Shares/Post-Closing Volume									
	1	2	3	4	5	6	7	8	9	10
1 month	5.9	15.2	26.8	39.4	53.4	71.9	96.3	132	206	467
2 months	3.3	7.7	13.4	19.3	27.2	36.2	48.5	68.7	96.3	223
3 months	2.3	4.9	8.3	12.8	17.6	23.7	32.0	45.7	65.2	149
6 months	1.3	2.6	4.3	6.1	8.3	11.3	16.0	22.5	32.3	72.6
12 months	0.6	1.2	1.9	2.7	3.7	5.0	6.9	9.7	14.3	36.4
24 months	0.3	0.6	0.8	1.1	1.6	2.1	2.9	4.1	6.3	17.5

Table 7

Buy-and-Hold Returns to Market and PIPE Investors

This table reports summary statistics of buy-and-hold returns after PIPE transactions. Market Investor Return is the return earned by purchasing the PIPE issuer's stock on the market on the transaction closing date and holding it for a fixed period. PIPE Investor Return is the return earned by purchasing securities in the PIPE transaction and holding them for a fixed period. Abnormal returns are relative to the return on a matched firm, which is obtained by considering all firms in the same 2-digit SIC industry that did not previously issue a PIPE in the sample period and selecting the firm with the minimum sum of the absolute differences between the standardized equity book-to-market ratio and the standardized log market capitalization. Observations where this sum exceeds one are excluded due to poor match quality, which removes 222 observations from the full sample. *t*-stat is the bootstrapped skewness-adjusted *t*-statistic from 1000 draws with replacement.

Panel A: Unregistered PIPEs

	Mean	StDev	*t*-stat	p25	p50	p75	Obs.
Market Investor Raw Return (%)							
3 months	0.8	38.2	0.7	-20.4	-3.8	14.8	1,375
6 months	-1.8	72.0	-0.8	-44.2	-13.9	19.8	1,358
1 year	0.6	87.7	0.2	-56.8	-20.1	29.7	1,268
2 years	13.3	154	3.4	-66.9	-25.7	41.0	1,037
Market Investor Abnormal Return (%)							
3 months	-1.7	49.6	-1.2	-25.3	-1.7	20.1	1,375
6 months	-2.9	84.6	-1.2	-40.9	-6.8	31.0	1,358
1 year	-3.1	119	-0.9	-50.9	-7.2	45.1	1,268
2 years	-4.1	205	-0.6	-67.2	-6.6	53.9	1,037
PIPE Investor Raw Return (%)							
3 months	23.7	54.8	16.7	-5.9	14.1	43.2	1,375
6 months	20.4	95.7	9.2	-35.3	1.7	45.6	1,358
1 year	22.6	116	8.4	-49.7	-6.6	56.5	1,268
2 years	39.1	216	9.4	-62.8	-13.4	66.4	1,037
PIPE Investor Abnormal Return (%)							
3 months	21.2	61.3	9.9	-11.1	16.6	46.2	1,375
6 months	19.3	103	7.0	-30.1	7.4	53.2	1,358
1 year	18.9	139	4.1	-42.3	3.2	66.5	1,268
2 years	21.7	253	2.6	-57.8	3.7	74.9	1,037
PIPE Investor Abnormal Return (excluding Warrants) (%)							
3 months	12.5	56.0	7.5	-16.7	9.5	35.1	1,375
6 months	9.8	88.4	4.0	-33.8	3.0	45.4	1,358
1 year	9.5	126	2.3	-44.6	1.0	61.1	1,268
2 years	10.1	221	1.3	-61.1	1.6	66.8	1,037

Panel B: Registered PIPEs

	Mean	StDev	*t*-stat	p25	p50	p75	Obs.
Market Investor Raw Return (%)							
3 months	-1.1	39.4	-0.5	-22.4	-6.7	11.3	421
6 months	-0.3	66.4	-0.1	-42.5	-14.4	20.8	410
1 year	3.7	90.3	0.8	-61.6	-18.0	39.2	387
2 years	8.4	124	1.3	-70.6	-28.4	40.8	303
Market Investor Abnormal Return (%)							
3 months	-1.1	45.9	-0.5	-26.6	-3.1	18.2	421
6 months	-4.4	114	-0.8	-36.7	-0.8	27.5	410
1 year	-4.9	119	-0.8	-52.9	-6.0	55.3	387
2 years	-23.0	184	-2.1	-77.6	-6.4	43.6	303
PIPE Investor Raw Return (%)							
3 months	10.4	51.1	4.9	-16.8	3.1	22.1	421
6 months	10.9	77.9	3.0	-37.8	-4.0	31.6	410
1 year	14.8	103	3.1	-57.0	-7.8	52.4	387
2 years	18.9	139	2.6	-70.6	-21.7	48.1	303
PIPE Investor Abnormal Return (%)							
3 months	10.4	56.1	3.8	-17.6	5.4	32.0	421
6 months	6.8	114	0.8	-32.0	5.3	41.0	410
1 year	6.2	127	0.9	-50.1	-1.3	65.7	387
2 years	-12.4	194	-1.1	-77.4	-3.2	55.3	303
PIPE Investor Abnormal Return (excluding Warrants) (%)							
3 months	2.8	48.3	1.2	-22.4	0.7	26.8	421
6 months	-0.2	116	-0.1	-33.8	2.7	33.7	410
1 year	-1.1	119	-0.2	-52.4	-3.7	57.3	387
2 years	-19.1	183	-1.8	-78.0	-3.9	52.3	303

Table 8

PIPE Portfolio Return Regressions

This table reports regressions of value-weighted portfolio returns on the market excess return and the Fama-French small-minus-big and high-minus-low factor returns. Portfolios are constructed by investing in each dollar of PIPE issuance in the sample and holding the investment for a fixed window. Market Investor Return is the return earned by purchasing the PIPE issuer's stock on the market on the transaction closing date. PIPE Investor Return is the return earned by purchasing securities in the PIPE transaction. PIPE Investor Return (Excluding Warrants) is the return earned by purchasing the discounted stock in the PIPE transaction and valuing any warrants at zero. Heteroskedasticity-robust *t*-statistics are reported in brackets. There are 180 monthly return observations from 2001 to 2015.

Panel A: Market Investor Return

Holding Period	Unregistered PIPEs				Registered PIPEs			
	3 mo.	6 mo.	1 yr.	2 yr.	3 mo.	6 mo.	1 yr.	2 yr.
Alpha	0.29	-0.40	-0.55	-0.59	-0.90	0.08	0.27	0.18
	[0.6]	[-1.0]	[-1.7]	[-2.2]	[-1.6]	[0.2]	[0.5]	[0.5]
Mkt - Rf	1.18	1.26	1.29	1.26	0.88	0.71	1.02	0.97
	[9.7]	[10.1]	[16.2]	[18.4]	[6.6]	[5.6]	[7.8]	[9.7]
SMB	0.62	0.64	0.86	0.83	1.70	1.32	1.39	1.33
	[2.8]	[3.3]	[4.9]	[5.5]	[6.5]	[5.0]	[5.2]	[6.4]
HML	-0.42	-0.26	-0.14	-0.24	-0.18	-0.02	-0.25	-0.34
	[-1.9]	[-1.4]	[-1.0]	[-1.9]	[-0.7]	[-0.1]	[-1.0]	[-1.4]

Panel B: PIPE Investor Return

Holding Period	Unregistered PIPEs				Registered PIPEs			
	3 mo.	6 mo.	1 yr.	2 yr.	3 mo.	6 mo.	1 yr.	2 yr.
Alpha	5.85	2.30	0.98	0.29	2.79	1.59	0.93	0.58
	[6.9]	[4.0]	[2.4]	[0.9]	[2.9]	[2.8]	[1.7]	[1.5]
Mkt - Rf	1.35	1.38	1.31	1.25	1.35	0.86	1.08	1.03
	[6.7]	[8.6]	[12.6]	[14.4]	[3.8]	[5.8]	[8.1]	[9.6]
SMB	0.75	0.82	1.07	1.05	1.78	1.44	1.49	1.40
	[2.3]	[3.3]	[5.3]	[6.2]	[4.2]	[4.7]	[5.4]	[6.4]
HML	-0.84	-0.46	-0.27	-0.27	-0.02	0.04	-0.21	-0.28
	[-1.7]	[-1.6]	[-1.3]	[-1.7]	[-0.1]	[0.2]	[-0.9]	[-1.2]

Panel C: PIPE Investor Return (Excluding Warrants)

Holding Period	Unregistered PIPEs				Registered PIPEs			
	3 mo.	6 mo.	1 yr.	2 yr.	3 mo.	6 mo.	1 yr.	2 yr.
Alpha	4.72	1.80	0.69	0.15	1.44	1.10	0.76	0.49
	[6.2]	[3.4]	[1.8]	[0.5]	[1.8]	[2.0]	[1.4]	[1.3]
Mkt - Rf	1.35	1.35	1.28	1.23	1.09	0.75	1.03	0.98
	[7.9]	[9.0]	[13.5]	[14.8]	[4.0]	[5.4]	[8.0]	[9.5]
SMB	0.68	0.80	1.03	1.01	1.79	1.44	1.47	1.36
	[2.2]	[3.3]	[5.3]	[6.1]	[5.1]	[5.0]	[5.4]	[6.4]
HML	-0.62	-0.39	-0.22	-0.25	-0.09	0.01	-0.24	-0.31
	[-1.9]	[-1.6]	[-1.3]	[-1.7]	[-0.3]	[0.0]	[-1.0]	[-1.3]

Table 9

Cross-Sectional Splits of Abnormal Returns to Market and PIPE Investors

This table reports summary statistics of one-year buy-and-hold abnormal returns after PIPE transactions. Market Investor Return is the return earned by purchasing the PIPE issuer's stock on the market on the transaction closing date and holding it for a fixed period. PIPE Investor Return is the return earned by purchasing securities in the PIPE transaction and holding them for a fixed period. Abnormal returns are relative to the return on a matched firm, which is obtained by considering all firms in the same 2-digit SIC industry that did not previously issue a PIPE in the sample period and selecting the firm with the minimum sum of the absolute differences between the standardized equity book-to-market ratio and the standardized log market capitalization. Observations where this sum exceeds one are excluded due to poor match quality, which removes 222 observations from the full sample. Returns are reported as percentages. *t*-stat is the bootstrapped skewness-adjusted *t*-statistic from 1000 draws with replacement.

	Mean	StDev	*t*-stat	p25	p50	p75	Obs.
Market Investor Abnormal Return by Issuer Market Capitalization ($)							
0 to 49.9 million	3.7	133	0.5	-47.7	-6.3	57.5	372
50 to 99.9 million	-3.0	129	-0.4	-54.0	-4.1	56.2	429
100 to 199.9 million	-7.5	100	-1.3	-61.0	-14.3	33.4	400
200 to 499.9 million	-5.3	126	-0.7	-42.6	-4.3	49.2	298
500 million and above	-8.6	82.1	-1.2	-44.5	-6.6	31.9	156
PIPE Investor Abnormal Return by Issuer Market Capitalization ($)							
0 to 49.9 million	31.3	162	3.7	-38.9	7.3	85.2	372
50 to 99.9 million	21.2	149	2.7	-48.3	6.0	85.2	429
100 to 199.9 million	7.7	114	1.3	-52.4	-3.6	48.4	400
200 to 499.9 million	5.9	130	0.5	-36.9	2.4	61.1	298
500 million and above	5.5	90.7	0.6	-35.4	4.8	49.2	156
Market Investor Abnormal Return by PIPE Discount							
-0.01% and below	13.2	114	1.5	-49.6	3.4	66.2	162
0% to 9.99%	5.0	105	1.0	-40.6	-2.4	50.9	473
10% to 19.9%	-4.0	131	-0.7	-51.6	-8.0	42.1	510
20% to 39.9%	-13.2	117	-2.2	-61.8	-9.9	41.5	432
40% and above	-31.2	137	-1.7	-76.0	-25.5	17.3	75
PIPE Investor Abnormal Return by PIPE Discount							
-0.01% and below	4.7	111	0.5	-53.2	-7.6	56.3	162
0% to 9.99%	12.9	110	2.4	-37.8	3.4	61.9	473
10% to 19.9%	14.8	148	1.8	-44.2	1.0	57.3	510
20% to 39.9%	19.7	142	2.6	-47.6	7.4	82.4	432
40% and above	48.6	207	1.8	-33.8	10.4	105	75

Table 9 continued:

	Mean	StDev	*t*-stat	p25	p50	p75	Obs.
Market Investor Abnormal Return Split by Issuer EBITDA/Assets							
-50.0% and below	15.8	141	1.7	-45.8	3.8	61.1	236
-49.9% to -5.0%	1.1	140	0.2	-61.1	2.5	72.1	402
-4.9% to 4.9%	-16.9	118	-3.4	-57.2	-16.6	32.7	398
5.0% and above	-2.7	95.9	-0.6	-44.9	-5.1	42.0	479
PIPE Investor Abnormal Return Split by Issuer EBITDA/Assets							
-50.0% and below	42.6	167	4.2	-41.3	11.1	93.3	236
-49.9% to -5.0%	27.2	169	2.9	-52.6	14.0	96.2	402
-4.9% to 4.9%	-2.3	124	-0.4	-46.8	-7.0	49.6	398
5.0% and above	13.6	106	2.3	-36.2	4.3	61.2	479
Market Investor Abnormal Return Split by Issued Shares/Daily Volume							
Unregistered							
0 to 10 days	-8.1	102	-1.4	-50.8	-9.0	49.2	306
10 to 30 days	-12.0	132	-1.7	-48.0	-8.2	42.6	296
30 to 80 days	-0.1	114	-0.1	-52.7	-8.8	29.3	239
80 days and above	2.0	119	0.2	-56.5	-3.6	49.1	204
Registered							
0 to 10 days	-0.5	106	-0.0	-49.1	-16.1	47.0	91
10 to 30 days	-14.2	137	-0.8	-60.9	-14.2	37.8	85
30 to 80 days	2.2	95.3	0.2	-54.1	-3.5	61.9	56
80 days and above	-16.9	122	-1.1	-60.4	-15.4	67.0	72
PIPE Investor Abnormal Return Split by Issued Shares/Daily Volume							
Unregistered							
0 to 10 days	13.9	114	2.0	-43.5	0.2	77.2	306
10 to 30 days	12.4	149	1.0	-40.1	2.1	67.0	296
30 to 80 days	22.0	142	2.6	-39.0	-0.5	47.2	239
80 days and above	21.0	142	2.2	-52.0	3.2	61.8	204
Registered							
0 to 10 days	9.1	113	0.7	-44.1	-8.8	56.6	91
10 to 30 days	1.7	152	0.1	-45.1	-4.2	52.8	85
30 to 80 days	10.2	101	0.7	-53.7	0.4	70.4	56
80 days and above	-9.4	123	-0.6	-61.9	-7.4	82.7	72

Figure 1

Time Series of PIPE and SEO Issuance by Small Firms

This figure reports annual issuance of PIPEs and SEOs for firms with market capitalization under $1 billion from 2001 to 2015. SEO data are obtained from SDC Platinum. The SEO sample includes primary offerings by U.S. listed companies with non-missing data on CUSIP and market capitalization. All PIPEs includes common stock, equity line, convertible preferred stock, convertible debt, and other types of PIPEs in *PrivateRaise*, excluding Rule 144A offerings and confidentially marketed public offerings, but placing no restrictions on investor type. Stock PIPEs includes the common stock subset of the All PIPEs sample.
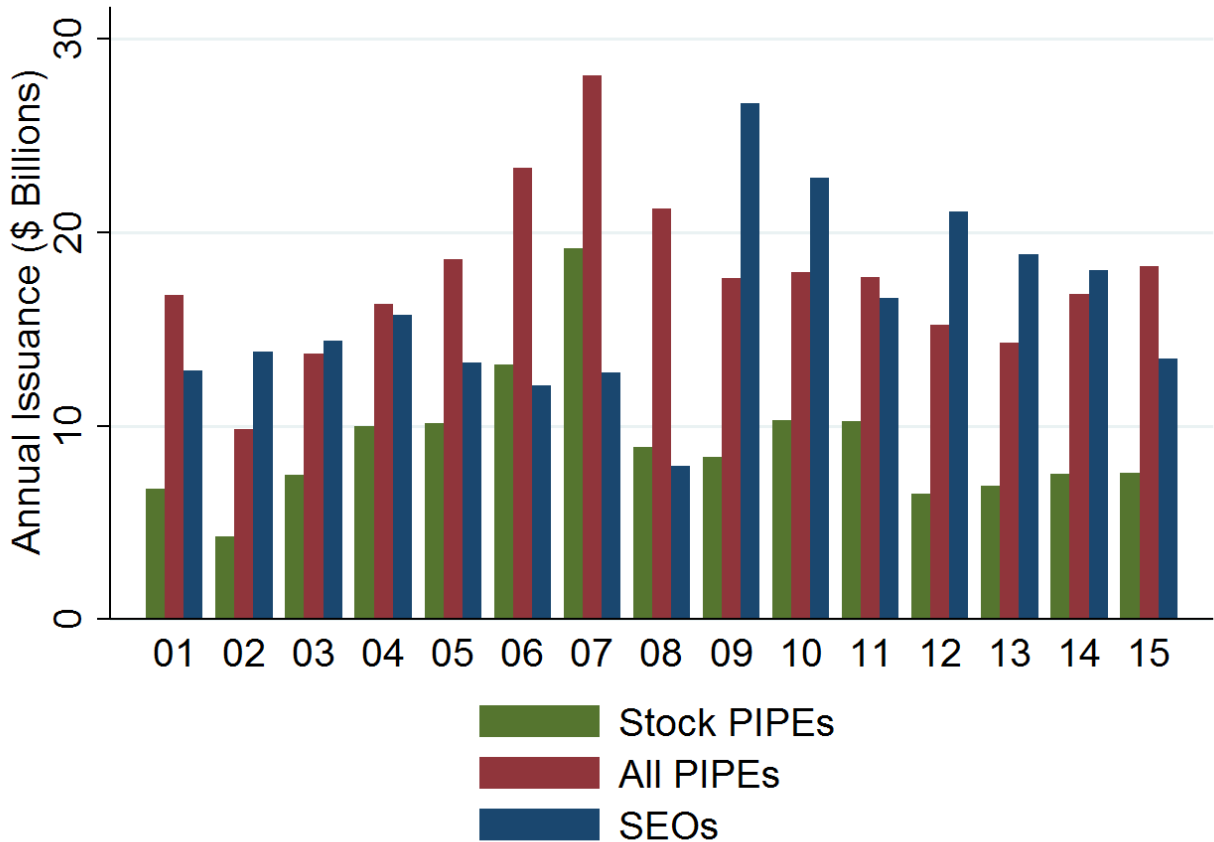
Figure 2

UAHC Prices and Volumes around the December 2006 PIPE

This figure reports the price and trading volume of United American Healthcare Corporation (UAHC) from one month before the closing of its December 2006 PIPE transaction to one month after the effective registration date for the shares sold in the offering. The vertical line on December 14, 2006 marks the announcement of the transaction after the market close. The vertical line on January 26, 2007 marks the effective registration date.
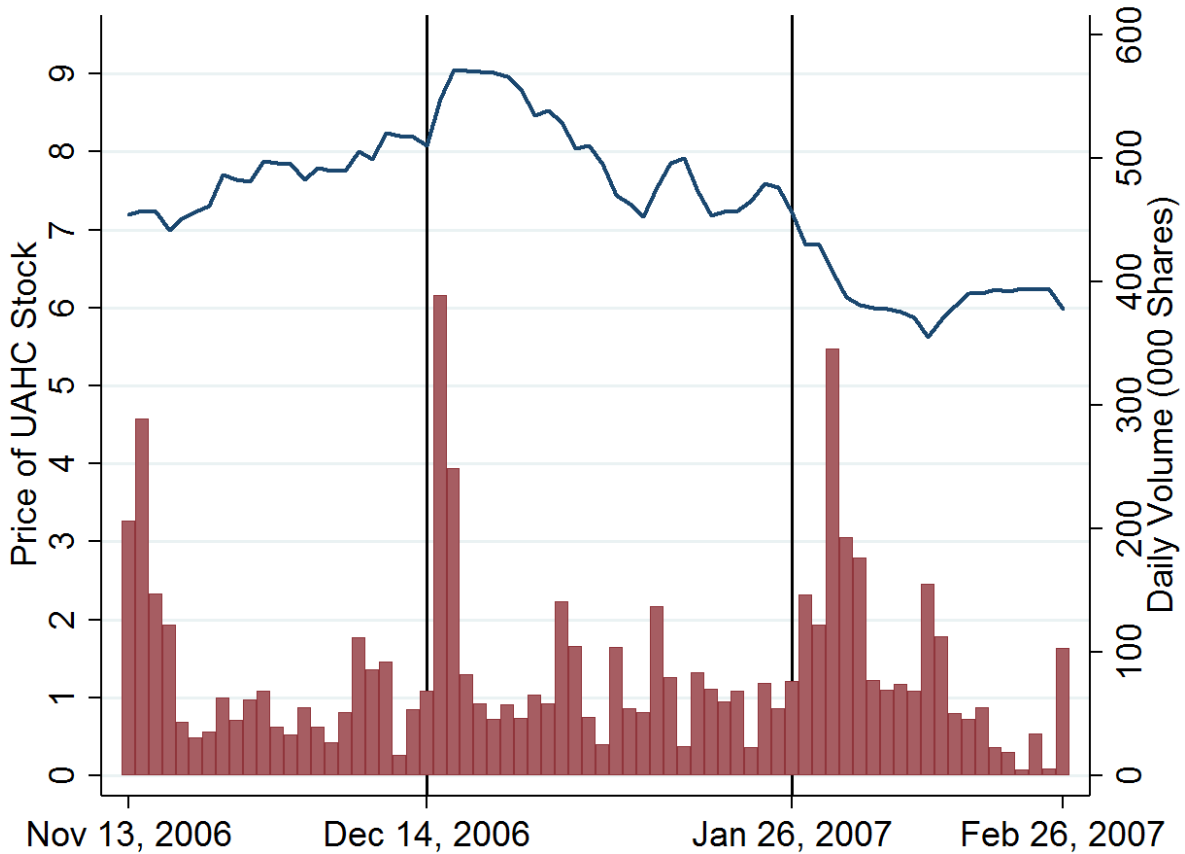

Figure 3

Cross-Sectional Distribution of Returns to Market and PIPE Investors

This figure reports kernel density estimates of one year returns after PIPE transactions. Market Investor Return is the return earned by purchasing the PIPE issuer's stock on the market on the transaction closing date and holding it for a fixed period. PIPE Investor Return is the return earned by purchasing securities in the PIPE transaction and holding them for a fixed period. Kernel density estimates are computed using the Epanechnikov kernel with the optimal bandwidth determined by Stata. Returns are truncated at 300% to reduce the scale of the graph.