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The economics of PIPEs, revisited

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Abstract This paper examines rent sharing in private investments in public equity (PIPEs) between newly public firms and private investors. The evidence suggests highly asymmetric rent sharing. Newly public firms earn a negative return of up to −15% in the first post-PIPE year, while investors benefit due to the ability to dictate transaction terms. The results are economically relevant because newly public firms are, at least in recent years, more likely to tap private rather than public markets for follow-on financing shortly after the initial public offering (IPO), and because the results for newly public firms contrast with those for the broad PIPE market in Lim et al. (2021). The study also contributes to the PIPE literature by offering an integrative view of competing theories of the cross-section of post-PIPE stock returns. We simultaneously test proxies for corporate governance, asymmetric information, bargaining power, and managerial entrenchment. While all explanations have univariate predictive power for the post-PIPE performance, only the proxies for corporate governance and asymmetric information are robust in ceteris-paribus tests.

Plain English Summary Who benefits if public firms raise financing privately? In this study, we examine the returns to public firms vis-á-vis private investors in so-called *private investments in public equity* (*PIPEs*). The results indicate that public firms earn a significant negative return, while private investors earn a fair return. Public firms only marginally benefit from private investors in PIPEs if the latter help improve corporate governance or reduce informational asymmetries. Thus, the principle implication of this study is that, in general, PIPEs signal poor performance prospects for the issuing firm, and investors should not invest in those companies unless they are able to purchase PIPE stock at a privately negotiated discount. Given that PIPEs have recently become the dominant way to raise follow-on financing for newly public firms, the evidence in this study casts doubt on the attractiveness to go public in the first place.

Keywords Private investment in public equity (PIPE) · Private equity · Newly public firms · Initial public offerings (IPOs)

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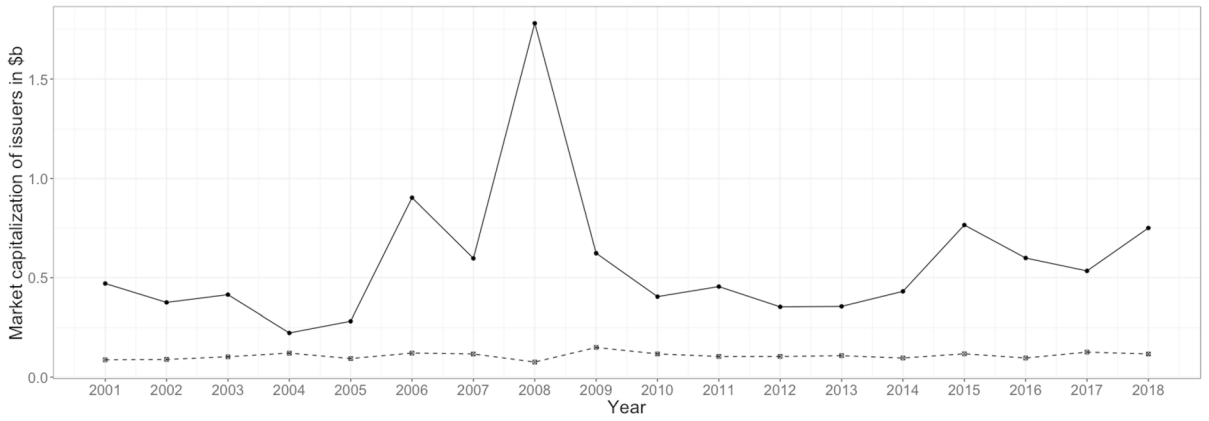

Fig. 1 PIPE issuers' market capitalization, 2001–2018. The graph shows the median (dashed line) and mean (solid line) market capitalization of PIPE companies in $ billion by issuance year. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs

JEL classification: G23 · G32 · L26 · M13

1 Introduction

Research in entrepreneurial finance covers topics as diverse as crowdfunding, business angels, venture capital (VC), token offerings, and initial public offerings (IPOs) (for excellent recent overviews, see Cumming and Vismara (2017); Cumming et al. (2019); Block et al. (2018); Cumming and Groh (2018)). The number of studies in the *entrepreneurship*[1] literature extend beyond the IPO is much smaller, and these studies typically restrict their focus on post-IPO failure (i.e., delisting or bankruptcy events) (e.g., Carpentier and Suret 2011; Chou et al. 2013) and post-IPO underperformance (e.g., Ritter 1991; Loughran and Ritter 1995), as well as some other outcomes.[2] This focus may leave an important gap in the entrepreneurial finance literature because many newly public firms fail to raise follow-on financing in public markets, but survive by reverting to entrepreneurial financing markets (Iliev and Lowry 2020; Lim et al. 2021; Bernardo et al. 2021), which is "contrary to conventional wisdom" (Iliev and Lowry 2020, p. 1527). The purpose of this study is to contribute to filling this gap.

Specifically, we ask the following research question:

> How are follow-on financing transaction rents shared between newly public firms and private investors?

The study's empirical focus is on private investments in public equity (PIPEs). Rent sharing in PIPEs is not a novel topic in the literature. The returns to PIPE issuers *and* investors are already examined in the excellent, recent study by Lim et al. (2021). Lim et al. (2021) find that PIPE issuers do not benefit from PIPEs, but PIPE investors earn, on average, a 19.7% abnormal return over their holding periods. However, the PIPE market is very heterogeneous. As Figure 1 below illustrates, the PIPE market typically features young, small, and financially distressed firms, yet it is penetrated by very large firms during crises periods. Therefore, an important novelty of this study is to focus on *PIPEs of newly listed firms*. The focus on newly public firms is of relevance because their behavior may differ substantially from the broad cross-section of public firms, as Signori and Vismara (2017) suggest. Additional novelties of this study include contributions to the PIPE literature in terms

[1] Of course, there are several studies in the *corporate* finance literature, e.g., Ritter (1991) and Loughran and Ritter (1995).

[2] Note that there are studies that examine other aspects of post-IPO behavior, such as the post-IPO M&A activity (e.g., Signori and Vismara 2017), innovation (e.g., Bernstein 2015), earnings management (e.g., Kao et al. 2009), governance (e.g., Krishnan et al. (2011)), disclosure (e.g., Barth et al. 2017), and operating performance (e.g., Jain and Kini 1994).

of the accuracy of return estimation as well as implications for the literature on going public prematurely, as discussed further below and in Section 5.2.

Focusing on PIPEs of *newly public firms* seems relevant for at least two reasons. First, Brau (2012) offers survey-based evidence in line with Pagano et al. 's (1998) theory that more cost-efficient access to equity finance in public markets may be an important motive for entrepreneurs behind the going-public decision. Loughran and Ritter (1995) examine follow-on financing of newly public firms in *public* markets. Examining follow-on financing of newly public firms in *private* markets is equally important, as these transactions outsize those in public markets in more recent years (Lim et al. 2021). Second, Iliev and Lowry (2020) show that private financiers typically found in the entrepreneurial space also populate financial markets for public companies. Lim et al. (2021) even report that firms with a market capitalization below $1 billion that recently went public are more likely to revert to private than public markets for follow-on financing. Therefore, it seems interesting to shed light on how newly public firms and private inventors share rents in follow-on financing transactions, and, in particular, on how economically beneficially it is for newly public firms to raise follow-on financing privately.

We test two overarching hypotheses.[3] The first hypothesis, the *value-destruction hypothesis*, predicts that public *entrepreneurs* earn a negative abnormal return when they raise follow-on financing privately. The rationale is that PIPE contracts are designed so that investors have an incentive to exit the investment as early as possible to maximize returns. Investors lack effective incentives to help turn-around the company. Thus, the newly public entrepreneur's downward trend likely continues. The second hypothesis, the *wealth-transfer hypothesis*, predicts that investors in private follow-on financing rounds of public entrepreneurs do not lose money. This is because private transactions allow for sophisticated contracting solutions (Chaplinsky and Haushalter 2010), which explain the performance disparity between entrepreneurs and investors. The rationale behind the second hypothesis is that investors are in a position of superior bargaining power when newly public entrepreneurs approach them for follow-on financing, as the entrepreneurs reveal their inability to tap public markets (Gomes and Phillips 2012). Investors thus contract with entrepreneurs who choose between accepting the investors' terms or bankruptcy. In such a situation, general Nash bargaining should allocate most of the transaction surplus to the investors. Thus, investors can demand contract terms, such as purchase discounts and resale covenants, that help them extract most of the transaction rents.

We find strong evidence in support of these hypotheses. Entrepreneurs underperform the market by up to 15% in the year following the follow-on financing. Investors, on average, never underperform the market. The results thus suggest highly asymmetric rent sharing in post-IPO entrepreneurial finance markets to the entrepreneur's disadvantage. The results also indicate that the abnormal return estimates are highly sensitive to the risk adjustment method. Fama and French (1993, 2015) factor models provide more robust estimates than Barber and Lyon 's (1997) single-control-firm-matched buy-and-hold abnormal returns, plausibly because the latter fail to control for common variation in risk premia (Mitchell and Stafford 2000). Most importantly, these results for PIPEs involving newly listed firms starkly contrast with those for the broad PIPE market in Lim et al. (2021) with respect to the economic magnitude of the estimated returns for both PIPE issuers and investors.

Another important contribution to the PIPE literature is our integrative view on explanations for post-PIPE performance. The existing literature has produced competing views that help explain the post-PIPE stock underperformance that broadly fall into four groups: (i) corporate governance (Wruck 1989; Wruck and Wu 2009), (ii) asymmetric information (Hertzel and Smith 1993; Wu 2004), (iii) bargaining power (Lim et al. 2021; Brophy et al. 2009), and (iv) managerial entrenchment (Barclay et al. 2007). These theories have never been tested simultaneously. Therefore, it is not clear which theories prevail after controlling for the others. To this end, we simultaneously analyze various proxies for these four

[3] Our hypotheses go beyond the existing literature on private placements that is restricted to the (under)performance of issuing companies. The existing evidence raises the important question why sophisticated investors invest in firms that, on average, are expected to underperform. We provide novel insights by hypothesizing and testing whether firm and investor performance differs (due to price discounts, resale restrictions, and other covenants), which could potentially reconcile the conflicting findings first discovered by Hertzel et al. (2002) and Lim et al. (2021).

competing theories of the cross-section of post-PIPE returns. The results suggest that private follow-on financing rounds may entail higher abnormal returns if, ceteris paribus, they improve corporate governance via managerial monitoring and if they reduce informational asymmetries.

We extend the existing PIPE literature in two additional ways. First, we check the sensitivity of rent sharing in PIPEs before and after the Jumpstart Our Business Startups (JOBS) Act. As per Barth et al. (2017), the JOBS Act created more uncertainty through increased levels of asymmetric information among a certain class of IPO firms. Therefore, it is reasonable to expect that the asymmetry in rent sharing between newly public firms and private investors increased after the JOBS Act. Indeed, we find that the post-PIPE stock price underperformance is more pronounced in PIPEs of issuers that went public after the JOBS Act's induced increased informational asymmetry. Second, we examine post-PIPE M&A activity. Signori and Vismara (2017) examine M&A activity of newly public firms. In keeping with them, we find that PIPE investor, issuer, and offering characteristics are indicative of whether a PIPE firm becomes a takeover target within 3 years following the PIPE.

This paper is not the first to examine rent sharing between PIPE issuers and investors (e.g., Krishnamurthy et al. 2005; Lim et al. 2021). Lim et al. 's (2021) excellent, recent study reports that PIPE investors hold PIPE stock for an average of 384 days and earn abnormal returns of 19.7% (under the assumption that investors sell 10% of the daily trading volume after the end of the lack-of-marketability (LOM) term), while PIPE issuers experience a stock price change over the holding periods of 3.7%. We contribute to the PIPE literature by extending Lim et al. 's (2021) findings in the following ways. First, like Lim et al. (2021), we also compute returns to investors after the LOM period. However, we sample only from discount-only deals as this allows a more accurate estimation of the LOM term. In more exotic PIPEs, there are legal statutes that complicate the calculation of the LOM term. For example, in PIPEs that involve warrants, the LOM term can be reduced by half if the warrant includes a cashless exercise option, which is undisclosed. Therefore, it is not possible to calculate the correct LOM term for PIPEs that involve warrants, a problem that is avoided in this study and plausibly leads to more accurate estimates. Second, another deviation from Lim et al. (2021) is the way in which we calculate the LOM term. Lim et al. (2021) suggest that the LOM term is also determined by the relative illiquidity. They assume that PIPE investors can sell off 10% (other fractions are also considered) of the daily trading volume without a significant price impact. The crucial difference is that Lim et al. (2021) base the LOM term calculation on the post-PIPE trading volume. However, we argue that the discount compensates PIPE investors for the expected post-PIPE underperformance (Hertzel and Smith 1993; Hertzel et al. 2002). When the discount is negotiated, i.e., pre-PIPE, the investors have to take the pre-PIPE trading volume into account, rather than the post-PIPE trading volume that is unknown at that point in time. Therefore, comparing discount and underperformance requires to calculate the underperformance for the LOM term based on variables taken at the time of the discount negotiation. For this reason, we compute the LOM term based on the pre-PIPE (rather than the post-PIPE as in Lim et al. (2021)) trading volume. Again, this is a contribution in terms of accuracy. Third, a number of competing explanations have been suggested in the PIPEs literature. These explanations include corporate governance, asymmetric information, bargaining power, and managerial entrenchment. No prior study has offered an integrated view that has simultaneously checked for all these variables. For this reason, the present study is the first study that examines the robustness of each explanation when controlling for competing explanations.

The paper also has implications for the going-public decision. Many IPOs are premature.[4] So-called premature IPOs come in two types. *Premature IPOs of Type I* are those that are detected as such and therefore withdrawn. Withdrawal rates are relatively high (Fan and Yamada 2020). Roughly 20% of US IPOs are withdrawn even after registration (Dunbar and Foerster 2008). *Premature IPOs of Type II* are those that are conducted but should have been withdrawn. Estimated post-IPO failure rates give an indication that such transactions are relatively common. Carpentier and Suret (2011) estimate that up to 60% of their

[4] Sometimes, conducting premature IPOs can be rational and optimal, e.g., in "hot" markets (Derrien 2005). Therefore, following an anonymous reviewer's suggestion, I wish to clarify that "prematurely" does not necessarily imply a bad timing of the IPO itself.

2,373 sample Canadian penny stock IPOs over the 1986–2003 period have failed. Given that PIPEs are the main mechanism for public firms to raise equity privately (Lim et al. 2021) and we document that rent sharing between newly public firms and private investors in PIPEs is highly disadvantageous for entrepreneurs, the study's main results may help reduce the number of *premature IPOs of Type II* as the expectation of unfavorable rent sharing in PIPEs may deter such IPOs.

The organization of the paper is as follows. Section 2 discusses theoretical arguments, the institutional context, and develops hypotheses. Section 3 introduces the sample and defines methods and variables, and section 4 presents out empirical results. Section 5 summarizes our findings, and discusses contributions and implications for future research.

2 Theory, background, and hypotheses

2.1 The going-public decision

Why do firms go public? Theories of the going-public decision are diverse. Brau (2012) and Brau and Fawcett (2006) provide an excellent overview. Key tenets of the literature are that IPOs help firms to (i) overcome financing constraints (especially bank borrowing constraints) by providing access to public equity markets (Pagano et al. 1998; ii) reduce asymmetric information via signaling and disclosure (e.g., Leland and Pyle 1977; Dambra et al. 2015; iii) make a profit if shares are overvalued in and out of "hot" markets (Derrien 2005; Altı 2005; iv) disperse ownership (Chemmanur and Fulghieri 1999; v) create a market for insiders, such as VCs, to liquidate the investment (Black and Gilson 1998); and (vi) to use their tradable shares as a currency for future acquisitions, which is the primary motive behind the going-public decision according to Brau and Fawcett (2006).[5]

As Pagano et al. (1998, p. 38) summarize, IPOs enable firms to tap public equity markets and this is "the most cited benefit of going public, which is explicitly or implicitly present in most models." It follows that the research objective of the present study to improve our understanding under what conditions recent-IPO firms are able to raise follow-on equity financing in public markets (or not) is of paramount importance to both managers and academics.

There is also rich survey-based evidence of corporate managers' perceptions of the advantages and disadvantages of IPOs. Results from questionnaires distributed among practitioners reported in Brau (2012) suggest that the key motivations behind IPOs are to raise additional funds for immediate and long-term growth (82.6% and 86.8% of surveyed managers strongly agreed, respectively, in Table 1 Panel A in Brau (2012)), the reduction in cost of capital, and the potential use of public shares as a currency in future acquisitions. Interestingly, there was strong disagreement whether relatively small and relatively young firms should conduct an IPO.

An important aspect of going public is related to the increase in reputation of being a public firm (only one in five respondents disagreed; Brau (2012)), and the access to follow-on financing. In fact, roughly 80% of the responding firms stated the plan to conduct a secondary offering (or at least thought of this possibility) within the first 2 years after the IPO. However, only 10.9% actually conducted a secondary offering (Brau 2012). This discrepancy might be indicative of the biased perception among entrepreneurs of access to public markets post-IPO. As Lim et al. (2021) report, post-IPO firms with market capitalization below $1b are more likely to revert to private markets than to raise equity in public markets, suggesting that many IPOs are "*premature*" and not ready for public markets.

2.2 Premature IPOs

We use "premature IPOs" as an umbrella term in this study to refer to all going-public decisions in which IPO firms are unable to seize the benefits of public markets, such as follow-on public equity financing. These firms typically are young, small, and, in some cases, unprofitable when they go public. Premature IPOs are rarely explicitly examined in the literature, although there are a number of notable

[5] The argument to create markets for insiders to exit may be relatively weak in the recent market context, in which secondary markets have formed for VCs to exit pre-IPO (Andrieu and Groh 2021). Entrepreneurs may also (partially) "exit" the venture via M&A transactions (Meoli et al.). While the economics follow-on financing after an M&A transaction seem also very interesting, acquisitions are beyond the scope of this paper.

Table 1 Sample distribution, 2001–2018

Issuance year	# PIPEs	Venture size ($m)	PIPE size ($m)	PIPE size (%)
2001	63	166.90	10.00	6.87%
2002	178	108.55	8.99	9.19%
2003	65	162.30	14.85	9.85%
2004	64	177.48	18.10	10.53%
2005	78	201.44	20.00	10.29%
2006	89	244.94	21.88	11.66%
2007	83	219.18	18.00	9.42%
2008	74	180.74	16.13	11.18%
2009	77	166.70	15.21	8.68%
2010	73	156.21	14.25	9.15%
2011	96	144.88	17.01	10.96%
2012	85	211.44	18.08	9.79%
2013	94	121.34	14.21	10.21%
2014	115	278.63	19.00	9.11%
2015	128	128.92	10.42	9.37%
2016	142	138.59	12.18	9.72%
2017	143	266.55	20.00	9.83%
2018	21	313.91	11.90	4.50%
Total	**1,668**	**166.69**	**15.00**	**9.65%**

This table shows the sample distribution by issuance year over our 2001–2018 sample period, as well as the median issuing venture and issuance size. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs

exceptions, such as Carpentier et al. (2010) and Carpentier and Suret (2011). These studies sometimes refer to premature IPOs as *penny stock IPOs*, *pre-graduation IPOs*, *Neuer Markt IPOs*, or *microcap IPOs*, but essentially refer to the same underlying concept that most of these firms went public prematurely and are therefore unable to seize the benefits from being public.[6]

Failure rates Premature IPOs are relatively common. Only roughly 80% of scheduled IPOs are eventually conducted (20% are withdrawn after registration) (Fan and Yamada 2020), and of those conducted IPOs many do not survive for long, although estimated survival rates vary. For example, Carpentier and Suret (2011) find that roughly 60% of Canadian penny stock IPOs do not survive in their 1986–2003 sample. The failure rates are higher in younger firms, in firms with negative earnings, in firms with non-prestigious underwriters or auditors, in firms not backed by VCs, and in firms that went public during hot markets. Carpentier and Suret (2011) also highlight that failure (usually measured by a delisting) is not always, but often associated with bankruptcy.

While there are many potential determinants of delisting decisions, such as missing growth opportunities, costs of financial distress, and negative momentum (Marosi and Massoud 2007), it seems that premature IPO-firms delist primarily because of financing concerns. Pour and Lasfer (2013) study going-dark decisions of firms previously listed on the London Stock Exchange's (LSE's) Alternative Investment Market. They attribute the delisting decisions mainly to their inability to raise follow-on financing. This motivates the present study to provide a better understanding as to the precise conditions at which premature-IPO firms are able to raise follow-on financing.

[6] For an excellent study of Neuer Markt IPOs in Germany, see Audretsch and Lehmann (2005, 2008).

2.3 Why do public firms raise follow-on financing privately?

As Iliev and Lowry (2020) show, PIPEs (discussed in the next section) are the primary method for newly public ventures to raise equity privately. The corporate finance literature offers at least two explanations for why public firms raise equity privately, asymmetric information and monitoring/coordination, both of which imply that it would be prohibitively costly for those firms to tap public equity markets.

Asymmetric information and firm quality Wu (2004) and Cronqvist and Nilsson (2005) relate proxies for the level of asymmetric information, such as analyst coverage, trading volume, and firm size, to the external financing choice and report that issuing companies are more likely to place equity privately in the presence of high levels of asymmetric information. Gomes and Phillips (2012) study the dynamics of the external financing choice in a large panel of public firms. They find that firms that have previously placed equity privately switch to public markets when their information asymmetry has decreased, and vice versa. Furthermore, equity (debt) offerings are more likely than debt (equity) offerings in private (public) markets, which Gomes and Phillips (2012) attribute to higher information production incentives for private investors when securities are more information-sensitive. A related argument is that low-quality firms prefer to raise follow-on financing through PIPEs rather than via a public follow-on offering because the private offering helps them to disguise the fact that they are low-quality by maintaining the pre-financing level of asymmetric information.[7]

Contracting and coordination Chaplinsky and Haushalter (2010) argue that PIPEs are relatively attractive to high-risk companies because of the availability of contract terms that are contingent on the issuer's future performance, which may reduce contracting costs related to agency, moral hazard, and adverse selection between the issuing companies and external financiers. Chakraborty and Gantchev (2013) propose that PIPEs may be preferred to SEOs in order to reduce coordination frictions among existing shareholders. More so than SEOs, PIPEs alter shareholder concentration in a way that improves the odds of each existing shareholder that her vote is pivotal to changing firm policy.[8]

2.4 Institutional background: the PIPE market

Private investments in public equity (PIPEs) are placements of (oftentimes restricted) stock by public firms with a small group of sophisticated investors in private transactions (Bernardo et al. 2021; Pinedo and Tanenbaum 2011). While the market is in principle open to any public company, it is most often the small and struggling firms that have not been public for a long time and fail to raise follow-on capital at more favorable terms in public markets (Iliev and Lowry 2020; Lim et al. 2021).

Investors in PIPEs typically are venture capital funds, private equity (i.e., buyout) firms, and hedge funds, sometimes strategic investors as well (Brophy et al. 2009). PIPE investments are high-risk, and therefore unattractive for many other institutional players, such as pension funds. The nature of PIPE firms (i.e., young, struggling, no access to public equity) lets investors dictate the terms (Chaplinsky and Haushalter 2010; Lim et al. 2021). As such, PIPEs are often characterized by high discounts (often in excess of 10% relative to the public market price) and more sophisticated contracting terms, such as price reset and anti-dilution restrictions (Chaplinsky and Haushalter 2010; Bernardo et al. 2021).

The market has evolved rapidly since the going-public wave leading to the dotcom bubble in the late 1990s (for an excellent recent study, also see Andriosopoulos and Panetsidou 2021). While Chakraborty and Gantchev (2013) documents that the portion of PIPEs in overall Seasoned Equity Offerings (SEOs) increased from 4% in 1995 to 27% in 2007, Lim et al. (2021) report that the number of PIPEs now exceeds the number of other SEOs in the market segment of young public companies with market capitalization below $1b. Thus, PIPEs are the primary way by which entrepreneurs that recently went public raise follow-on equity.

Figure 1 illustrates the typical size of the PIPE-issuing company by issuance year over the 2001–2018 period. It provides three insights. First, the median

[7] I thank an anonymous reviewer to point out the related argument.

[8] Moreover, market timing does not seem to explain why public firms raise external finance in private placements. The probability of a public offering is higher if the issuing firm's stock price has recently increased, whereas private placements seem to occur independent of temporary inefficiencies in firm valuation (Gomes and Phillips 2012).

issuing company is relatively small for a public company with a market capitalization of roughly $100m (the dashed line). Second, the average market capitalization of issuing companies is larger, suggesting that larger public firms also raise equity in the PIPE market from time to time. In contrast to younger and smaller firms that populate the PIPE market because they lack alternatives in public markets, larger issuers often use the PIPE market as a way to privately negotiate strategic transactions, such as product alliances, access to or the transfer of intellectual property, or corporate control reallocations (Bernardo et al. 2021). Third, there are spikes in the average but not in the median issuer market capitalization. In particular, larger firms use PIPEs sometimes when public markets freeze, such as during the GFC 2008/9, implying that the PIPE market typically serves as market of "last resort" financing (Brophy et al. 2009).

2.5 Main hypotheses: entrepreneur and investor returns

Newly public firms that raise follow-on financing privately often are in deep financial distress (Brophy et al. 2009). They need to raise equity at an additional cost of 10–20% of the issuance size in the form of discounts to attract so-called investors of last resort (Lim et al. 2021; Brophy et al. 2009). The fact that these institutional investors that are typically specialized on high-risk investments in small, young, and sometimes unprofitable companies are only willing to participate at a high discount may indicate that the short- to medium-term prospects of the issuing entrepreneurs are negative.[9]

PIPE investors often commit to certain resale restrictions that ensure the entrepreneur that the investors do not pocket the discount and then sell the stock, creating further downward price pressure (Bernardo et al. 2021). However, the combination of discount and resale restrictions creates adverse incentives to PIPE investors. Their realizable return increases in the discount and decreases in the length of the resale restriction (Lim et al. 2021). Thus, they have an economic incentive to exit the investment as quickly as possible.

[9] The study by Hertzel et al. (2002) supports this view, although it does not disentangle entrepreneur and investor returns.

These incentive problems are further established in the private placement literature. Krishnamurthy et al. (2005) find that, conditional on financial distress levels, PIPEs that did not involve officers, directors, and affiliated institutions underperform, which they argue could be related to an absent (but expected) certification effect of insider participation in PIPEs. Barclay et al. (2007) show that PIPEs with passive investors experience lower stock returns than PIPEs involving change of control, active or managerial investors. In a similar vein, Wruck and Wu (2009) find that PIPEs that do not form new governance-improving relationship entail lower stock returns. In line with the overall argument, a number of studies document that issuing entrepreneurs that resort to hedge funds experience the poorest post-PIPE stock performance (Dai 2007; Brophy et al. 2009; Billett et al. 2015; Lim et al. 2021).

Taken together, newly public ventures that raise follow-on financing privately are expected to destroy shareholder value in the post-financing period because of the adverse incentives in private transactions.

H1: *Post-PIPE abnormal returns to entrepreneurs are negative (value-destruction hypothesis).*

The relative distribution of bargaining power in PIPE transactions is strongly skewed in favor of the investors. This is because public entrepreneurs signal with private transactions that they have currently not (or at least not at reasonable terms) access to public equity markets (Gomes and Phillips 2012). Given a financing gap, entrepreneurs have no other option to survive than the PIPE, and investors are therefore able to dictate the deal terms. In addition, investors transact in the knowledge that they provide short-term emergency liquidity, and, as Kim and Bettis (2014, p. 2053) put it, "cash is surprisingly valuable as a strategic asset" in crises situations. Liquidity provides entrepreneurs with going-concern real option value, which help justify entrepreneurs' decisions to engage in transactions that would otherwise seem highly unattractive.

There are a number of other factors that suggest that investors do not lose in PIPEs. First, public entrepreneurs raising follow-on financing privately typically face economic distress. Restructuring-experienced PIPE investors often promise to help turn-around these firms and reconnect them to public equity markets by improving corporate governance (although this is often a claimed benefit of PIPE investors, we

show in Section 4.2.4 that the involvement of active investors do not lead to better PIPE stock performance than that of passive investors.) These value-adding services may entitle the investor to extract turn-around rents (Wruck 1989; Wruck and Wu 2009).

Second, public entrepreneurs needing to raise equity privately typically suffer from salient information asymmetries, which make public equity prohibitively costly (Gomes and Phillips 2012). PIPE investors are known by the market to have skills, experience, and resources to conduct a due diligence and determine whether and at what terms a public entrepreneur is investment-worthy. Thus, investors may provide a "certification service" to the entrepreneur, for which investors are able to extract information-production rents (Hertzel and Smith 1993).

Overall, investor returns are expected to be non-negative in the period after a public entrepreneur has raised follow-on financing privately because of the superior bargaining power.

H2: *Post-PIPE abnormal returns to investors are non-negative (wealth-transfer hypothesis).*

In addition to our two primary empirical predictions, we also test four potential channels for the performance differences that broadly relate to theories of corporate governance, asymmetric information, bargaining power, and managerial entrenchment. We discuss these channels in the results section. In particular, prior work suggests that post-PIPE abnormal returns might be higher (i) if the offering improves corporate governance, (ii) if the offering reduces information asymmetries, (iii) in the presence of higher bargaining power, and (iv) with activist investor participation.

3 Data

3.1 Sample construction

Our sample comes from the *PrivateRaise* database. We start with all PIPEs with issuance amount>$1m over the 2001–2018 period, and exclude certain deals (i.e., 144As and confidentially marketed public offerings). We sample only from PIPEs involving non-affiliated investors and reporting issuers pursuant to the 1934 Exchange Act that are closed. We also restrict our sample to discount-only deals involving common stocks, thereby excluding those with fixed purchase conversion prices and warrants. Moreover, we define "premature IPO" firms as those that raised follow-on financing through PIPEs in private rather than in public markets after the IPO.

PrivateRaise contains detailed information about contract terms and investors in each PIPE transaction. When not available from *PrivateRaise*, we manually searched SEC's *Edgar* database and the issuing companies' press announcements. Other variables, such as issuer characteristics, come from CRSP, Compustat, and Form 8-K filings.

Our final sample contains 1,668 PIPE transactions.

3.2 Sample distribution

Table 1 summarizes the sample distribution by issuance year. It is relatively even over our sample period and resembles that in Lim et al. (2021). The median issuer market capitalization over the 2001–2018 sample period is $167m and the median issuance amount is $15m. This corresponds to a relative offering size of roughly 10%.

3.3 Variables

3.3.1 Return measures

Our key outcome variables are abnormal returns to ventures and investors. We measure returns in several ways.

First, we employ the buy-and-hold approach in two ways.

1. **Buy-and-hold return relative** (**BHRR**). Following Brophy et al. (2009), we compute BHRR as the return relative for PIPE company i at time t is defined as $RR_{it} = \prod_{s=-250}^{t}(1 + R_{is})$. The average buy-and-hold return relative is normalized to one on the closing day.
2. **Buy-and-hold abnormal return** (**BHAR**). We compute BHARs by implementing Barber and Lyon 's (1997) single-control-firm approach. That is, we benchmark the discount-adjusted performance for each PIPE company by identifying a matching control firm by industry, market capitalization, and book-to-market ratio in the most recent reporting period prior to the PIPE.

Second, we estimate pricing errors (**alphas**) from Fama and French 's (2015) five-factor model (and from one- and three-factor models) to address common concerns that BHARs fail to account for all

cross-sectional dependencies in returns (Fama 1998; Mitchell and Stafford 2000). Our equally weighted calendar-time portfolios include all PIPE companies for the number of trading days it takes to liquidate a position starting on the closing day.[10] All results are robust to examining weekly instead of daily returns.

These various return estimates differ for ventures and investors. Unlike for ventures, the realizable investor return depends also on the discount at which the stock was purchased in the private financing round and the non-marketability and relative illiquidity terms that have to be taken into account until an investor can exit the PIPE position (Bernardo et al. 2021). Specifically, the entrepreneur return is measured as the difference in the prices for various (arbitrary) holding periods. In contrast, the inventor return is measured as the relative price difference adjusted for the discount over the investor's expected investment horizon. The investor's expected investment horizon is measured as the sum of the non-marketability period pursuant to resale registration covenants or SEC Rule 144 and the subsequent relative illiquidity period. The subsequent relative illiquidity period is measured as the time it takes to sell the PIPE stock assuming that investors can sell at most 10% of the daily trading volume on any given day.

3.3.2 *Proxies for theories of public firms' private financing motives*

Finally, we construct proxies for motives behind PIPEs proposed in prior research to be able to examine their role in the cross-section of entrpereneur and investor returns. Specifically, we construct (i) monitoring and coordination proxies from I/B/E/S International, CRSP, and Compustat data (Chakraborty and Gantchev 2013; Wu 2004; Wruck 1989; ii) asymmetric information proxies from Thomson Reuters 13F data (Wruck 1989; Wu 2004; Hertzel and Smith 1993; Chakraborty and Gantchev 2013; iii) bargaining power proxies from Compustat data (Brophy et al. 2009; Chaplinsky and Haushalter 2010); and (iv) managerial entrenchment proxies from Schedule 13D and 13G filings on the SEC's Edgar database (Barclay et al. 2007; Wruck and Wu 2009).

Monitoring and coordination To measure for monitoring levels, we follow Wruck (1989) and obtain for each issuer the level (in %) of institutional ownership from Thomson Reuters Institutional Holdings (13F) database prior to the focal PIPE transaction. Additionally, we compute the average investment horizon of institutional investors for each PIPE issuer (Gaspar et al. 2005). This requires merging Thomson Reuters 13F database with the International Funds database (also part of FactSet's LionShares database). Therefore, we aggregate the fund-level observations in the International Funds database at the institution level and restrict observations to equity securities held by institutional investors. For each institutional investor, we compute the investment horizon by averaging the fractions of portfolio holdings bought or sold over the last 6 months. This measure is annualized by averaging two consecutive observation periods. Finally, for each PIPE issuer, we obtain the weighted average churn rate (WACR) by weighting each institutional investor's investment horizon by its equity share in the firm prior to the PIPE issue.

Moreover, we proxy for coordination frictions among existing shareholders in their choice of firm policy by using the Shapley value from the generalized pivotal player approach for infinite-person games (Milnor and Shapley 1978, as applied to the PIPE context by Chakraborty and Gantchev (2013)). The Shapley value of a current institutional investor (who holds at least 3% of a PIPE firm's outstanding shares) is defined as the probability that, in a randomly permuted ordering of all investors, the shareholder and her predecessors together, but her predecessors alone do not, have a majority vote. Chakraborty and Gantchev (2013) argue that the Shapley value is a better proxy than the Herfindahl index of equity holders for the value of control rights and shareholder concentration (for a detailed discussion, see Chakraborty and Gantchev (2013), section 2.2).

Asymmetric information Chemmanur and Fulghieri (1999); Hertzel and Smith (1993); Gomes and Phillips (2012), and Wu (2004) argue that asymmetric information drives the choice of public firms to issue equity privately. For example, Hertzel and Smith (1993) argue that private placement discounts compensate investors for information production (e.g., due diligence efforts) and

[10] Our method follows Lim et al. (2021) who assume that investors sell at most 10% of the daily trading volume at any given day measured after the holding period. We differ from Lim et al. (2021), however, in that we compute the investment horizon based on the pre-issuance trading volume. We argue that the returns over the expected investment horizon are what investors have in mind when they negotiate discounts.

Table 2 Summary statistics

Issuance year	Mean	SD	Q1	Median	Q3
Panel A: issuer and issuance size					
Issuer's market capitalization (in $m)	528.47	979.45	68.86	166.67	435.03
Issuance amount (in $m)	49.07	132.08	5.67	15.00	39.84
Relative issuance size	0.144	0.194	0.051	0.096	0.163
Panel B: additional variables					
Institutional ownership	0.393	0.279	0.143	0.369	0.612
Weighted-average churn rate	0.395	0.133	0.310	0.382	0.483
Equity Shapley value	0.071	0.052	0.027	0.063	0.101
Analyst coverage	20.673	26.287	6	13.00	27
Trading volume	23.621	125.376	2.037	5.716	13.182
Asset tangibility	0.465	0.471	0.122	0.317	0.756
Financial distress	0.472	0.499	0	0	1
Market-to-book	3.322	2.776	1.500	2.226	3.940
Active investor	0.197	0.398	0	0	0
Passive investor	0.345	0.475	0	0	1

This table presents summary statistics for our 2001–2018 sample. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs

certifying firm quality to other outside investors. In line with these studies, we use analyst coverage, trading volume, and asset tangibility to proxy for asymmetric information. Analyst coverage data comes from the I/B/E/S International database and reports the number of analysts following a particular firm on an annual basis. Trading volume data is taken from CRSP and the OTC Markets Group, and divided by the average number of outstanding shares in the year prior to the PIPE announcement. Asset tangibility is proxied for by the ratio of plants, property, and equipment to total assets in the year prior to the PIPE transaction based on Compustat records.

Bargaining power Brophy et al. (2009) and Chaplinsky and Haushalter (2010) relate PIPE discounts as complex financial contracting outcomes to issuing firms' bargaining power. They show that investors assert higher discounts from distressed firms or firms with low market-to-book ratios. We use Compustat data and define firms to be distressed if they report negative EBIT for the two consecutive years prior to the PIPE transaction year. The market-to-book (M2B) ratio is defined based on total assets in the year prior to the PIPE offering.

Managerial entrenchment Barclay et al. (2007) find that managerial entrenchment helps explain several outcomes in the PIPE market. They argue that agency-motivated managers will likely avoid activist investor involvement in PIPEs and instead favor investors that facilitate increasing managerial entrenchment levels. We proxy for managerial entrenchment in two ways. First, we use Item 5 reporting in 8-K filings in the SEC's *Edgar* database to identify deals that entail a change of control. Such deals create a new blockholder (holding more than 5% of the outstanding shares) in the PIPE firm. Second, we use Schedule 13-D and 13-G filings on *Edgar* to distinguish between active and passive investors that enter the issuing firm through the PIPE transaction.

3.4 Summary statistics

Summary statistics are in Table 2. Panel A shows that the mean (median) issuer has a market capitalization of $528m ($167m) and raises $49m ($15m) in private follow-on financing transactions. This corresponds to a relative deal size of 14.4% (9.6%). Panel B shows summary statistics for several proxies of theories for public firms' private financing motives, which we discuss below when we examine the cross-sectional determinants of post-financing returns.

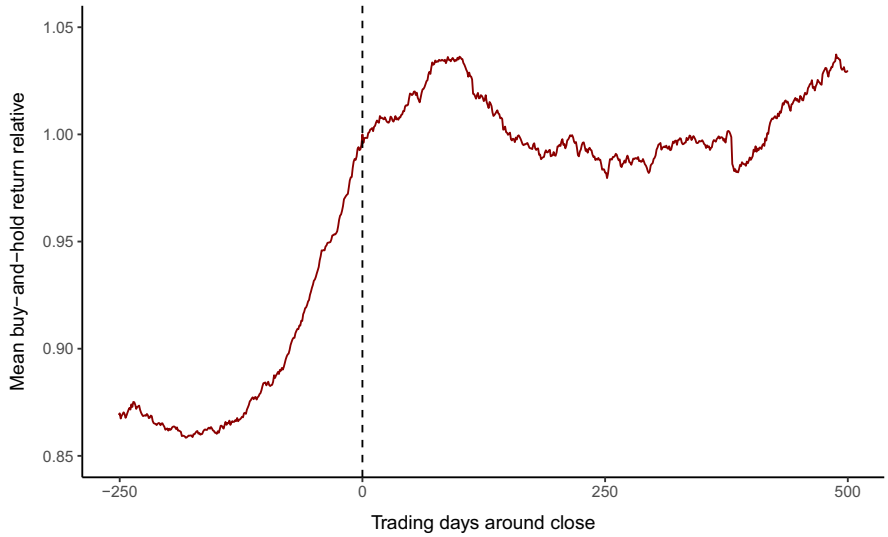

Fig. 2 Buy-and-hold return relatives. These are buy-and-hold return relatives (BHRR) for the period [−250, 500] days around the PIPE closing date. Following Brophy et al. (2009), we compute BHRR as the return relative for PIPE company i at time t is defined as $RR_{it} = \prod_{s=-250}^{t}(1 + R_{is})$. The average buy-and-hold return relative is normalized to one on the closing day

Table 3 Abnormal returns to entrepreneurs, 2001–2018

Alpha (firms)	1.17%***	1.41%	−1.44%	−2.70%	−13.75%***	−14.71%***	−8.11%**
[T-stat]	[3.40]	[1.24]	[−0.78]	[−0.99]	[−3.33]	[−3.65]	[−2.09]
Matched	✓	✓	✓	✓	.	.	.
MKT	.	.	.	.	✓	✓	✓
SMB	.	.	.	.	.	✓	✓
HML	.	.	.	.	.	✓	✓
RMW	.	.	.	.	.	.	✓
CMA	.	.	.	.	.	.	✓
Measurement approach	BHAR	BHAR	BHAR	BHAR	CAPM	FF* (1993)	FF* (2015)
Measurement period, in days	[−4, 5]	[0, 100]	[0,250]	[0,500]	.	.	.
Measurement term (post-PIPE)	.	.	.	.	p.a.	p.a.	p.a.

** FF stands for Fama and French*

These are abnormal return estimates for the entrepreneur. Columns (1)–(4) estimate buy-and-hold abnormal returns (BHARs). We compute BHARs by implementing Barber and Lyon 's (1997) single-control-firm approach. That is, we benchmark the discount-adjusted performance for each PIPE company by identifying a matching control firm by industry, market capitalization, and book-to-market ratio in the most recent reporting period prior to the PIPE. BHARs are shown for the [−4, 5], [0, 100], [0, 250], and [0, 500] event windows (in days) with respect to the closing day. Columns (5)–(7) show pricing errors (alphas) from the CAPM, Fama and French (1993) three-factor and Fama and French (2015) five-factor models. The pricing errors are the preferred measure of abnormal returns in our context because they, unlike BHARs, control for common variation in risk premia (Fama 1998; Mitchell and Stafford 2000). Pricing errors are annualized. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

4 Empirical results

4.1 Main results

4.1.1 Entrepreneur returns

Figure 2 shows average BHRRs for the [−250, 500] period in days around the closing date of the PIPE. There is a surge in BHRRs in the period shortly before the PIPE. However, average BHRRs do not increase in the 2 years following the PIPE. Given that stock markets appreciate on average by 7% per annum, the evidence in Figure 2 may be a first indication of underperforming entrepreneurs.

We formally test whether entrepreneurs are underperforming by estimating risk-adjusted abnormal

returns in Table 3. We measure abnormal returns both in terms of BHARs (Barber and Lyon 1997) and with various Fama and French (1993, 2015) factor models. BHARs are measured for the [−4, 5], [0, 100], [0, 250], and [0, 500] event windows (in days) with respect to the closing day. Following Brophy et al. (2009), we implement Barber and Lyon 's (1997) single-control-firm approach to benchmark performance for each entrepreneur by identifying a matching control entrepreneur by industry, market capitalization, and book-to-market ratio in the most recent reporting period prior to the PIPE date. Short-term returns are positive (1.17%) and statistically significant at the 1% level. This is in line with Wruck (1989); Hertzel and Smith (1993) who show that shareholders are relieved and react favorably when a deal is closed. However, the estimates for the [0, 100], [0, 250], and [0, 500] event windows are not statistically significant.

These longer-term BHARs, however, are subject to the important concerns that they fail to account for all cross-sectional dependencies in returns as they do not control for common variation in risk premia (Fama 1998; Mitchell and Stafford 2000). Thus, the pricing errors from the Fama-French factor models should be the preferred measure of risk-adjusted abnormal returns. This may be of paramount importance in the present entrepreneurial context, as Fama-French risk factors, such as SMB and HML, may be particularly relevant for the risk adjustment.

We estimate pricing errors (alphas) from the CAPM, and Fama and French (2015, 1993) three- and five-factor models. Our equally weighted calendar-time portfolios include all PIPE companies for the number of trading days it takes to liquidate a position starting on the closing day. Our method follows Lim et al. (2021) who assume that investors sell at most 10% of the daily trading volume at any given day.[11] All results are robust to examining weekly instead of daily returns.

Indeed, annualized Fama-French pricing errors (alphas) from one- three-, and five-factor models suggest that, on average, entrepreneurs underperform by −13.75%, 14.71%, and 8.11%, respectively, during the post-PIPE year. The estimates are consistent with other recent estimates (e.g., Brophy et al. 2009; Lim et al. 2021). The results are also consistent with the broader private placement literatre (Hertzel et al. 2002). Although the significant entrepreneurial underperformance is puzzling, post-issue underperformance is also documented in other issuing contexts (e.g., Loughran and Ritter 1995).

Overall, the results support **H1** that newly public ventures are worse off if they need to raise follow-on financing in private capital markets.

4.1.2 Investor returns

Inventor returns may substantially differ from entrepreneur returns for two reasons. First, inventors demand high discounts for their participation and, second, they also negotiate other terms that hedges them against price depreciation, such as resale covenants. Examining discount- and holding-period-adjusted returns is key to disentangle the performance for the investor from the general stock price performance of the issuing venture. Thus, investors should not lose as much value as entrepreneurs. In fact, **H2** posits that investors actually do not lose at all in PIPEs.

BHARs account for the initial PIPE discount and are computed for the approximated expected investment horizon, assuming that PIPE investors exit their investments with a minimum detrimental price impact strategy.[12]

Table 4 presents the abnormal returns to investor over their expected post-PIPE investment horizon. Investors face an average expected investment horizon of 263 days in our sample. They earn an average discount-adjusted and holding-period-adjusted BHAR of 3.15% (t-statistic = 2.18), statistically significant at the 5% level.[13]

We contrast the average estimated BHARs with pricing errors (alphas) from the CAPM and Fama

[11] We differ from Lim et al. (2021), however, in that we compute the investment horizon based on the pre-issuance trading volume. We argue that the returns over the expected investment horizon are what investors have in mind when they negotiate discounts.

[12] Again, our method follows Lim et al. (2021) who assume that investors sell at most 10% of the daily trading volume at any given day measured after the holding period. We differ from Lim, Schwert, and Weisbach (2019), however, in that we compute the expected investment horizon based on the pre-PIPE trading volume. We argue that the returns over the expected investment horizon are what investors have in mind when they negotiate discounts.

[13] These estimates exclude registered direct offerings, which can be freely sold immediately post issuance, and OTC issuers whose stocks are sometimes subject to trading in very thin markets. These restrictions are in line with most prior research on PIPEs (e.g., Lim et al.).

Table 4 Abnormal returns to investors, 2001–2018

Alpha (investors)	3.15%**	−3.17%	−4.10%	2.87%
[T−*stat*]	[2.18]	[−0.64]	[−0.85]	[0.61]
Matched	✓	.	.	.
MKT	.	✓	✓	✓
SMB	.	.	✓	✓
HML	.	.	✓	✓
RMW	.	.	.	✓
CMA	.	.	.	✓
Measurement approach	BHAR	CAPM	FF* (1993)	FF* (2015)
Average investment horizon = 263 days				

** FF stands for Fama and French*

These are abnormal return estimates for the investors (i.e., discount-adjusted) over their investment horizon. The investment horizon is defined in Section 3.3.1. Column (1) estimates buy-and-hold abnormal returns (BHARs). We compute BHARs by implementing Barber and Lyon 's (1997) single-control-firm approach. That is, we benchmark the discount-adjusted performance for each PIPE company by identifying a matching control firm by industry, market capitalization, and book-to-market ratio in the most recent reporting period prior to the PIPE. BHARs are shown for the [−4, 5], [0, 100], [0, 250], and [0, 500] event windows (in days) with respect to the closing day. Columns (2)–(4) show pricing errors (alphas) from the CAPM, Fama and French (1993) three-factor and Fama and French (2015) five-factor models. The pricing errors are the preferred measure of abnormal returns in our context because they, unlike BHARs, control for common variation in risk premia (Fama 1998; Mitchell and Stafford 2000). Pricing errors are annualized. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

and French (1993, 2015) three- and five-factor models to control for common variation in risk premia. Our equally weighted calendar-time portfolios include all PIPE issuing entrepreneurs for the number of trading days it takes to liquidate a position (i.e., taken into account the minimum investment horizon and the minimum detrimental price impact exit strategy) starting on the closing day. All results are robust to examining weekly instead of daily returns.

Investors with an equally weighted portfolio (including all PIPE issuances) who exit their positions as soon as possible after the minimum holding period has elapsed make an insignificant discount- and holding-period-adjusted excess return (five-factor alpha = 2.87%, *t*-statistic = 0.61). The alphas support the conjecture that investors do not lose money in PIPEs. In fact, all three Fama-French factor models lead to statistically nonsignificant pricing errors.

Overall, the evidence in Table 4 partially supports **H2** that investors are better off in PIPEs than entrepreneurs. The finding is surprising insofar as it suggests highly asymmetric rent sharing in newly public ventures' private financing rounds.

4.2 Additional results

We now examine whether these results differ in the cross-section. Specifically, we test four theories frequently put forth in the entrepreneurial and corporate finance literature. Figure 3 presents BHRRs for eight sub-portfolios, depicting daily BHRRs for the [−250, 500] event window (in days) relative to the closing date of the PIPE transaction and normalized to one on the closing day.[14] We sort entrepreneurs into high/low portfolios according to the level of institutional ownership (a proxy for corporate governance), analyst coverage (a proxy for asymmetric information), financial distress (a proxy for bargaining power), and activist investor involvement (a proxy for managerial entrenchment). The graphs indicate that there are theory-consistent cross-sectional differences. Specifically, entrepreneurs with high institutional ownership (e.g., Wruck 1989), high analyst coverage (e.g., Wu

[14] Following Brophy et al. (2009), the return relative for PIPE company *i* at time *t* is defined as $RR_{it} = \prod_{s=-250}^{t}(1 + R_{is})$.

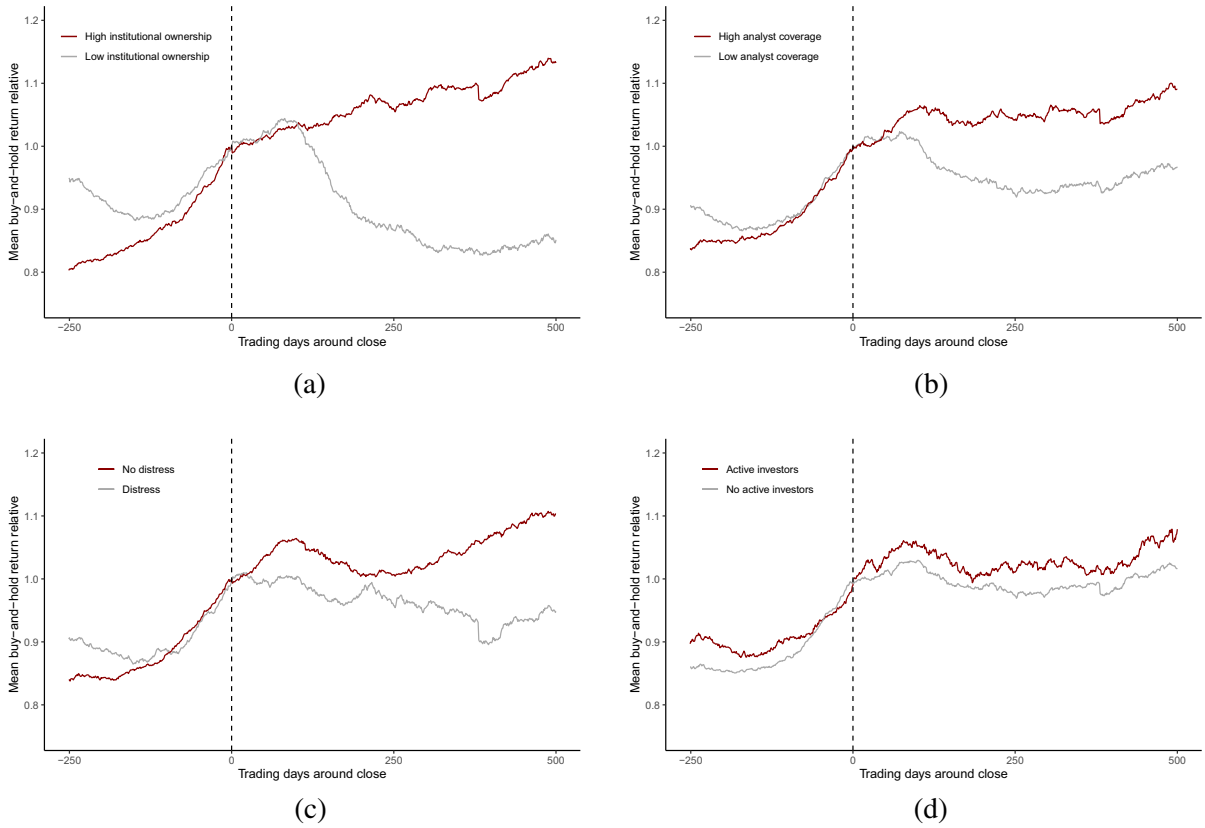

Fig. 3 Buy-and-hold return relatives for sub-portfolios. These are buy-and-hold return relatives (BHRR) for the period [−250, 500] days around the PIPE closing date for various sub-portfolios. Panels **a**, **b**, **c**, and **d** show BHRRs for high- vs. low-portfolios based on levels of institutional ownership, analyst coverage, financial distress, and activist investor involvement. The variables to construct the sub-portfolios are described in Section 3.3.2. Following Brophy et al. (2009), we compute BHRR as the return relative for PIPE company i at time t is defined as $RR_{it} = \prod_{s=-250}^{t}(1 + R_{is})$. The average buy-and-hold return relative is normalized to one on the closing day

2004), healthy financials (e.g., Brophy et al. 2009), and active investors (e.g., Barclay et al. 2007) seem to outperform their peers. However, the magnitude of the performance differentials varies across panels. Entrepreneurs with relatively high institutional ownership outperform their peers the most, while BHRRs for issuers with active investors is only slightly higher than those of firms without active investor participation. Next, we test whether these differences are robust to different risk adjustments.

The key findings of the next subsections are as follows:

- For *entrepreneurs*, the returns are significantly negative for high and low portfolios
- The high- and low-portfolio returns for *entrepreneurs* are statistically different only for those formed on analyst coverage (a proxy for asymmetric information), suggesting that a successful PIPE may signal certification of the underlying venture to market participants
- For *investors*, the portfolio returns are neither statistically different from zero nor statistically different from each other (in a low- vs. high-portfolio comparison)
- The latter finding is striking and may indicate that *investors* are able to efficiently negotiate discounts and investment horizons that guarantee them a fair return. Their fair return does not appear to be contingent on their role (e.g., being an activist inves-

Table 5 The corporate governance mechanism (institutional ownership)

	Entrepreneur returns			Investor returns		
	High	Low	Δ	High	Low	Δ
CAPM α (p.a.)	−13.68%***	−18.60%***	4.92%	−1.46%	−10.48%	9.02%
[*T*-stat]	[−3.41]	[−3.78]	[0.77]	[−0.30]	[−1.25]	[0.93]
FF 3-factor α (p.a.)	−14.26%***	−20.22%***	5.96%	−1.84%	−12.45%	10.61%
[*T*-stat]	[−3.65]	[−4.19]	[0.96]	[−0.38]	[−1.49]	[1.10]
FF 5-factor α (p.a.)	−6.77%*	−14.46%***	7.69%	5.63%	−6.27%	11.90%
[*T*-stat]	[−1.82]	[−3.03]	[1.27]	[1.20]	[−0.75]	[1.24]

These are abnormal returns to entrepreneurs (columns (1)–(3)) and investors (columns (4)–(6)) based on annualized pricing errors (alphas) from Fama-French factor models, as described in Table 3 and Table 4, respectively. The alphas are computed for high- and low-portfolios based on the institutional ownership variable, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

tor or improving corporate governance via entrepreneurial monitoring).

4.2.1 Corporate governance

Table 5 contains abnormal returns for various high- and low-portfolios formed on the corporate governance proxy (i.e., based on below- and above-median institutional ownership). Wruck 's (1989) theory suggests that high-institutional ownership entrepreneurs perform better (also see Bertoni and Giudici 2014 and Bonaventura et al. 2018, for strategic considerations in IPO share allocation). While Wruck 's (1989) conjecture seems to be correct in terms of the portfolio returns' magnitude, the differences between high- and low-portfolios are never statistically significantly different.

Entrepreneur returns are consistently negative for both high- and low-portfolios, no matter whether estimated by the CAPM or Fama-French three- or five-factor models. Their risk-adjusted returns range from −6.77% (*T*-statistic = −1.82) to −20.22% (*T*-statistic = −4.19). Strikingly, investor returns are never statistically significant, neither in sub-portfolio nor the difference between high- and low-portfolios. This suggests that the average investor is always able to negotiate favorable deal terms, both in good and in poor corporate governance ventures.

4.2.2 Asymmetric information

Table 6 contains abnormal returns for various high- and low-portfolios formed on the asymmetric information proxy (i.e., based on below- and above-median analyst coverage). Work by Hertzel and Smith (1993) and Wu (2004) suggests that firms with salient information asymmetries may benefit from these transactions (vis-á-vis public transactions) because sophisticated PIPE investors may "certify" the quality of the underlying venture to the market by participating in the deal. The notion is that sophisticated PIPE investors have both skills and resources to conduct a thorough due diligence and assess the venture's true value.

In our sample, entrepreneur returns in high- vs. low-asymmetric information portfolios are statistically significant, at least at the 10% level. The difference ranges from 7.69 to 11.79%, indicating that the venture's post-PIPE underperformance is at least 7.69% smaller when the issuing entrepreneur is of the high-asymmetric information type.

Again, and surprisingly in the light of the difference in portfolio returns for the entrepreneurs, investor returns are mostly statistically non-significant. This is consistent with the notion that it does not matter for investors whether they invest in high- or low-asymmetric information ventures. Their superior position enables them to negotiate favorable terms with any issuer type.

Table 6 The asymmetric information mechanism (analyst coverage)

	Entrepreneur returns			Investor returns		
	High	Low	Δ	High	Low	Δ
CAPM α (p.a.)	−9.59%**	−21.24%***	11.65%*	−0.85%	−9.28%	8.43%
[*T*-stat]	[−2.34]	[−4.62]	[1.89]	[−0.16]	[−1.44]	[1.01]
FF 3-factor α (p.a.)	−10.54%***	−22.33%***	11.79%*	−1.31%	−10.79%*	9.48%
[*T*-stat]	[−2.61]	[−4.98]	[1.95]	[−0.24]	[−1.70]	[1.13]
FF 5-factor α (p.a.)	−6.77%*	−14.46%***	7.69%*	5.38%	−3.38%	8.76%
[*T*-stat]	[−1.11]	[−3.45]	[1.81]	[1.01]	[−0.54]	[1.07]

These are abnormal returns to entrepreneurs (columns (1)–(3)) and investors (columns (4)–(6)) based on annualized pricing errors (alphas) from Fama-French factor models, as described in Table 3 and Table 4, respectively. The alphas are computed for high- and low-portfolios based on the analyst coverage variable, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

Table 7 The bargaining power mechanism (financial distress)

	Entrepreneur returns			Investor returns		
	Yes	No	Δ	Yes	No	Δ
CAPM α (p.a.)	−17.91%***	−12.06%***	−5.85%	−7.93%	−1.09%	−6.84%
[*T*-stat]	[−3.47]	[−3.37]	[−0.93]	[−1.04]	[−0.21]	[−0.74]
FF 3-factor α (p.a.)	−18.40%***	−13.78%***	−4.62%	−8.01%	−2.92%	−5.09%
[*T*-stat]	[−3.67]	[−3.93]	[−0.76]	[−1.07]	[−0.57]	[−0.56]
FF 5-factor α (p.a.)	−9.82%**	−9.10%***	−0.72%	0.69%	2.12%	−1.43%
[*T*-stat]	[−2.04]	[−2.64]	[−0.12]	[0.09]	[0.41]	[−0.15]

These are abnormal returns to entrepreneurs (columns (1)–(3)) and investors (columns (4)–(6)) based on annualized pricing errors (alphas) from Fama-French factor models, as described in Table 3 and Table 4, respectively. The alphas are computed for high- and low-portfolios based on the financial distress variable, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

4.2.3 Bargaining power

Abnormal returns for various high- and low-portfolios formed on the bargaining power proxy (i.e., based on below- and above-median financial distress) are in Table 7. Recent work by Brophy et al. (2009) and Lim et al. (2021) suggests that bargaining power may be a key determinant of the return distribution in PIPEs. Our results support this view.

Entrepreneur returns are significantly negative both in high- and in low-bargaining power ventures. Ventures with low bargaining power underperform by 9.82 to 18.40%, depending on the risk adjustment method and statistically significant at least at the 5% level. Similarly, ventures with high bargaining power underperform by 9.10 to 13.78%, statistically significant at least at the 1% level. The difference in these portfolio returns is not statistically significant.

Again, investor returns are statistically insignificant. This further corroborates the conjecture that investors are able to dictate terms in entrepreneurial post-IPO follow-on financing campaigns in private markets. Investors never lose money, no matter whether they transact with entrepreneurs with relatively high or low bargaining power. The comparison between entrepreneur and investor returns adds important novel insights to the existing literature that used to focus on investor returns (e.g., Brophy et al. 2009).

Table 8 The activist investors mechanism

	Entrepreneur returns			Investor returns		
	Yes	No	Δ	Yes	No	Δ
CAPM α (p.a.)	−5.91%	−16.25%***	10.34%	−0.88%	−5.55%	4.67%
[*T*-stat]	[−1.06]	[−4.01]	[1.50]	[−0.09]	[−1.07]	[0.42]
FF 3-factor α (p.a.)	−7.64%	−17.13%***	9.49%	−1.65%	−6.28%	4.63%
[*T*-stat]	[−1.39]	[−4.35]	[1.40]	[−0.17]	[−1.23]	[0.42]
FF 5-factor α (p.a.)	−3.89%	− 9.94%***	6.05%	2.03%	1.00%	1.03%
[*T*-stat]	[−0.71]	[−2.64]	[0.91]	[0.21]	[0.20]	[0.09]

These are abnormal returns to entrepreneurs (columns (1)–(3)) and investors (columns (4)–(6)) based on annualized pricing errors (alphas) from Fama-French factor models, as described in Table 3 and Table 4, respectively. The alphas are computed for high- and low-portfolios based on the activist investor variable, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

4.2.4 Activist investor

The final mechanism that may explain abnormal returns in the cross-section relates to managerial entrenchment, or, more specifically, to activist investor involvement. Barclay et al. (2007) first proposed that managerial entrenchment may be an important motive in private placements, and that activist investors may reduce entrenchment-related agency costs, which should lead to superior post-issue performance. Table 8 shows abnormal returns for various high- and low-portfolios formed on the managerial entrenchment proxy (i.e., based on whether or not an activist investor that identifies as such through a mandatory SEC schedule 13-type filing participates in the PIPE).

Consistent with theory, we find that PIPEs with activist investor participation do not underperform, no matter the risk adjustment method. In contrast, PIPEs without activist investor participation significantly underperform by −9.94% and −17.13%. Yet, the difference is not statistically significant, arguably because of high volatility in the market segment for public entrepreneurial companies that are not able to raise financing in public markets.

Furthermore, in line with our previous observations for the other portfolios, investor returns are never statistically significant. The finding is delicate because investors are obliged by the SEC to file with them whether they choose to be an active or a passive investor. The insignificant return difference between these two investor types suggests that the value from bringing on board an active investor (who may demand higher offering discounts in return for her post-offering involvement) may, on average, *not* be worth it.

4.3 Robustness

Several sensitivity checks indicate that our results are consistent with alternative specifications. Table 9 presents regression results of the determinants of the returns to entrepreneurs, while Table 10 contains analogous results for the returns to investors.

Specifically, we test additional determinants (beyond those in the portfolio analyses) that have been proposed in the literature. For the corporate governance mechanism, we control for the weighted-average churn rate of investors (Döring et al. 2021) and the equity Shapley value (Chakraborty and Gantchev 2013) in addition to the institutional ownership variable (Wruck 1989). For the asymmetric information channel, we control for the trading volume and asset tangibility (Wu 2004) in addition for analyst overage (Hertzel and Smith 1993). For the bargaining power mechanism, we control for market-to-book (Lim et al. 2021) in addition to the financial distress variable (Brophy et al. 2009). For managerial entrenchment, we include both activist and passive investor (Barclay et al. 2007).

Table 9 presents abnormal returns to entrepreneurs for various event windows, including the announcement window [−4,5] as well as the longer post-financing windows [0,100], [0,250], and [0,500]. The

Table 9 Determinants of entrepreneur returns

Dependent variable:	Entrepreneur returns, in %			
Event window:	[−4, 5]	[0, 100]	[0, 250]	[0, 500]
Panel A: corporate governance				
Institutional ownership	2.66	17.72***	27.97***	36.59***
	(1.93)	(5.69)	(9.20)	(13.15)
WACR	0.41	−10.93	−15.76	−27.23
	(3.20)	(9.45)	(15.28)	(21.83)
Equity Shapley value	9.24	−56.38**	−24.82	−45.85
	(8.89)	(26.22)	(42.41)	(60.60)
(Adjusted R^2)	(5.8%)	(7.1%)	(7.2%)	(5.7%)
Panel B: asymmetric information				
Analyst coverage	0.001	0.02	0.10	0.10
	(0.02)	(0.05)	(0.07)	(0.11)
Trading volume	0.01*	−0.03***	−0.04***	−0.04*
	(0.003)	(0.01)	(0.01)	(0.02)
Asset tangibility	−1.30	4.49	6.66	17.87***
	(0.97)	(2.85)	(4.61)	(6.59)
(Adjusted R^2)	(5.8%)	(7.2%)	(7.3%)	(5.8%)
Panel C: bargaining power				
Financial distress	−0.30	−7.62***	−6.45	−4.42
	(0.98)	(2.89)	(4.68)	(6.69)
Market-to-book	−0.47***	0.13	0.42	−0.69
	(0.16)	(0.48)	(0.77)	(1.10)
(Adjusted R^2)	(6.1%)	(7.0%)	(6.8%)	(5.3%)
Panel D: managerial entrenchment				
Active investor	0.43	0.76	4.36	13.37*
	(1.07)	(3.17)	(5.13)	(7.32)
Passive investor	1.77**	−0.81	4.52	6.30
	(0.86)	(2.55)	(4.12)	(5.88)
(Adjusted R^2)	(5.8%)	(6.6%)	(6.7%)	(5.4%)

These are results from regressions of abnormal returns to entrepreneurs over various event windows on various proxies for theories of public ventures' private financing motives, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

regression coefficients indicate that many proxies in the literature have little explanatory power for entrepreneur returns, and those determinants that matter have a different impact on abnormal returns over the various event windows.

Table 10 Determinants of investor returns

Dependent variable: investor return, in %		
Panel A: corporate governance		
	Coef.	*s.e.*
Institutional ownership	17.33**	(7.05)
WACR	−10.90	(11.87)
Equity Shapley value	−62.03*	(35.17)
(Adjusted R^2)	(12.1%)	
Panel B: asymmetric information		
Analyst coverage	0.09*	(0.05)
Trading volume	−0.05	(0.07)
Asset tangibility	4.48	(4.04)
(Adjusted R^2)	(12.0%)	
Panel C: bargaining power		
Financial distress	−8.85**	(3.82)
Market-to-book	0.31	(0.66)
(Adjusted R^2)	(12.1%)	
Panel D: managerial entrenchment		
Active investor	5.82	(4.07)
Passive investor	1.69	(3.04)
(Adjusted R^2)	(11.9%)	

These are results from regressions of abnormal returns to investors over their expected investment horizon on various proxies for theories of public ventures' private financing motives, as defined in Section 3.3.2. The sample period is 2001–2018. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

For example, for announcement returns, we find significant effects that are (i) increasing in trading volume, (ii) decreasing in market-to-book ratios, and (iii) higher in the presence of a passive investor. In contrast, for abnormal returns over the [0,100] window, effects are significantly (i) positive for high institutional ownership entrepreneurs, (ii) negative for high equity Shapley firms, (iii) negative for high trading volume firms, and (iv) negative for firms with pronounced financial distress. While these results are largely consistent with the literature (chaplinsky2010financing,lim2019economics,wruck2009relationships,barclay2007private,krishnamurthy2005does), they highlight how highly contingent the identified effects are for various event windows.

Turning to investor returns, the results indicate, in line with the evidence for the portfolio analyses that there are hardly differences in the cross-section because PIPE investors are able to dictate the deal terms, that there are only few significant effects. Table 10 presents the regression results of the determinants of discount-adjusted and holding-period-adjusted investor returns. These are the returns that investors can actually realize. The parameter estimates indicate that investor returns are (i) increasing in institutional ownership, (ii) decreasing in the equity Shapley value, (iii) increasing in analyst coverage, and (iv) lower in ventures that are in financial distress. Note that the adjusted R^2 of these regression models is sufficiently high, explaining roughly 12% of the variation in investor returns.

4.4 Ad hoc sensitivity checks

4.4.1 The JOBS Act

The Jumpstart Our Business Startups Act, or JOBS Act, offers another perspective to test the robustness of our results.[15] As per Barth et al. (2017), the JOBS Act created more uncertainty through increased levels of asymmetric information among a certain class of IPO firms. Specifically, Title I of the JOBS Act, which defined "Emergent Growth Companies" (henceforth, EGCs) and lifted some of the IPO-related disclosure regulations pertaining to ECGs. Therefore, an interesting sensitivity analysis is to split the sample into before and after the JOBS Act to create a "control" and "treated" group. The overall interpretation put forth in this paper would be supported if the post-PIPE stock price underperformance is more pronounced in the treated group, i.e., in PIPEs of issuers that went public after the JOBS Act's induced increased informational asymmetry.

However, the bottleneck with this analysis is that the JOBS Act was relatively recent and our research focus on PIPEs leads to a small sample. Title I of the JOBS Act creating ECGs was signed into effect on April 5, 2012. The treated sample consists of all PIPEs that were issued by firms that went public after April 5, 2012. IPO issuers do not immediately conduct PIPEs after IPOs but wait some time. On the other end of the sample period (and the sample extends only until 2018), I need to deduct time to compute the performance of PIPE stocks over a relatively long horizon (i.e., the LOM term) before my sample ends. Therefore, this approach reduces the number of observations dramatically.

For this reason, an approximation seems reasonable. Specifically, instead of taking April 5, 2012, as the cutoff for the IPO date, we take the date plus 6 (12, 18, and 24) months as the cutoff for the PIPE date to examine the difference in abnormal returns in the year following the PIPE in the treated (post-JOBS Act) and the control group (pre-JOBS Act). Indeed, the results are as expected, which is reconfirming. The treated group, i.e., the high-uncertainty group, has more negative post-PIPE abnormal stock performance than the control group.

4.4.2 Post-PIPE M&As

An interesting extension is to look at post-PIPE M&A activity. For example, Signori and Vismara (2017) document increased M&A activity of newly listed firms within 3 years after the IPO. To this end, we manually searched for PIPE issuers that were acquired within 5 years after the follow-on financing in the SDC M&A database. This leads to a reduction in the sample size. Surprisingly, only 38 out of the 1,106 PIPE issuers in the merged PIPE-M&A sample were acquired, which corresponds to a takeover probability of 3.4%. This is clearly below the 16.8% that Signori and Vismara (2017) report for their sample of takeovers of European firms within 3 years after their IPO

Although the small sample size of the merged M&A-PIPEs dataset, in particular the small number of post-PIPE takeover targets, limits the analyses that can be done, we look at tests of differences in means between the subsample of acquired and non-acquired PIPE firms. The results are reported in Table 11.

Signori and Vismara 's (2017) key prediction translated into the present study's context would be that PIPE issuers' stocks of higher liquidity are more likely targeted in an takeover attempt. We measure liquidity by the PIPE stock's trading volume as a 12-month average. Indeed, as per Signori and Vismara 's (2017) prediction, we report that high-liquidity PIPE stocks are more likely takeover targets in the 5 years following the PIPE, albeit

[15] We thank an anonymous reviewer for suggesting the test.

Table 11 Post hoc analysis of M&A: acquired vs. non-acquired PIPE firms

	Acquired	Non-acquired	*P*-value of Δ (Acq.−Non-acq.)
Signori and Vismara 's (2017) overarching prediction:			
Liquidity	27.84	23.04	76.47%
Additional predictions pertaining to the investor type:			
Active investor	0.45	0.19	0.34%***
Strategic investor	0.42	0.18	0.48%***
Additional predictions pertaining to PIPE issuer characteristics:			
Market-to-book	2.27	3.35	0.01%***
Operating profitability	−0.00	0.14	0.00%***
Cash flow	−24.39	171.93	0.00%***
Proceeds over mkt. cap.	0.38	0.14	0.00%***
Additional predictions pertaining to the PIPE transaction:			
Discount, in %	−8.60%	5.56%	0.08%***

These are tests of differences in means between the subsamples of acquired and non-acquired PIPE issuers within 5 years after the PIPE. The sample period is restricted to 2001–2013 to avoid a possible truncation bias toward the end of the sample period. The sample consists of all SEC-registered and unregistered discount-only common stock PIPEs in the *PrivateRaise* database that involve reporting issuers and non-affiliated investors, excluding Rule 144A offerings and CMPOs. The subsample of acquired PIPE issuers corresponds to the subset of takeovers that are listed in the SDC Platinum M&A database. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

the difference is statistically non-significant, possibly because of the small subsample of acquired PIPE firms.

To shed more light on the differences between acquired and non-acquired PIPE firms, we also explore the differences pertaining to (1) the PIPE investor type, (2) PIPE issuer characteristics, and (3) the PIPE transaction itself.

1. **PIPE investor type:** PIPE issuers that attract *activist* or *strategic investors* are more likely to become takeover targets following the PIPE transaction.
2. **PIPE issuer characteristics:** PIPE issuers with low *market-to-book ratio*, as well as weak *operating profitability* and *cash flow* characteristics are more likely to become takeover targets following the PIPE transaction. Interestingly, these firms conduct larger PIPE transactions in the first place, as indicated by the *PIPE proceeds relative to their market capitalization*.
3. **PIPE transaction:** PIPE issuers who become takeover targets do actually sell PIPE stock at a negative discount, i.e., a *premium*. This is very interesting insofar as it might be indicative of the market anticipating a takeover (and hence a takeover premium), which is why PIPE stock of soon-to-be takeover targets trade at a premium.

Overall, these additional analyses seem to be consistent with the overall story in the manuscript.

5 Discussion

5.1 Summary of the main results

The empirical evidence from a US sample of private follow-on equity financing transactions involving newly public ventures over the 2001–2018 period provides support for our overarching value-destruction hypothesis (*VDH*) and wealth-transfer hypothesis (*WTH*). That is, private follow-on financing of newly public firms destroys substantial value for the entrepreneur and existing shareholders. In fact, these firms underperform the market by up to 15% in the year following the equity injection. This supports the VDH. Additional evidence shows that investors that become new shareholders through the private financing do not lose value. Instead, they are able to negotiate price discounts and other contract terms that help them realize a non-negative abnormal return over their investment horizon. Overall, the combined evidence suggests that private follow-on financing of newly public firms constitutes a wealth transfer from old to new shareholders, supporting the WTH. Thus, our results suggest highly asymmetric rent sharing.

We also examine cross-sectional determinants of venture and investor returns, and find mixed results. Specifically, we test the effects of various proxies that the existing literature relates to theories of corporate governance (Wruck 1989; Wruck and Wu 2009), asymmetric information (Hertzel and Smith 1993; Wu 2004), bargaining power (Lim et al. 2021; Brophy et al. 2009), and managerial entrenchment (Barclay et al. 2007). The results are mixed. For example, market-to-book ratio, as a proxy for the issuing firm's bargaining power, matters for announcement-related abnormal

returns, but not for long-term post-financing abnormal returns. Nevertheless, there are three empirical patterns that are consistent and robust. First, the proxies for the four theories help explain returns to entrepreneurs but not to investors. This suggests that investors are always able to negotiate efficiently (price discounts, resale restrictions, other covenants) so that they never lose money on average. Second, there is some evidence that transactions that improve managerial monitoring by institutional investors increase subsequent returns. Third, there is also some evidence that post-financing returns are higher in ventures with lower trading volume, suggesting that sophisticated investors in private transactions provide a "certification services" to ventures, thereby reducing informational asymmetries.

5.2 Theoretical contributions and practical implications

Our study contributes to the literature by focusing on PIPEs of *newly listed firms* as well as by improving the accuracy of PIPE stock performance measures, as discussed above. It also contributes to the literature in an additional way. Namely, our paper also contributes to the broader private placement literature (see, Bernardo et al. 2021, for a recent discussion). Ever since Hertzel et al. (2002) who reported that private placement firms underperform the market post-placement, a number of studies has provided insights into the cross-sectional differences in the post-placement underperformance (e.g., Krishnamurthy et al. 2005; Dai 2007). However, it is still a puzzle as to why sophisticated investors would invest in the first place if they have to expect value-destruction in these deals (Hertzel et al. 2002). Our results show that discount- and investment-horizon-adjusted returns to investors in PIPEs are not negative. This reconciles the conflicting findings in earlier work and shows that sophisticated investors are able to contract efficiently in PIPEs.

As per practical implications, the results highlight the disincentives of going public prematurely. First, many newly public firms fail to raise growth capital at more favorable terms in public equity markets, which often is a stated reason to go public in the first place (Brau 2012). Additionally, they may raise financing in PIPEs at more disadvantageous terms than as a pre-IPO venture. This is because public ventures fail to raise follow-on financing in public markets usually suffer from deteriorated bargaining power and thus forego their fair share of the transaction surplus. Second, given that the founder-CEO's personal wealth is in large parts concentrated in the company stock, the economically significant underperformance of follow-on financing may depress the entrepreneur's personal wealth. Third, because investors in private follow-on financing rounds can demand high price discounts, these transactions often dilute existing shareholders. Overall, the evidence suggests that the short-term liquidity benefits of going public should be carefully be weighted against the potentially detrimental long-term consequences of premature IPOs.

5.3 Limitations and directions for future research

This study is a first attempt to shed light on the economics of newly public firms that need to revert to private, entrepreneurial finance markets because of a failure to tap public equity markets for follow-on financing. As such, there are a number of limitations that, at the same time, promise potentially fruitful directions for future research. First, several aspects of newly public firms that raise financing privately deserve further attention. For example, how do newly public firms that require private follow-on financing differ from those that can access public equity markets? Similarly, what are the relative advantages and disadvantages of being a private pre-IPO venture vis-á-vis a newly public post-IPO venture, and what are the conditions under which either one status should be preferred? Second, the paper started with the distinction between *premature IPOs of Type I and Type II*, and motivated our overarching research question with the restricted focus of existing entrepreneurial finance research on the survival of public ventures. Given the identified substantial costs of follow-on financing of some newly private ventures, it seems interesting to investigate whether private follow-on financing and its detrimental consequences impact ventures' long-term survival. Third, we still lack a basic understanding of investors in private follow-on financing rounds of newly public ventures. Who are they, how is their investment behavior different from each other and pre- vs. post-IPO, and can the ventures' and investors' post-financing performance be explained by investor identity and characteristics? Finally, the paper has established some stylized facts and offered a coarse theoretical framework, and

therefore leaves room for more sophisticated theorizing on the motivations and performance of follow-on financing in private markets by public ventures. Such theoretical approaches could include a more nuanced view on the selection and treatment effects of PIPE issuers by investors (Fisch and Momtaz 2020; Cumming et al. 2021; Momtaz 2022), the role of other cross-sectional explanations, such as board independence (Bertoni et al. 2014), and time-variant determinants, such as financial regulation (Cattaneo et al. 2015), and the potential signaling and information cascade effects of PIPEs (Colombo et al. 2019; Vismara 2018; Welch 1992).

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