Insider Financing and Venture Capital Returns

Michael Ewens, Matthew Rhodes-Kropf and Ilya Strebulaev*

October 7, 2016

Abstract

Staged financing of venture capital-backed firms is valuable to both investors and entrepreneurs, but comes with a potential cost: hold-up. With asymmetric information and strong control rights, financial intermediaries may earn rents on their inside knowledge. We find that in an environment where insiders have the significant potential to hold-up the entrepreneur – financings where only previous investors participate – have predictable outcomes and returns. However, in contrast to predictions from the theory of hold-up, we show that these inside financings lead to a *higher* likelihood of failure, *lower* probability of IPOs, and *lower* cash on cash multiples than rounds with new (outside) investors. Inside financings also appear to be negative NPV, suggesting that investors make inefficient continuation decisions. We propose a novel alternative and show how the findings are consistent with a manifestation of an agency problem driven by changing opportunity costs over the VC fund life-cycle.

*Ewens: California Institute of Technology; Rhodes-Kropf: MIT and NBER; Strebulaev: Stanford University and NBER. Corresponding author, Michael Ewens (mewens@caltech.edu). We thank Nick Crain, Arthur Korteweg (discussant), Will Gornal, Song Ma (discussant), David Robinson (discussant), Berk Sensoy (discussant), Sophie Shive (discussant), Morten Sorensen (discussant) and participants at the LA Finance Day, Caltech, Western Finance Association, 7th European Banking Center conference, AFA 2016, Vanderbilt University and GSU-CEAR Finance Conference and PE Symposium at LBS for their comments. We also thank Correlation Ventures and VentureSource for access to the data. This paper was previously circulated under the title *Inside Rounds and Venture Capital Returns*.

1 Introduction

Venture capital (VC) evolved to fill a gap in the financing of high-growth entrepreneurial firms left by traditional sources of capital. This funding gap stems from frictions in the selection and monitoring of entrepreneurial firms. Staged investment emerges from the extreme information asymmetry about the quality of the idea or founder. Staging also provides a platform to learn (Bergemann and Hege (1998)), introduces real options and mitigates hold-up by the entrepreneur with inalienable capital (Neher (1999)).[1] Staging itself can produce conflicts of interest, which several authors (e.g. Admati and Pfleiderer (1994) and Fluck, Garrison, and Myers (2007)) show gives rise to syndicated investment, the benchmark structure of VC financings. One major conflict of interest is a theme of theoretical and empirical research in banking, but little studied in venture capital: hold-up.

It is likely that the hold-up problem studied for banking (Rajan (1992)), leveraged buyouts and equity blockholders (e.g. Burkart, Gromb, and Panunzi (1997)) is more severe in venture capital. In banking, lenders can exploit information monopolies (Houston and James (1996)) gained from repeated interactions in relationship lending.[2] Similarly, the high uncertainty about entrepreneurial firm quality and the potential negative signals from a lack of participation in future investments provides VCs an informational advantage over potential outside investors and bargaining power over the entrepreneur. Leverage from these advantages are enhanced by VCs' strong control rights from preferred equity or board seats. Venture capital presents an ideal environment for examining hold-up: in some financings the participating investors are *only* those investors who previously invested in the company, while in others new 'outside' investors also participate. We call financings with only previous investors "inside rounds." In our sample, there were 10,104 entrepreneurial firms from 1992 to 2014 that received investment in a total of 22,382 investment rounds (excluding the initial investment rounds). Of those rounds 6,645 were inside rounds (approximately 30%).

Does it matter whether the only investors are insiders? In a frictionless Modigliani-Miller world, the composition of investors should not have predictive power. If financier hold-up is at play, how-

[1] The importance of abandonment options in venture capital is noted in much work on VC (see Gompers, 1995, Cornelli and Yosha, 2003, Bergemann and Hege, 2005, Fluck, Garrison, and Myers, 2007, Bergemann, Hege, and Peng, 2008)

[2] Also see Sharpe (1990), Grossman and Hart (1986) and Aghion and Tirole (1994).

ever, then the inside venture capitalists can earn higher returns because the entrepreneur is unable to find/convey the inside information to outside investors. Insiders could exploit their informational advantage and keep their best (expected return) investments to themselves. Interestingly, when we added a question to a recent survey by Gompers, Gornall, Kaplan, and Strebulaev (2016) on how VC's make decisions – "When you (a VC) see an inside round by peer firms, what do you think the reason was?" – the second most popular answer was "Keep a good deal to themselves." This suggests and exploitation of inside information. A theoretical alternative is that the hold-up problem could be reversed. Here the entrepreneur's human capital is inalienable, allowing her to demand a higher equity price. We do not find evidence in favor of either explanation.

We begin the empirical analysis by characterizing how inside rounds and those rounds with at least one new investor (i.e. outsider) differ. Several features of inside rounds suggest that they tend to occur after negative shocks to the entrepreneurial firm. They coincide with both lower capital infusions by insiders and downward movements in entrepreneurial firm valuation. Such patterns are consistent with an environment where the VC holds up the entrepreneur. This also matches the most popular answer to the survey question mentioned above which was "[To] overcome a short-term portfolio company setback." To isolate whether inside rounds are in fact times when financial intermediaries hold-up the company, we next study the returns earned by investors.

Inside rounds generate 15-18% lower cash on cash multiples than outside rounds. Investments in inside rounds also appear to be value-destroying or negative NPV for plausible values of cost of capital. These findings persist when we control for a number of company-specific and time-series variables and cannot be explained by differences in systematic risk or investor unobserved heterogeneity. These results both shed light on the determinants of VC returns and show that there is a degree of cross-sectional predictability in the venture industry. Moreover, the lower returns for inside rounds is in direct contradiction to the hold-up hypothesis and demands an alternative explanation.

A potential explanation could be the opposing managerial hold-up problem where the entrepreneur can walk away from the startup and increase the chances of investment failure. The common solution to this hold-up has existing investors stage their investment. However, we find that inside rounds are 20% more likely to lead to failures, are less likely to lead to IPOs and have

30% lower exit valuations. Higher failure rates, lower rates of IPO and lower exit valuations would be detrimental to the entrepreneur and thus are inconsistent with entrepreneur hold-up.

The lower returns earned in inside rounds could be due to a behavioral bias. It is difficult to rule out a behavioral bias and is therefore a possibility. However lower returns could be rationalized if inside investors evaluate the investment using a cost of capital that is lower than that of the average investor (even though as noted there are no measurable difference in risk). So we propose a novel principle-agent problem driven by the fund lifecycle. This problem demonstrates the powerful effects of opportunity costs on pricing and reinvestment decisions.

Venture capital partners may initially (during what is called the investment period) both invest in new companies as well as make follow-on investments into companies in which they previously invested. However, after raising their next fund, the previous fund closes to new investments - thus VCs can only make follow-on investments into current portfolio companies. This rule aims to prevent conflicts between the funds regarding which fund invests in any new investment opportunity. New funds are typically raised 3-4 years after the previous fund. At this point the old fund has made initial investments in enough new companies that its remaining capital is reserved to support these investment through to exit.[3] However, this change has an effect on the decision to continue to support a company. During the investment period a VC can either support an existing portfolio company *or* find a new one. After the investment period the VC can allocate existing fund capital among existing companies. This change potentially lowers the opportunity cost of making a follow-on investment.

The predicted shift in opportunity cost may be quite large in part because of the structure of compensation contracts. The typical VC earns the management fee whether or not the remaining capital is invested, but earns a carry (i.e. profit-sharing) on any positive return. This compensation structure results in VC investors facing a near zero cost of capital in the post-investment period. Consistent with this explanation, we find that insiders' propensity to participate in inside rounds is much higher after the investment period ends. Furthermore, the return to inside rounds is lower for those done after the investing period. Investors invest in fewer inside rounds and make better

[3]The remaining capital is often significant (30-60%) as existing companies need capital as they grow so investors have to stand ready to support them.

decisions about when to participate in them during the investment period when they have a higher opportunity cost. These findings are a demonstration of both the impact of opportunity costs and a novel principle-agent problem.

Of course multiple effects may be occurring at once, including escalation of commitment and multiple principal-agent problems. Therefore, we also ask whether VCs window-dress their fund performance by keeping firms alive long enough to raise a new fund. Peek and Rosengren (2005) shows that banks do this in Japan with poorly performing loans - a practice referred to as ever-greening. We do not find support for this among venture capitalists. Alternatively, VCs may have incentives to gamble for resurrection if they are currently not performing well.[4] Again, there is little evidence in favor of this explanation. Our interpretation of the results, particularly those for returns, is crucially not a causal one. The lower returns in inside rounds do not imply that randomly adding an outside investor would improve outcomes. Rather, the correlations help rule out the posed financier hold-up problem while highlighting a rationalization for over-payment driven by the VC fund lifecycle.

In related work, Broughman and Fried (2012) also study inside rounds and ask whether insiders use the financings to dilute the equity stakes of the entrepreneur. They find evidence instead that VCs use these financings as "backstops" when firms struggle to raise capital. Our paper improves the analysis with a more representative sample of financings and richer pricing and returns data. We also tie an investor's reinvestment decision to the investment period story above and provide direct evidence for inside round under-performance. Two related papers, Guler (2007a) and Guler (2007b), show that VCs, as a group, tend to make sequential investments in deals even if objective criteria suggest the deals need to be abandoned. Our results highlight a rational explanation for the patterns found in earlier work. Recently, Khanna and Mathews (2015) show theoretically the VCs may optimally over-pay for entrepreneurial firms in late-stage financings to signal good, private information to outside investors and induce effort by the entrepreneur. The proposed mechanism is an incentive to "posture" to third parties, while we argue that the over-paying in inside rounds stems from features of the fund lifecycle. Finally, the fund lifecycle relationship with investment strategy

[4] A related effect is gambling in the presence of losses if there is a chance to break even (Thaler and Johnson (1990))

that we find contributes to a growing literature about how fundraising incentives (e.g. Chakraborty and Ewens (2016)) and past performance (e.g. Barrot (2015)) impacts reinvestment decisions. Our ability to study pricing and returns reveals real consequences for investment performance from similar frictions.

2 Data and variables

This section describes the data and introduces main variables of interest.

2.1 Data sources

We start with the venture capital database VentureSource from Dow Jones. The data includes information about entrepreneurial firms, their investors, and individual financing rounds. We then augment and improve VentureSource with data from Correlation Ventures, a quantitative venture capital fund.[5] Additional valuation information of financings and exits comes from Thompson VentureEconomics and Pitchbook. Further, Correlation Ventures collects information on financings from their investment partners. This additional data improves the quality and coverage of VentureSource along a number of dimensions. For our purposes, financing-level and exit valuations are most important.

To construct the main dataset, we first select all the non-first round financings where we can track venture capitalist investors' reinvestment decisions. An entrepreneurial firm is in the sample if it raised its first round of financing between 1990 and 2008. The upper bound provides time for an exit event for the investment (end of 2015) and the lower bound is the start of VentureSource's data coverage. We exclude all firms that were founded prior to 1978. The second financing event must follow a previous equity financing, in which at least one of the investors is a traditional venture capital investor. Such an investor raises the fixed-life fund (10–12 years) from institutional investors such as endowments, pension funds, and trusts. In VentureSource, this includes institutional venture capital, diversified private equity, and SBIC (government grant-backed) funds. Hedge funds, mutual funds, investment banks, and corporate VC arms are excluded from this definition. We

[5] Ewens and Rhodes-Kropf are advisors to and investors in the fund.

drop financings with small investment amounts to avoid potential hidden bridge financings or incorrectly split equity tranches, where "small" is defined by financings in the lower 5% of investment size within each of the seven major industries over the sample period. We also exclude rounds that are classified as corporate, bridge, or debt financings. Finally, if a company has a set of financings less than a month apart, we have to drop the company from the sample, because we are unable to number the rounds confidently. The main sample includes 22,382 financing rounds in 10,104 entrepreneurial firms.

2.2 Variable construction

A critical variable of interest is the degree of round's "insidedness." The notion of an inside round concerns the dynamic identities of investors and the staging of financings. In each financing round t, for $t \geq 2$, investors that contributed capital in at least one prior round are called "Inside" investors or simply insiders. If an investor in round t did not participate in any of the prior financings of this company, that investor is called an "Outside" investor in round t. A dummy variable "Inside Round" equals one for financing round t if all investors contributing capital in this round are insiders. If there is at least one outside investor, then the round is "Outside Round." All equity financing rounds can therefore be classified as either "inside" or "outside" rounds. Due to investors' desire to announce new outside investments and the disclosure requirements for private financings, we are confident that the dummy variable for inside rounds is very accurate.[6] In robustness tests, we also use other definitions of insidedness. "Inside VC Round" equals one if all VC investors in this round are insiders. If at least one new investor is a VC firm, it is then called an "Outside VC Round." Clearly rounds for which "Inside Round" equals one, will also have "Inside VC Round" equal one, but the reverse is not necessarily true. Insideness can also be captured through continuous measures, either with the fraction of inside dollars or fraction of inside investors.[7]

[6]Given that the average VC fund invests in 10 - 25 unique entrepreneurial firms, there is often a public announcement of financings with new investors. Furthermore, Regulation D required – from 1995–2008 – full disclosure of directors and major investors in the exemption filing with the SEC. Finally, Correlation Ventures (one of the providers of our data) has received full information about many active VC investors' portfolios. In less than 5% of rounds was VentureSource missing a new investor.

[7]We specify the fraction of dollars provided by inside investors in financing round t of entrepreneurial firm i, KI_{it}: $KI_{it} = \frac{\sum_{j \in I_{it-1}} K_{ijt}}{K_{it}}$. I_{it-1} is the set of inside investors (i.e., all investors that contributed in at least one round prior to round t), K_{it} is the total capital raised in financing t and K_{ijt} is the capital contributed by investor j (which

A financing may be considered an outside round even though the new investors contributed a small fraction to the financing. So as a stronger alternative to the presence of outside VCs, we consider the identity of lead investors in the financing round. Lead investors are those that contribute the most capital to the round and are in reality the drivers of bringing together the funding syndicate. We identify leads in two ways. First, VentureSource may flag an investor or multiple investors as leads. Second, if such a flag is not available, then we identify the lead as the investor who provides the most capital. The division of capital within a round and across investors is sometimes missing for a subset of investors, so we split capital equally to those with unknown contributions.[8] With this lead investor flag, a round has a new lead investor if there is at least one new investor (i.e. outsider) who is also identified as a lead in the round.

To estimate the value of investments, we use the so-called "Pre-money" and "Post-money" valuations of entrepreneurial firms' financings. The post-money valuation, V_{it}^{Post}, values company i in financing round t taking into account the capital K_{it} contributed in that round by investors on an as-converted-common equity basis. In venture capital transactions, investors typically receive convertible preferred stock, a security that is converted into common stock if the exit valuation is sufficiently high but is essentially a debt security if the exit valuation is low (see Kaplan and Strömberg (2003)). In other words, the valuation assumes that all the securities issued to investors will be converted to common equity upon exit. We address these contract features in Section 5. "Pre-money" valuation, V_{it}^{Pre}, is the valuation of the company in round t before the capital injection is taken into account. In other words,

$$V_{it}^{Post} = V_{it}^{Pre} + K_{it}. \tag{1}$$

A financing round t is an"up" ("down", "flat") round if the pre-money valuation in round t increases (decreases, is not changed) relative to the post-money valuation in round $t-1$ (that is, if $V_{it}^{Pre} > V_{it-1}^{Post}$, $V_{it}^{Pre} < V_{it-1}^{Post}$, $V_{it}^{Pre} = V_{it-1}^{Post}$, respectively). In the empirical analysis, we often combine the "down" and "flat" rounds.

can be zero). Second, we also specify a similar fraction based on the number of investors. Let C_{it} be the set of all investors in financing round t. Then, $\text{FracInside}_{it} = \frac{\sum_{j \in I_{it-1}} 1[j \in C_{it}]}{\#C_{it}}$ is the fraction of those investors that are insiders. The indicator $1[j \in C_{it}]$ is one if investor j is an investor in round t.

[8]This approach may result in assigning multiple lead investors to a round.

We use entrepreneurial firm exit outcomes and investor returns as proxies for investment success. Outcomes can be classified as failed, non-failed, or still active. An investment has failed if the company is listed as out of business, in bankruptcy, or has been identified as not active through additional research.[9] A company is also labeled as failed if it received the first VC funding prior to 2004 and has yet to exit by the end of 2015. A company is considered non-failed if it had an IPO or was acquired. Finally, there are a number of companies founded in the last ten years of the sample that have not exited yet and are labeled as "private."

An IPO dummy is used as one proxy for success. The IPO dummy is very popular among researchers (e.g. Lerner (1994) and Sorensen (2007)) and is the most frequent measure of success used in the VC literature. However, the variable does not capture acquisition exits with large exit valuations. Indeed, it is well known that there are more successful M&A outcomes where investors earn significant returns than IPO outcomes in the VC industry since 2000. We therefore define another dummy, "Good exit," which equals 1 if the outcome is either an IPO or an acquisition, in which valuation V_i is known and at least two times all the capital invested. While the exact threshold used in the definition of M&A "success" is necessarily ad hoc, our results are robust to using a higher threshold. The last outcome measure is the log of the eventual exit valuation V_i. This variable is available only in cases of IPO or M&A, i.e. the results are conditioned on non-failure. Specifically, "Log exit valuation" is the log of the reported valuation at sale or IPO. For the latter, the valuation is the firm valuation at the IPO offering.

To calculate the return for non-failed investments, one needs the final exit valuation (i.e., IPO valuation or acquisition price) and the dilution of equity due to subsequent financing events. We follow the literature on investment-level VC returns (e.g., Cochrane (2005), Korteweg and Sorensen (2010)) and focus on the "gross multiple" variable M_{it} for firm i in round t, which is defined as:

$$M_{it} = \frac{V_i}{V_{it}^{Post}} \prod_{s=t+1}^{T} D_{is}, \tag{2}$$

[9] We searched for active websites or founders with LinkedIn profiles that listed the entrepreneurial firm as still active.

where T is the total number of equity financing rounds, and the sequence D_{is} are the dilutive factors. When an entrepreneurial firm raises outside equity, the previous investors' equity positions are diluted by one minus the fraction of equity sold. That is, D_{is} is calculated as $1 - K_{is}/V_{is}^{Post}$, where K_{is} is the total capital raised in financing s. For example, suppose a second round financing is followed one year later by a new equity round that raises capital in return for 30% of the equity. The equity stakes of the investors in the second round financing will all fall by 30%, so that D_{it+1} is 0.7.

To calculate a return M_{it} for non-failed investments, one requires all the interim valuations between rounds t and T. In many cases, the exit value V_i is known but the interim valuations are missing. The majority of these cases are acquisitions where the exit value is less than the total capital invested. Here, we assume the most recent investors (i.e. those in the syndicate immediately prior the exit) receive their capital back first. That is, the last investors are first made whole, followed by the previous syndicate investors, as long as the capital is available. This approach assumes that each investor has the so-called senior $1X$ liquidation preference, a typical provision in VC contracts.[10]

Throughout the analysis using returns, we winsorize the gross multiple at the 99th percentile as some of the right tail outcomes appear to be unrealistic (Cochrane (2005)). Another empirical problem is the positive selection of returns. Investments that eventually have an initial public offering have a relatively higher probability of their valuation reported. In contrast, acquisitions are much less likely to have prices and returns reported. As IPO returns tend to exceed those of acquisitions, this leads to positive selection in any venture capital returns data. For example, while only 10% of investment have an IPO, over 35% of all observed returns in our data come from IPO outcomes. Conversely, acquisition returns are underrepresented in the sample of observed returns. We address this concern by following the Korteweg and Sorensen (2010) approach of re-weighting the observed returns using the true exit weights in the full sample. We first calculate the probability that any financing in the full sample has one of the three exit outcomes: IPO, acquisition, or failure. Next, we calculate the same exit rates in the sample of financings where we can calculate returns. It

[10]We gain approximately 1,900 returns from this, however, the results are similar if we continue to treat these returns as missing.

is here that the IPO exit rate is significantly higher than observed in the full sample. The regression weights are then the ratio of the true exit probability divided by the fraction of exits in the returns sample. This approach removes the positive selection from high observability of IPO returns in the sample by down-weighting IPOs and up-weighting the acquisition returns.

2.3 Descriptive statistics

Table 1 provides descriptive statistics on some basic characteristics of the sample. The standard features of financings such as financing year, industry distribution, and total capital raised are consistent with other research. In terms of final outcomes for firms that receive at least two rounds of financing, 11% of start-ups eventually become publicly listed companies, 46% are acquired, 31% are failures, and 13% are still private. Given the conservative nature of our definition of failure, the last category consists mostly of failures, because they must have received their first equity financing between 2004 and 2008. We have the exit valuation for 2,863 acquired firms, that constitutes about 61% of the total acquired sample. Of those, 1,560 (54%) have an exit valuation that exceeds capital invested.[11]

The average entrepreneurial firm is founded in 1998, with the funding year and the company age widely distributed. More than 40% of the firms in the sample are from California, while the Information Technology sector comprises more than half of the sample. Other sectors, unreported in the table, include energy and retail. The average firm in the sample raises 4.40 rounds of funding, between the minimum required 2 (by sample construction) and the maximum of 20. Over 80% of the sample features syndicated investment, in which at least two investors provide capital in the round. On average, each round of financing features a participation of four investors and a total capital injection of $14.3 million. While the median round size is nearly $9 million, the amounts vary from insignificant rounds to the maximum of $1.5 billion. It takes on average 1.3 years for the firm to raise its next round of funding, consistent with the prevailing industry notion that most firms raise subsequent funding in about 12 to 18 months.

[11] Many VC-backed acquisitions are also failures because such exits span a wide range in terms of valuations, from outright failures (penny sales) to huge successes, as demonstrated by Puri and Zarutskie (2012).

Valuations are known only for about 57% of the sample and gross multiple can only be estimated for 59%. For the subsample with valuations, the (unreported) average capital raised is $14.9 million, similar to the $14.3 million value reported for the total sample. The average (median) post-money valuation of $83.1 ($39.5) million suggests that this subsample is biased, as expected, towards more successful companies. However, while the average gross multiple is a healthy 1.63, the median gross multiple is 0, indicating that in at least 50% of deals, for which this variable is reported, investors lose all of their money. The positive selection bias in this subsample thus ensures that investors are likely to lose on an overwhelming fraction of their investments.

Figure 1 shows the prevalence of inside rounds over the sample period along with the number of financings. Outside of the dot-com era, inside rounds account for a little over 30% of all financing events. Table 2 provides descriptive statistics of our main insidedness variables for the main sample (Panel A) and for the subsample, in which the financing valuation is known (Panel B). Inside investors constitute 64% of all the investors and contribute 62% of the capital in the next round of funding in an average deal. Unreported, the outside VCs constitute on average 22% of the financing round investors. The rest are non-VC new investors, such as corporations, angel investors, individuals or investment banks. In around 30% of cases, however, there are no new investors in the round and 45% of the cases there are no single new outside VC investor.[12] Moreover, in 58% of cases, the round does not feature a new lead investor. Taken together, these findings suggest that the rounds in which only insiders participate are more common in the VC industry than some previous anecdotal evidence may have led researchers as well as industry insiders to conclude. Evidence from Panel B is broadly consistent with these findings.

2.4 What do VCs think of inside rounds?

Given the several possible explanations for inside rounds, we begin with a small survey of active VCs. The authors of the Gompers, Gornall, Kaplan, and Strebulaev (2016) survey of 889 institutional VCs allowed us to add a question to their survey that sought to understand why investors believe inside rounds occur. The answers to the question guide some of the empirical analysis and

[12]This number resembles a similar measure of insideness in Bengtsson and Sensoy (Forthcoming) who find 22% of financings in the 2005-2009 sample have no new investors.

robustness tests. Rather than directly ask a VC why *they* invest in inside rounds, we instead asked "When you see an inside round by peer firms, what do you think the reason was?" Table 3 presents the seven non-exclusive options available to respondents. The table breaks down the fraction of responses for each answer and how they differ by early and late-stage VCs (i.e. investors who invest primarily in younger or older startups). The two most common responses are conflicting: "Kept a good deal to themselves" and "Overcome a short-term setback at the startup." Although we do not have statistical significance for the full sample, these two responses are non-zero in the sub-samples. Both sub-samples also agree on the third most common response "Too little external capital." This answer suggests that VCs use inside rounds to bridge supply shocks to the VC market. How do these answers map back to our questions about hold-up?

Two of the top three responses suggest inside rounds are situations where the inside VC investors have strong bargaining power and thus the financings should exhibit hold-up. Too little capital increases the value of insiders' available funds, while a short-term setup at the startup could trigger control provisions for preferred shareholders. In contrast, if inside rounds are on average an investor's best deal, then inside rounds would have higher IPO rates or exit valuations that comparable outside rounds. Overall, the responses in Table 3 point to a variety of explanations for the existence of inside rounds and in turn, possible differences in investment returns.

2.5 Inside vs non-inside rounds

Thus far we have established that inside rounds are surprisingly prevalent. But are these inside rounds truly different? In this section, we provide some preliminary comparisons between inside and outside rounds.

Figure 2 compares the change in valuation between two subsequent rounds with kernel densities of the ratio of pre-money valuation in the round to the post-money valuation in the previous round, $V_{it}^{Pre}/V_{it-1}^{Post}$, for inside and outside rounds. This ratio captures the relative gain in value for existing investors and, when greater than one, signals interim success for the entrepreneurial firm. These returns are not directly earned by investors, but they represent an implied return to investment. They are especially informative for inside rounds, because they represent the differences in prices paid by the same investors over two rounds of financing. A value of 1 is known as the "flat" round

(also singled out by the vertical line in the figure), less than one is "down", and greater than 1 is "up." Effectively, for firms experiencing down or flat rounds the news is negative, either because of the idiosyncratic shocks or changes in the macroeconomic situation.

The figure shows that inside and outside rounds experience different valuation dynamics. Inside rounds are much more likely to be down rounds and also have a larger mass at around 1. Moreover, the inside density attenuates much faster, implying lower likelihood of a round with a large increase in valuation. Taken together, the figure clearly shows that inside rounds are relatively worse in terms of valuation dynamics than outside rounds. Assuming that the positive selection is the same for inside and outside rounds, the figure presents a conservative picture of the fraction of down valuation changes. A number of economic mechanisms can be at work here, but one that is consistent with the emerging picture is the hold-up of the founders by venture capitalists, to the extent that VCs exercise bargaining power in inside rounds by diluting non-participating stockholders, including the founders.

Another possible difference between these types of financings is capital invested by investors. Figure 3 presents kernel densities by the log of capital raised, the financing variable that is available for most of the rounds in our dataset. The vertical line shows the mean log capital invested, which translates to $14.3 million in mean dollars. The figure shows that the two round types differ significantly. Inside rounds raise smaller amounts of money than outside rounds. Small amounts of capital invested in inside rounds could imply that these rounds are quickly completed and may in fact be hidden bridge rounds, as argued by Broughman and Fried (2012). For example, such rounds could be used by insiders to quickly provide capital to startups when facing both internal and external shocks. However, when we repeat the analysis that excludes what appear to be bridge rounds (tenth of all financings that raise the least capital and a quarter of all financings that are the earliest to be followed by the next financing), the results remain unchanged.[13]

Table 4 compares inside rounds to outside rounds and to the full sample along a number of other dimensions. Several results that stand out provide further differentiation between inside and outside rounds. Inside rounds raise on average more rounds of funding, are backed by VCs for a longer period of time, and the firms who raise them are older. However, the span of time it

[13]See the Appendix Figure A.1 for the distribution and Table A.2 for summary statistics.

takes for start-ups to raise the next round of funding is the same for inside and outside rounds, suggesting again that the average inside round is not an unanticipated "rescue financing." While the round syndicate size is – as expected – significantly smaller for inside rounds, the total number of investors (that includes all previous investors) is virtually the same for inside and outside rounds. Inside rounds are much more likely to be a "down" or a "flat" round: the former comprise 39% of inside rounds but only 20% of outside rounds. Finally, inside rounds feature significantly lower returns than outside rounds. The mean (median) gross multiple for inside rounds is 1.3 (0) versus 1.75 (0.3) for outside rounds. Also, there are more inside rounds with the zero gross multiple.

These results suggest that inside rounds are not only quite frequent, but are also truly different than outside rounds. The patterns of smaller capital invested and higher likelihood of downward revision in valuations show that inside rounds tend to occur after bad news or negative shocks to the entrepreneurial firm. In the next sections, we first investigate to what extent inside rounds can be used as a predictor of entrepreneurial firm outcomes and investor returns and then explore in more detail economic mechanisms that could be driving these results.

3 Insidedness as predictor of outcomes and returns

In this section, we explore the impact of insidedness on entrepreneurial firm outcomes, valuation, and investment returns. We find that insidedness is a strong predictor of these economic measures.

3.1 Inside rounds and entrepreneurial firm outcomes

Success in the VC industry is achieved either through an IPO, widely considered to be the major objective in the VC industry, or as a combination of IPO and a highly valued M&A. The first question we tackle is whether insidedness matters for explaining exit outcomes. If inside rounds are a selection of lower quality investments, then we should expect to observe worse outcomes. Alternatively, if the average inside round represents the insiders keeping the best deals to themselves, then we should find the opposite. Finally, if the observable features of the investors at the time of financing have little bearing on investment success, we should observe no relationship between inside rounds and eventual outcomes.

Table 5 reports the results of this analysis, where we regress the eventual outcome of the VC-backed firm on insidedness and control variables. In all specifications, we control for geographic (the state of entrepreneurial firm headquarters), industry (based on VentureSource's industry classification), founding year fixed effects and the interaction of the final two. The first two columns present results of a probit estimation and show a strong, negative relationship between inside rounds and high-quality exit outcomes. Translated into the marginal effects, these estimates predict a 27% lower probability of an IPO and a 19% of a "Good exit" if the firm had at least one inside round.[14] Relative to other explored determinants of VC-backed firm outcomes, participation of new investors in follow-on rounds is economically important. It is well known that the bulk of returns in the VC industry is a function of a small number of successful exits (e.g. Sahlman (1990)). Given that the difference between funds in top and bottom performance quartiles can be an artifact of a couple of IPOs or good exits, the difference in outcomes in Table 5 can translate into meaningful VC fund outcomes.[15] The results for the log value are similar, but economically even larger: firms with at least one inside round have a 30% lower exit valuation conditional on not failing. From Table 4 we know that the average firm with an inside round fails more often, so the total difference in exit valuation should in fact be larger than 30%. Columns (4) and (5) repeat the analysis with the alternative measure of insideness – no new lead investors – and the results are similar.

One explanation of these findings is that insidedness proxies for struggling companies that are more likely to have poor outcomes, despite receiving follow-up funding injections. Indeed, in unreported regressions, we show that inside rounds have a 15% to 25% lower changes in interim valuations (i.e. valuations between the current round and the previous round) than outside rounds. This implies that inside rounds imply a substantial downward revision of expectations about the final valuation of the company. While we cannot use round-level interim valuations in a firm-level regression, an obvious proxy for a poorly-performing VC-backed company is a down round. The final three columns include a dummy variable which equals to 1 if the firm had ever at least one down round. As expected, this dummy is significant.[16] For example, if the company ever had a

[14] Unreported, the linear probability model implies larger marginal results of a 34% lower probability of an IPO and a 18% of a "Good exit," assuming a constant linear effect.

[15] In unreported results we find that a higher fraction of inside rounds within a VC fund predicts worse performance in the whole fund and in the non-inside rounds.

[16] The results are qualitatively similar if "down round" also includes flat rounds.

down round, its likelihood of an IPO is lowered by 21%. The inclusion of down rounds, however, has very limited impact on the importance of inside rounds.

Another explanation of the findings in Table 5 is that inside rounds proxy for years in which the VC funding market was in poor shape. This is difficult to control in a firm-level specification. In unreported regressions, we estimate equivalent models at the round level, which invites controls for funding year fixed effects. The results are unchanged. For example, in the sample of all second round financings, inside rounds imply a 21% (28%) lower probability of an IPO (good exit) and a 40% lower valuation. One last concern is that inside round investors are of lower quality and have relatively less experience. We repeat the estimation in Table 5 with venture capital firm fixed effects – where an observation is a firm-investor – and the results are unchanged. Taken together, these results suggest that insidedness is an important explanatory variable on its own. The results further reinforce the notion that these rounds tend to occur after negative shocks to the entrepreneurial firm. The patterns of returns will help disentangle how hold-up manifests itself, if at all.

3.2 Inside round and investment returns

So far we have shown that inside rounds are characterized by lower success rates and exit valuations. The importance of insidedness for *returns* can stem from a number of economic mechanisms. The null hypothesis is that in the efficient Modigliani-Miller world, the composition of investors should not matter. It can impact the outcome, but not the cash flows of contracting parties. Therefore, studying the cash flows of inside rounds is of crucial importance. In most, if not all, VC transactions, all cash flows materialize at the time of exit. Studying final returns is thus the best way to capture the financial relevance of insidedness. Of course, the VC industry is full of frictions that give rise to competing conjectures about how insideness could drive return differences.

One possible explanation is the hold-up problem, in which participating investors use their increased bargaining power to unfairly dilute non-participating investors and common shareholders. Our focus on the refinancing decision is exactly the setting where such opportunism by the VC is possible. The entrepreneur's human capital is more likely sunk into the firm, giving the VC additional bargaining power. The observation that the valuation at the time of the inside round is substantially lower than for similar outside rounds is consistent with hold-up, as is the lower capital

invested which could produce additional constraints on the entrepreneur. Hold-up could result from a number of frictions, all of which lower outsiders' desire to invest and increase the bargaining power of the insiders vis-a-vis the entrepreneur. For hold-up to work for insiders, participating investors in the inside round should end up with higher returns (and definitely not lower returns) in expectation.

3.2.1 Studying various investment returns

In this section, we explore whether investment returns depend on insidedness. Table 6 reports the results on financing-level returns using the exit-weighting selection correction discussed in Section 2.2. The dependent variable is the log of the gross multiple M_{it}, which measures the return of a hypothetical dollar invested in this financing round accounting for expected future dilution. While this measure ignores the time value of money, it is a good first step of a comparative analysis of returns.[17] Now that we study log returns, we have to make an assumption about the recovery of investors' capital in the case of failure. There is virtually no empirical evidence of the size of this recovery. In principle, investors generate recovery by selling existing assets, such as patents, as well as recouping unspent cash in the bank that was invested in the previous rounds of funding. Existing research uses a wide range of recovery rates (i.e. Cochrane (2005) and Korteweg and Sorensen (2010)). We set the recovery of investors in the case of failure to the log of 25% of capital invested, and our results are robust for a wide range between 10% to 30%.

Table 6 again presents two measures of insidedness, the dummy variable indicating whether the round is a full inside round and a dummy whether the round did not have a new outside lead investor. Additional control variables include total capital raised up to this financing, time since last financing, total number of VC investors, and firm age at the time of financing. All specifications include fixed effects for financing year, industry, the interaction of year and industry and financing round number. The interactions ensure that the results are not driven by industry-time shocks. The insidedness coefficients of columns (1) and (2) imply a 16%–18% lower gross returns in inside rounds. Because our assumption about the recovery rate of investors in the failure cases is inevitably ad hoc, we also consider, in Column (3), the failure returns with a 10% recovery

[17] Inside rounds investments exits slightly faster than outside rounds – around 4 to 5 months – which we address below with a present value measure.

rate. The results are unchanged, suggesting that our assumption about the exact recovery does not drive the differences between inside and outside investments. Although all specifications include year, industry and year-industry interaction fixed effects, it is possible that inside rounds cluster in bad times. Column (4) excludes financings made during the two major downturns in venture capital – 2000 and 2008 – with no change in estimates.

Column (5) of Table 6 extends the analysis by including VC firm fixed effects, which allow us to address two related concerns about the previous results. First, inside rounds may simply be conducted by relatively worse investors who have more behavioral biases or suffer from worse incentive frictions. Second, VC firm quality is highly correlated with investment quality (e.g. Sorensen (2007) and the importance of deal flow) so the VC firm fixed effect partially addresses the cross-sectional variation of entrepreneurial firm quality by comparing investments in the same VC firm. Column (5) of Table 6 shows that all the patterns found in the first set of results remain. Thus, VC firm time-invariant quality and, in turn, some unobserved entrepreneurial firm qualities cannot explain the results. More importantly, the fixed effects estimates imply that within the average VC firm portfolio, inside rounds are relative under-performers in terms of returns.[18]

Note that companies with at least one inside rounds are more likely to exit via an M&A route. In our sample, 42% result in M&A relative to 35% for those companies with outside rounds only. As lower M&A valuations are less likely to be reported, returns of inside rounds are likely even *lower* than those reported in the table. At the same time, there are several factors that could unfairly lower insider rounds returns. One concern is that the return measures do not take into account the present value of money. If exits on inside rounds tend to occur more quickly, this would lower expected returns. The average difference in returns of 16% implies that for a comparable outside round with an average four-year holding period, an inside round would need to exit 1.5 years faster to compensate for the worse gross return.[19] In a simple unreported regression of time to exit on the insidedness of the round and control variables, having an inside round implies an

[18]We cannot run a similar regression with entrepreneurial firm fixed effects. The main reason is that within-firm gross multiple returns follow a clear pattern by investment stage: earlier rounds have higher multiples that later rounds. Moreover, each investment return within a set of firm returns uses the same exit valuation, limiting the variation needed in a fixed effects regression.

[19]The average gross multiple of inside rounds is 1.3, which is 16% lower than outside returns. The latter's average holding period is four years, which gives a 11% annualized return. For the inside round return of 30% to match this annualized return, it would need to exit is 2.5 years.

exit shorter by about five months. Thus, the realized difference in speed of exit cannot justify the average differences in gross returns.

As an alternative test of whether time value of money can explain differences in returns, the sixth column of Table 6 calculates the return accounting for the time to exit. We calculate a simple net present value of the investment using the realized time to exit T and cost of capital r_{VC}:

$$\text{PV} = \frac{K_{it} M_{it}}{(1 + r_{VC})^T} - K_{it}$$

We assume the cost of capital of 20% (see Metrick and Yasuda (2010)'s review of literature), but the results are similar for other sensible values. Column (6) presents the results, again with a negative coefficient on the inside round indicator. The estimated coefficient implies a \$2.4m lower present value for inside rounds and more importantly suggests that time to exit is not driving the results in columns (1) - (5). Of course, column (6) assumes that inside and outside rounds have the same risk profile or cost of capital.

If inside rounds are less risky, then expected returns should be lower. We follow the literature and consider the public market equivalent (PME) of Kaplan and Schoar (2005). This measure considers the alternative investment in the S&P 500 or other market portfolio over the same time horizon as the investment in question. Here we measure the cash-on-cash return in the S&P 500 index invested in at the date of the VC financing and sold at the exit date of the entrepreneurial firm. Dividing the VC investment gross multiple by this measure results in the PME. Importantly, this calculation assumes that both inside and outside rounds have the same market loading (here, a beta of one). However, the matching with the market return could still reflect differences in timing of investments and exits not captured in the industry-year interactions. Column (6) of Table 6 shows again that inside rounds under-perform even with this risk-adjustment.

The final assumption that we can relax is the relative riskiness of inside and outside rounds. Perhaps the two types have different systematic risk that could rationalize the differences in gross multiple. Before proceeding, it is important to highlight that all estimates compare returns earned controlling for financing stage, year, industry and the interaction of the industry and year. Thus, it seems implausible that even after controlling for such factors, the composition of investors signals

differences in systematic risk. Nonetheless, we estimate the CAPM regression of log returns for both inside and outside rounds following the methodologies of both Cochrane (2005) and Korteweg and Sorensen (2010). For each financing-level investment, we track the S&P 500, risk-free rate and Fama-French factors from initial capital infusion to exit date (i.e. t to T). From this we can calculate the standard factors in the 3-factor model that sync with the VC investment. As the returns are non-periodic and may span 2-3 years, we follow the generalized least squares procedure of Korteweg and Sorensen (2010). The main difference presented here is a lack of the first-stage selection regression, which likely attenuates the factor loadings. Insofar as inside and outside rounds exhibit similar such selection problems, this should not affect inference. The estimated coefficients on the three-factors are reported Table 7.

First, the full-sample beta is reassuringly similar to that reported in Korteweg and Sorensen (2010), which provides evidence that we capture the average correlations found in earlier work. Comparing columns (3)-(4) and (5)-(6), the loading on the market factor is lower for the inside rounds.[20] Thus, the concern that inside rounds appear to be of lower risk is justified. Again, the lack of the dynamic selection correction may dampen the loadings – too low a β and too large a loading on SMB and HML – so we approach these results with caution.

Does the difference in factor loadings have a material impact on our estimates in Table 6? The following back of the envelope estimation attempts to adjust for differences in risk. If we assume the base cost of capital of 20%, as well as that alpha is zero, the estimates of the relative betas in the single-factor model from Table 7 imply that inside rounds have an average cost of capital of 16% and outside rounds – that of 21%.[21] This cost of capital differential is arguably economically very substantial. The final column of Table 6 repeats the considers separate PMEs for inside and outside rounds, by imposing the larger beta on the outside round sample.[22] The results in Column (8) suggest that the cost of capital is not the main driver of the difference between inside and

[20] One possible means of generating a larger factor loading for outside rounds is the dynamic selection correction, which is excluded here. The Korteweg and Sorensen (2010) results show that the selection correction increases the absolute value of most loadings, particularly the market factor. Thus, we would have to believe that the selection issue is relatively *more* severe in outside rounds to increase the expected return estimate from the CAPM.

[21] The assumption of zero alpha is sensible. Korteweg and Sorensen (2010) find that an additional "VC factor" materially impacts the abnormal return, suggesting that omitted factors are major drivers for the large alpha.

[22] The PME discounts the gross multiple by the implied multiple from the change in the S&P 500 index I_T/I_t from initial investment to exit. We adjust this multiple with the respective betas using $1 + \beta_i(I_T/I_t - 1)$.

outside round returns, but could explain part of the differences found above. To summarize, our analysis suggests that the risk is indeed different in inside rounds, but the difference is not large enough to explain the differences in realized returns.

4 Explaining inside rounds

In this section, we consider a number of mechanisms that can the lower returns earned for inside rounds.

4.1 Are inside rounds negative NPV?

The results in Section 3 clearly show that, compared to outside rounds at the same stage of financing, inside rounds lead to worse outcomes. In other words, investors should prefer outside to inside rounds, other things equal. However, these results do not imply that participating insiders made suboptimal continuation or pricing decisions. Although the insiders' past investments are sunk, their existing and active stake is not. In other words, insiders have an additional consideration absent from any outsider's evaluation of the investment opportunity: supporting their current equity position and maintaining their real option. The existing investors face the following trade-off in inside rounds. On the one hand, if they do not reinvest, they avoid lowering their expected return on the new investment and save the capital for allocation to other more profitable opportunities. On the other hand, not reinvesting likely results in the entrepreneurial firm failing and the investor earning a small fraction of their original investment from their existing equity stake.

A true metric of insiders' incentives in this case is the NPV that takes into account the full payoff on their new and existing investments. If the NPV is positive, the implication would be that although inside rounds perform worse on average compared to outside rounds, they are rational for insiders given the value of preserving their option. On the other hand, a negative NPV would reveal that the any additional time given to the insiders through reinvestment does not sufficiently increase the expected returns to compensate for the cost of investment. Thus, it is likely some agency friction or behavioral explanation is at play.

In this section, we perform the NPV analysis of insiders' decisions. Any NPV analysis requires an assumption about two important inputs: cost of capital and recovery rate. Suppose that failing to find outside investors, the inside investor walks away from the investment. Upon doing so, she can recover some fraction γ of her past invested capital. This recovery rate can be relatively high for two reasons. First, in the case of liquidation, VC-backed companies typically possess valuable assets, such as patents, equipment, or paying customers that could be acquired by a competitor. Because of liquidation preferences, investors have the most senior position and would receive every single dollar realized from the sale of these assets. Second, if the investors walk away from the deal, the company may still survive by attracting other existing or new investors. Although the existing stake of the non-participating investor is typically heavily diluted, she should expect to recover a fraction of her investment.

If an investor reinvests capital K_{ijt} in the inside round for an equity position K_{ijt}/V_{it}^{Post}, her total equity position is now:

$$e_{ijt} = \frac{K_{ijt}}{V_{it}^{Post}} + \left(1 - \frac{K_{it}}{V_{it}^{Post}}\right) e_{ijt-1},$$

where e_{ijt-1} is her previous equity position. The previous stake is diluted by the new investment. The insider compares the cost of investing in the inside round, which equals to K_{ijt} plus the forgone recovery value from liquidation $\gamma \sum_{s=1}^{t-1} K_{ijs}$, to the expected value of their equity position conditional on investment. Let r_{VC} be the VC cost of capital and T the expected years to exit. Then the insider's decision can be summarized as:

$$\frac{E_t[V_i] e_{ijt} \prod_{s=t+1}^{T} D_{is}}{(1 + r_{VC})^T} - K_{ijt} > \gamma \sum_{s=1}^{t-1} K_{ijs}, \tag{3}$$

where $E_t[V_i]$ is the expected exit valuation of the entrepreneurial firm at time t and $\prod_{s=t+1}^{T} D_{is}$ captures the future dilution. All terms including T and D are expectations formed at the investment date t.

As the baseline case, we assume a 25% recovery rate and the cost of capital of 20%. We start with the distribution of observed returns for all inside rounds in our data. We then use simulation

to estimate the distribution of expected NPVs for each inside round. This distribution represents the set of possible outcomes for an investor considering an inside round investment. Section A.1 in the Appendix describes the simulation procedure. Table 8 presents a summary of the resulting NPV distribution. The first row of Panel A shows the baseline case. The average NPV is negative, with 94% of observations resulting in negative expected returns despite some large positive outliers. Panel A confirms that NPV is negative for various reasonable levels of the cost of capital. Panel B shows that NPV stays negative even if the recovery rate is lowered to 10% (the lowest assumed in Korteweg and Sorensen (2010)). A lower recovery rate makes reinvesting a more attractive option by decreasing the cost of walking away. Yet, this is not sufficient to make the average NPV positive.

Overall, the evidence in Table 8 demonstrates limitations in the defense of the average inside round through a real option argument. The average inside round appears to be a suboptimal continuation decision given the same cost of capital. Insiders are unable to sufficiently decrease the chances of investment failure to compensate for the additional capital required and lost recovered investment. The results also rule out a major prediction about inside rounds: hold-up. Inside investors' higher bargaining power would result in higher returns for inside rounds, which is the opposite of what we find.

4.2 Changing opportunity cost and the VC fund lifecycle

A critical parameter in the present value and NPV analysis above is the cost of capital or opportunity cost that the VC uses when evaluating investment opportunities. In fact, one important source of bargaining power in most hold-up stories is a valuable outside option available to the financier. We now consider one mechanism that could lead an insider to approach an investment with a lower opportunity cost, which would dampen the hold-up problem and rationalize investment in lower return inside rounds. That mechanism is the VC fund structure and the dynamics of compensation contracts over the fund lifecycle.

The first five years of a VC fund are designated the "investment period" where the VC commits to find the vast majority of their first-time investments and allocate the bulk of the fund's capital. This time period can be shorter if a VC firm raises a new fund, while after it ends the VC is often restricted from making new investments out of the previous fund. Management fee compensation

changes reflect this change: many VC funds' fees fall after the investment period to reflect the lower effort in managing the portfolio.[23] Investment choices are restricted after the investment period.

In the investment period, VCs choose among both new and existing investments. These latter follow-on investments are thus judged relative to new investment opportunities. Post-investment period, VCs are restricted from making new investments and must only choose among existing portfolio companies. This change in choice set may in turn impact the opportunity cost of additional investment from the fund. Compensation contracts exacerbate this effect. Specifically, VCs earn management fees regardless of whether the capital is invested (VCs rarely return capital), but they earn a carry on any non-negative return. Therefore, in the post-investment period fund any positive return earns carry. This explanation predicts that VCs will – all else equal – be more likely to invest in financings with relatively lower expected returns post-investment period. Thus, the rate of inside round participation should increase after the investment period and moreover, the returns to inside rounds will be relatively lower after this period. The first test of this prediction is presented in columns (1) - (3) of Table 9.

A unit of observation is an investor and financing for all second round and above rounds. We track the reinvestment or follow-on decisions of inside investors and round characteristics. The dependent variable is one if an existing investor participates in the next financing round. The main variables of interest are interacted with "Next round inside" which is a dummy variable if the next financing includes only insiders. Column (1) introduces a variable that captures the stage of the investor's fund. The dummy "Post-investment period" is one if the fund age is greater than five – when investors typically complete making new investments – or when the VC raises a new fund (which ever comes first).[24] All specifications include a control for fund age and financing round number fixed effects to address general trends in follow-on investment rates. The interaction term "Post-investment period X Next inside" is the variable of interest and has a positive coefficient, suggesting that relative to pre-investment period reinvestment decisions, VCs are more likely to follow-on in inside rounds that occur after the investment period of a fund ends. Column (2)

[23]Robinson and Sensoy (2013) find that 53% of VC funds have a lower fee percentage later in the funds life, while 14% change the basis for fee calculation.

[24]We also tried a data-driven dummy that is one after the VC fund makes less than 10% of its investments in new portfolio companies. The results are similar.

introduces VC firm fixed effects. The results remain and indicate that the patterns exist across funds and within a VC firm. Figure 4 presents the coefficient estimates from a full interaction model of the "Next inside" and dummies for each year around the end of the investment period. The pattern of coefficients reveals an increase in participation that persist for several years.

Column (3) of Table 9 asks whether the same relationship between post-investment period and inside round participation exists *within* a VC syndicate by including VC financing fixed effects. Here we compare VCs in different stages of their fund and ask whether syndicate members in post-investment period funds are more likely to invest in a subsequent inside round than their syndicate partners who are earlier in their fund. The results again suggest that the post-investment period leads to a higher likelihood of inside round participation. The estimates here are the strongest evidence in favor of our hypothesis because it both controls for financing-level unobserved heterogeneity (the finest level available in the data) and compares different investors in the same syndicate.

4.3 Differences in returns

Although VCs may increase their propensity to invest in inside rounds after the investment period ends, it is not yet clear whether such a shift is driven by the lower opportunity cost. The lower opportunity cost should manifest itself in relatively lower returns when compared to the pool of both outside and inside rounds completed in other periods. The last three columns of Table 9 present a similar analysis of log gross returns presented in Table 6 now with the sample of VC insiders where we can map investment to financing. A unit of observation is an existing VC investor participating in a follow-on financing. We consider the sample of financings with observed returns and ask whether features of insiders' participation in inside rounds can explain return differences within such rounds. Column (4) provides the benchmark relationship between inside rounds and returns for this sample. The coefficient on "Full inside round" is negative and significant. The inclusion of the dummy "Post-investment period" and the interaction term "Post-investment X Inside" in column (5) both lowers this coefficient's size and eliminates its significance. The coefficient on the interaction is negative, economically large and significant at the 10% level. The interpretation of this estimate follows from a comparison of inside and outside rounds made by insiders in the post-

investment period, controlling for the average difference in returns in the post-investment period (i.e. a structure similar to a difference-in-differences). The patterns found in columns (1) - (5) provide strong evidence for the changing opportunity cost explanation for inside round investments. Finally, column (6) considers the financing-level variant of post-investment period: the fraction of syndicate members in a post-investment period fund. The negative relationship with returns remains, but significance is missing. Overall, the lower opportunity cost in the post-investment period of a VC fund can rationalize reinvestment in lower expected return investments such as inside rounds. The results provides a new view on the consequences of the VC fund life-cycle on investment decisions.

5 Robustness and Discussion

Insidedness plays an important role in the outcomes of VC-backed companies. In this section we explore a other potential explanations for the observed differences and present some robustness tests.

5.1 Can preferred stock explain the results?

The gross multiple used above assumes that the investor purchases a share of common equity or, equivalently, the investor's security is converted into common equity upon exit. As is well known, most VCs purchase preferred shares which include participation and liquidation rights (Kaplan and Strömberg (2003)). Bengtsson and Sensoy (Forthcoming) show that rounds with flat or lower valuations are more likely to have stronger cash flow rights, more seniority and stronger participation rights. Inside rounds are more likely to be both flat or down, so it is possible that these contract features come into play when an inside round occurs.[25] If this is the case, then we could be underestimating the true returns earned by investors in inside rounds. The next two tables address whether inside rounds are more likely to have non-common contract features.

Table 10 uses the database of VC contracts provided by VC Experts. This data set includes a sample of VC-backed companies primarily financed after 2005 and provides information on the contractual provisions of securities held by VCs. The data set comes from extraction of terms from

[25]Control rights, which are difficult to observe, may also increase. Cash flow rights are the best proxy for returns earned by investors.

articles of incorporation filed in the state of Delaware and California. Several contract features available in the data could improve the investor's returns. Liquidation preference provides downside protection for a preferred shareholder than can guarantee at least one times capital invested (and up to three times). Next, preferred stock seniority provides an investor additional downside coverage and priority in the case of low valuation exits. Third, the insider can purchase "Participating preferred" stock that provides both the liquidation preference and the ability to participate in the upside without conversion. Finally, a preferred shareholder can have redemption rights which act as a put on their equity investment after some period of time. This right can provide bargaining power in liquidation events.

Each column of Table 10 asks whether there is a correlation between observed contract features and inside rounds. If insiders shift to more investor-friendly contracts, then the common equity assumption is an underestimate of average returns earned. The merge of VC Experts with VentureSource results in over 1,400 financing events with known contracts. Columns (1) - (4) show that insidedness is not statistically related to these contract features. For example, in Column (2) a dependent variable is a dummy that equals to one if the liquidation preference of the financing is greater than "one times" (known in the industry as "1X"). There is a weak positive relationship between insidedness and liquidation preference, which is not significant. The table also reports the mean of each dependent variable unconditionally and conditional on inside rounds. Again, the inside rounds tend to have slightly friendlier terms than outside rounds, but the difference is small.

As a final check on the measurement of returns, we ask whether better cash flow rights of VCs through strong downside protections can explain the results. In columns (1) and (2) of Table A.4 in the Appendix, we impose strong contracts on returns to inside rounds as an attempt to compensate for any switch from standard equity to debt-like returns. In column (1), all inside rounds that have a return greater than 0 and less than two time capital invested are given a two times capital return. Similarly, outside rounds with observed multiples between zero and one are assigned the latter. This adjustment improves the returns on the average non-failed inside round. This is an extreme assumption, because the observed fraction of $2X$ liquidation in the full VC Experts database is less than 15%, while this adjustment results in over 35% of inside rounds having such a feature. As expected, the coefficient on the inside round dummy decreases; however, we still find

a statistically significant negative relationship with returns. Column (2) repeats the same exercise but also replaces missing returns with the $2X$ return if the exit value is smaller than total capital raised. The results are unchanged. We conclude from this exercise that it is unlikely that strong preferred contract features could compensate for the lower observed as-if-common return differences found in the main results.

5.2 Alternative explanations for lower performance

The results in Table 9 support the changing opportunity cost explanation for informed investors' decisions to invest in inside rounds. Other frictions exist that could motivate participation in these under-performing rounds, which we now consider. Fundraising and reputation-building are an important component of VC investment decisions and compensation (e.g. Brown, Gredil, and Kaplan (2016) and Robinson and Sensoy (2013)). The incentive to gain reputation as a high quality investor may change investment strategy through quicker exits (e.g. Gompers (1996)) or delaying the reinvestment in worse companies (Chakraborty and Ewens (2016)).[26] Inside rounds could be another feature of investment strategy that responds to this agency issue. Inside rounds in fact fail at a higher rate, with little evidence of any offset by a higher likelihood of large exits. Nonetheless, perhaps VCs invest in inside rounds in the hopes of salvaging poor recent performance by "gambling for resurrection." Here, VCs may be willing to invest in poor *average* investments such as inside rounds for a small chance of a large return. This explanation predicts that we should observe more inside rounds when VC firms have suffered worse relative performance. Table A.3 in the Appendix asks whether recent investment performance predicts insider investment decisions.

As in Table 9, a unit of observation is an investor and financing for all second round and above rounds. The variable of interest in column (1) – "No big exits" – is a dummy variable that is one if the VC investor had an IPO or acquisition that exceeds two times capital invested in their portfolio in the past two years.[27] Our prediction is that VCs with weak recent track record may be willing to invest in relatively worse investments at high prices in an attempt to improve returns. We thus predict that the interaction "Next inside X No big exits" will positive

[26] Chung, Sensoy, Stern, and Weisbach (2012) and Hochberg, Ljungqvist, and Vissing-Jørgensen (2013) show that LPs respond to past and interim performance.

[27] The results are robust to using a one-year window.

and significant. We find no evidence in favor of this explanation. Inside round behavior could also mirror the practice of "evergreening" found in banking, which was particularly pronounced in Japan during their last major recession (Peek and Rosengren (2005)) and in Italy after the Lehman bankruptcy (Albertazzi and Marchetti (2010)).[28] Evergreening leads banks to delay recognition of losses and rolling over relatively worse loans. Banks may have regulatory and signaling incentives to provide refinancing to their worst investments. Similar incentives could exist in venture capital that would lower the effective cost of capital to participating insiders. Evergreening in VC would be most pronounced during fundraising, where VCs want to signal their ability to produce high returns and postpone writeoffs. Here we predict relatively more inside rounds during fundraising periods. Column (2) of Table A.3 considers the variable "Fundraising" that is one is within two years of successfully or unsuccessfully raised a new fund.[29] The coefficients on both the level and interaction are insignificant, suggesting that this type of evergreening does not appear to be an important predictor of inside rounds.

The last two columns of Table A.3 ask whether whether these two possible motivations for inside round participation play a role in the differences in returns. The interaction term "No big exits X Inside" in column (3) is negative as predicted, but insignificant. The coefficient on "Inside rounds" is still negative. There is no evidence that inside rounds with under-performing investors do worse. We conclude from this that a major driver of inside round under-performance does not stem from VCs "gambling for resurrection." Column (4) asks whether fundraising correlates with inside round returns. If during this time VCs want to avoid writing off bad investments, then they may be willing to reinvest at too-high prices. The coefficient on the interaction is positive and statistically insignificant. Combined with the results for similar variables in the first two columns, we find no evidence that reputation-building or "gambling for resurrection" can explain the average results.

[28] A changing fee structure could also incentivize the VC to keep under-performing investments alive. However, Robinson and Sensoy (2013) find that any such behavior is found in buyout rather than VC funds.

[29] See Chakraborty and Ewens (2016) for variable construction.

5.3 Other robustness tests

The results on inside round returns are robust to several measurement issues and alternative explanations. Table A.4 in the Appendix presents the main returns specification with the inside round dummy replaced with the "% inside dollars" (when known). The same negative relationship remains. Next, inside rounds could be pseudo-bridge rounds that act as "rescue" financings for entrepreneurial firms that suffered some negative shock. To address whether the main results are driven by this explanation, we exclude all rounds that are in bottom 10th percentile of size (by industry) and in the bottom 25th percentile by time since last financing. Here we assume that rescue financing events would be relatively smaller and occur more quickly than the average round. This subsample presented in column (4) exhibits the same patterns as found above.

The amount of capital invested is a strong predictor of outcomes. As Figure 3 shows, inside rounds are on average significantly smaller in terms of capital raised than outside rounds. To better understand if the size of the inside round is driving the lower returns, we construct a dummy variable "Capital ramp down." The variable tracks the sequence of capital raised between two sequential financings of an entrepreneurial firm and equals to one if the change in capital raised is in the bottom quartile of changes across the sample. A small or negative change in capital raised across financings could signal worse prospects or strong financing constraints for the firm. If within-firm capital ramp downs drive poor results, the interaction of this dummy with inside round should be negative. Column (5) of Table A.4 shows the opposite: inside rounds with large ramp-downs in capital have relatively higher returns. Combined with the results excluded small, quick financings, the evidence suggests that that backstop or rescue financing (e.g. Broughman and Fried (2012)) does not explain our main conclusions about return differences. A final concern is that inside rounds occur after specific industries suffer a downturn or a lack of new capital. Insofar as the industry-year fixed effects do not address this concern, the final column of Table A.4 introduces the variable "cold industry" that is one if the entrepreneurial firm's industry had bottom quartile number of deals in the previous 6 months. If the main inside round result is driven by time-varying, industry-specific changes in investment opportunities, then the interaction with this variable and the inside round dummy should be negative and weaken the main effect. Column (6)

shows that the first prediction is true, however, the average inside round still under-performs after adding this control. Overall, the lower returns to inside rounds is robust to a range of alternative explanations.

6 Conclusion

We study an environment in venture capital where opportunism by financial intermediaries would be at its worst and found no evidence in favor of its existence. The patterns of returns instead points to a novel agency problem driven by the VC fund life cycle. Here, VCs rationally respond to changes in the opportunity cost of investment by paying what appears to be too-high prices for struggling portfolio companies. The lack of evidence for higher returns and support for sub-optimal continuation decisions by insiders in these rounds suggests that hold-up by VCs is not a major concern. The results thus indicate that the collection of practices – syndication, preferred stock contracts and staged financings – temper the hold-up problem in venture capital. Moreover, there appear to be unintended consequences to the limited fund life and fixed investment period model of venture capital funds.

References

Admati, Anat R, and Paul Pfleiderer, 1994, Robust financial contracting and the role of venture capitalists, *The Journal of Finance* 49, 371–402.

Aghion, Philippe, and Jean Tirole, 1994, The management of innovation, *Quarterly Journal of Economics* 109, 1185–1209.

Albertazzi, Ugo, and Domenico Junior Marchetti, 2010, Credit supply, flight to quality and evergreening: an analysis of bank-firm relationships after lehman, *Bank of Italy Temi di Discussione (Working Paper) No* 756.

Barrot, Jean-Noel, 2015, Investor horizon and the life cycle of innovative firms: Evidence from venture capital, .

Bengtsson, Ola, and Berk A Sensoy, Forthcoming, Changing the nexus: the evolution and renegotiation of venture capital contracts, *Journal of Financial and Quantitative Analysis* pp. 2009–19.

Bergemann, Dirk, and Ulrich Hege, 1998, Venture capital financing, moral hazard, and learning, *Journal of Banking and Finance* 22, 703–35.

——— , 2005, The financing of innovation: Learning and stopping, *RAND Journal of Economics* 36, 719–752.

——— , and Liang Peng, 2008, Venture capital and sequential investments, *Working Paper*.

Broughman, Brian J, and Jesse M Fried, 2012, Do vcs use inside rounds to dilute founders? some evidence from silicon valley, *Journal of Corporate Finance* 18, 1104–1120.

Brown, Gregory W, Oleg Gredil, and Steven N Kaplan, 2016, Do private equity funds game returns?, *Working Paper*.

Burkart, Mike, Denis Gromb, and Fausto Panunzi, 1997, Large shareholders, monitoring, and the value of the firm, *Quarterly Journal of Economics* 112, 693–728.

Chakraborty, Indraneel, and Michael Ewens, 2016, Managing performance through delay: Evidence from venture capital, *Working paper*.

Chung, Ji-Woong, Berk A Sensoy, Lea Stern, and Michael S Weisbach, 2012, Pay for performance from future fund flows: the case of private equity, *Review of Financial Studies* p. hhr141.

Cochrane, John H, 2005, The risk and return of venture capital, *Journal of financial economics* 75, 3–52.

Cornelli, Franchesca, and O. Yosha, 2003, Stage financing and the role of convertible securities, *Review of Economic Studies* 70, 1–32.

Fluck, Z., K Garrison, and S. Myers, 2007, Venture capital contracting: Staged financing and later-stage syndication of venture capital investments, *MIT Working paper*.

Gompers, Paul, Will Gornall, Steven N. Kaplan, and Ilya Strebulaev, 2016, How do venture capitalists make decisions?, *Working paper*.

Gompers, Paul A, 1995, Optimal investment, monitoring, and the staging of venture capital, *The journal of finance* 50, 1461–1489.

Gompers, Paul A., 1996, Grandstanding in the venture capital industry, *Journal of Financial Economics* 42, 133–56.

Grossman, Sanford J., and Oliver D. Hart, 1986, The costs and benefits of ownership: A theory of vertical and lateral integration, *Journal of Political Economy* 94, 691–719.

Guler, Isin, 2007a, An empirical examination of management of real options in the u.s. venture capital industry, *Advances in Strategic Management* 24, 485–506.

——— , 2007b, Throwing good money after bad? political ad institutional influences on sequential decision making in the venture capital industry, *Administrative Science Quarterly* 52, 248–285.

Hochberg, Yael V, Alexander Ljungqvist, and Annette Vissing-Jørgensen, 2013, Informational holdup and performance persistence in venture capital, *Review of Financial Studies* p. hht046.

Houston, Joel, and Christopher James, 1996, Bank information monopolies and the mix of private and public debt claims, *Journal of Finance* pp. 1863–1889.

Kaplan, Steven N, and Antoinette Schoar, 2005, Private equity performance: Returns, persistence, and capital flows, *The Journal of Finance* 60, 1791–1823.

Kaplan, Steven N, and Per Strömberg, 2003, Financial contracting theory meets the real world: An empirical analysis of venture capital contracts, *The Review of Economic Studies* 70, 281–315.

Khanna, Naveen, and Richmond D Mathews, 2015, Posturing and holdup in innovation, *Review of Financial Studies* p. hhv071.

Korteweg, Arthur, and Morten Sorensen, 2010, Risk and return characteristics of venture capital-backed entrepreneurial companies, *Review of Financial Studies* p. hhq050.

Lerner, Joshua, 1994, Venture capitalists and the decision to go public, *Journal of Financial Economics* 35, 293–316.

Metrick, Andrew, and Ayako Yasuda, 2010, *Venture capital and the finance of innovation* (Wiley) 2nd edn.

Neher, Darwin V., 1999, Staged financing: An agency perspective, *Review of Economic Studies* 66, 255–74.

Peek, Joe, and Eric S Rosengren, 2005, Unnatural selection: Perverse incentives and the misallocation of credit in japan, *American Economic Review* 95, 1144–1166.

Puri, Manju, and Rebecca Zarutskie, 2012, On the life cycle dynamics of venture-capital-and non-venture-capital-financed firms, *The Journal of Finance* 67, 2247–2293.

Rajan, Raghuram G., 1992, Insiders and outsiders: The choice between informed and arm's-length debt, *Journal of Finance* 47, 1367–400.

Robinson, David T, and Berk A Sensoy, 2013, Do private equity fund managers earn their fees? compensation, ownership, and cash flow performance, *Review of Financial Studies* 26, 2760–2797.

Sahlman, William A., 1990, The structure and governance of venture-capital organizations, *Journal of Financial Economics* 27, 473–521.

Sharpe, Steven A., 1990, Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships, *Journal of Finance* 45, 1069–87.

Sorensen, Morten, 2007, How smart is smart money: A two-sided matching model of venture capital, *Journal of Finance* 62, 2725–2762.

Thaler, Richard H., and Eric J. Johnson, 1990, Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice, *Management Science* 36, 643–660.

7 Figures and Tables

Figure 1: Inside rounds over time

Notes: The figure reports the fraction of inside rounds from 1995 - 2014 as defined in Section 2.2.

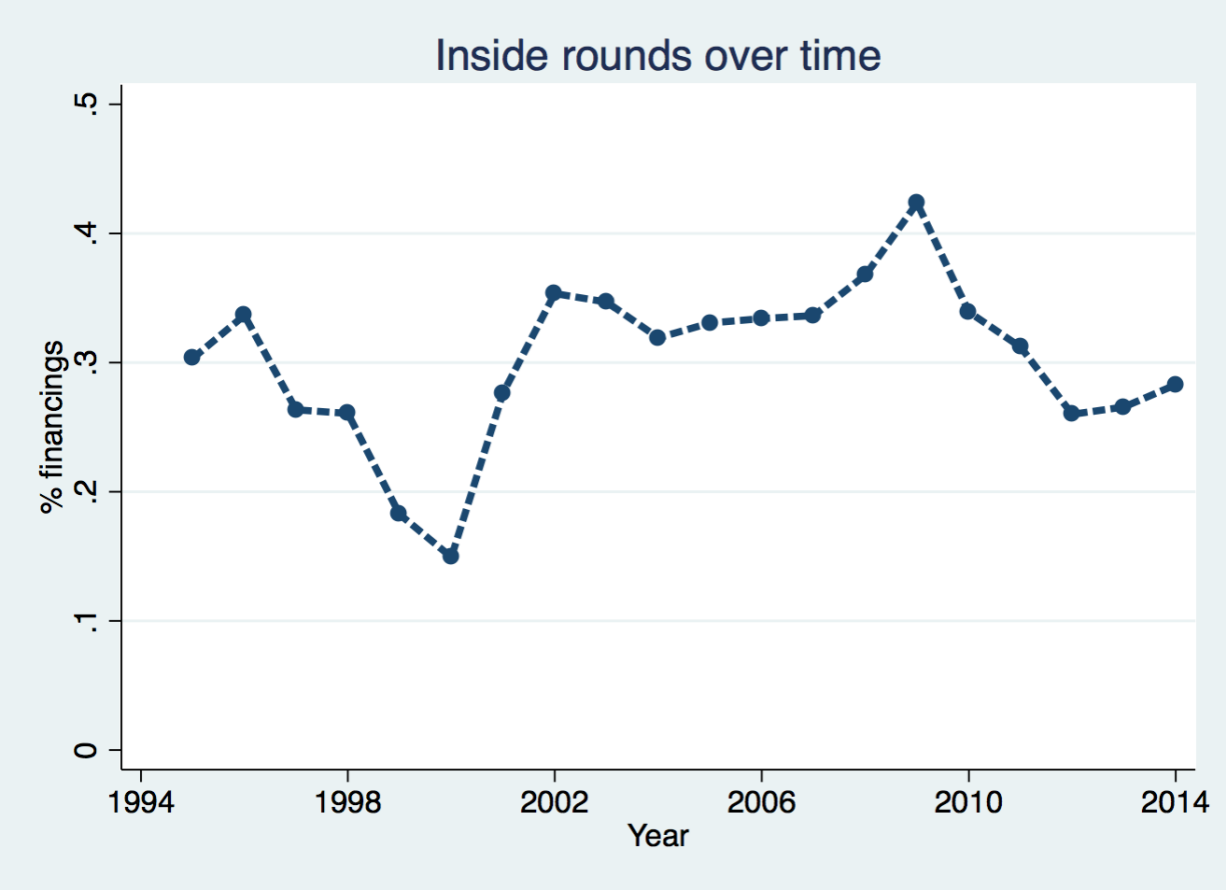

Figure 2: Change in valuation: inside vs. outside rounds

Notes: The figure reports the kernel density of the ratio of the current financing pre-money valuation over the previous financing's post-money valuation $V_{it}^{Pre}/V_{it-1}^{Post}$. Pre-money valuation is the total firm valuation prior to the financing event, while post-money valuation is the value after the capital infusion. The ratio of current pre-money over past post-money represents a change in total firm value across financing events. The red vertical line is for the ratio value of one, which is called a "flat" round.

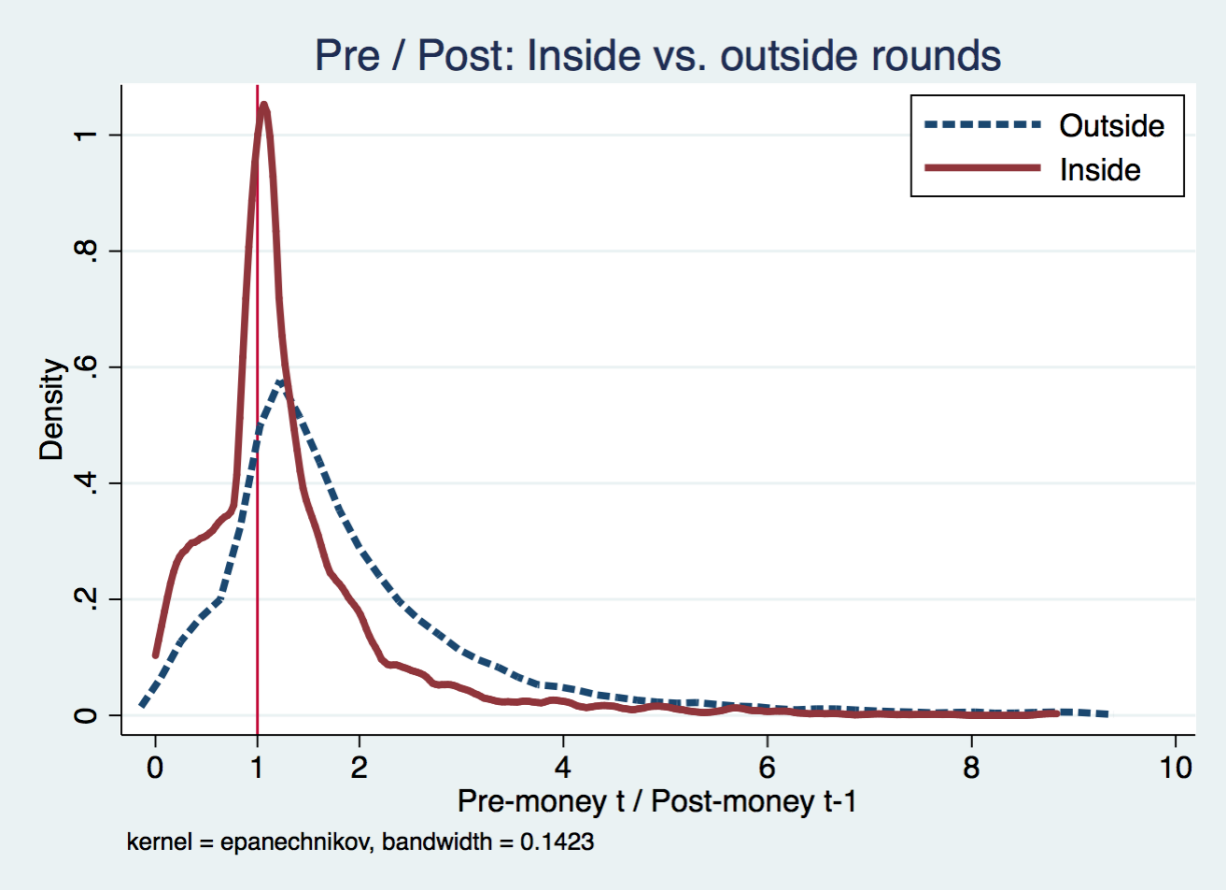

Figure 3: Log capital invested: inside vs. outside rounds

Notes: The figure reports the kernel densities of log of capital invested in a financing event in two samples. "Outside" are those financings with at least one VC investor who is new to the pool of investors. "Inside" are those financings where all investors were previously invested in the firm.

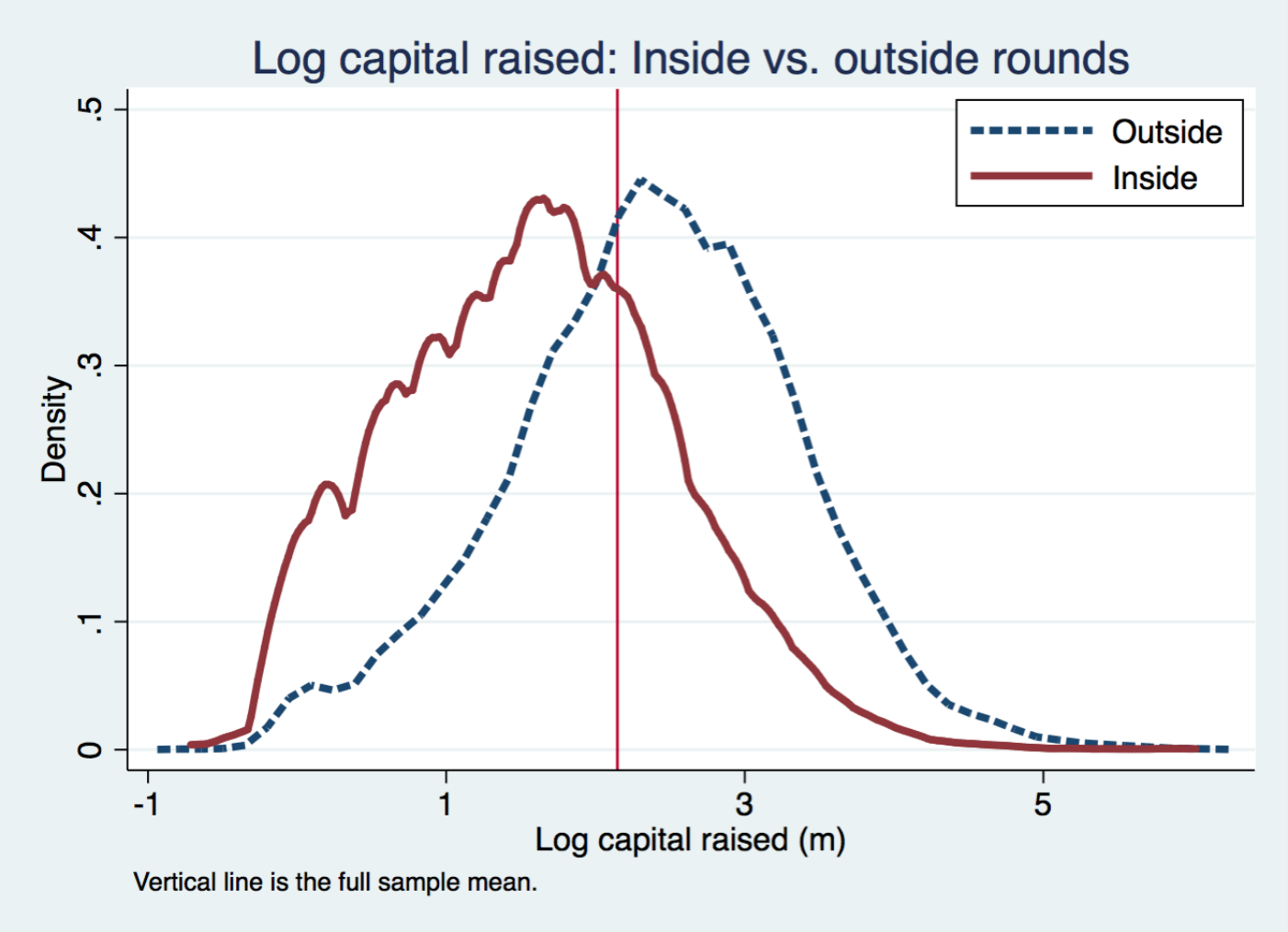

Figure 4: Inside round participation by fund age

Notes: The figure reports the coefficients on the interaction terms "Next inside X Fund Age" from a regression of participation by investors in a round and a set of financing-level controls. The coefficient estimate represents the relative rate of investment in inside rounds over the fund lifecycle. The excluded year is the beginning of the post-investment period. See Table 9 for the full regression results.

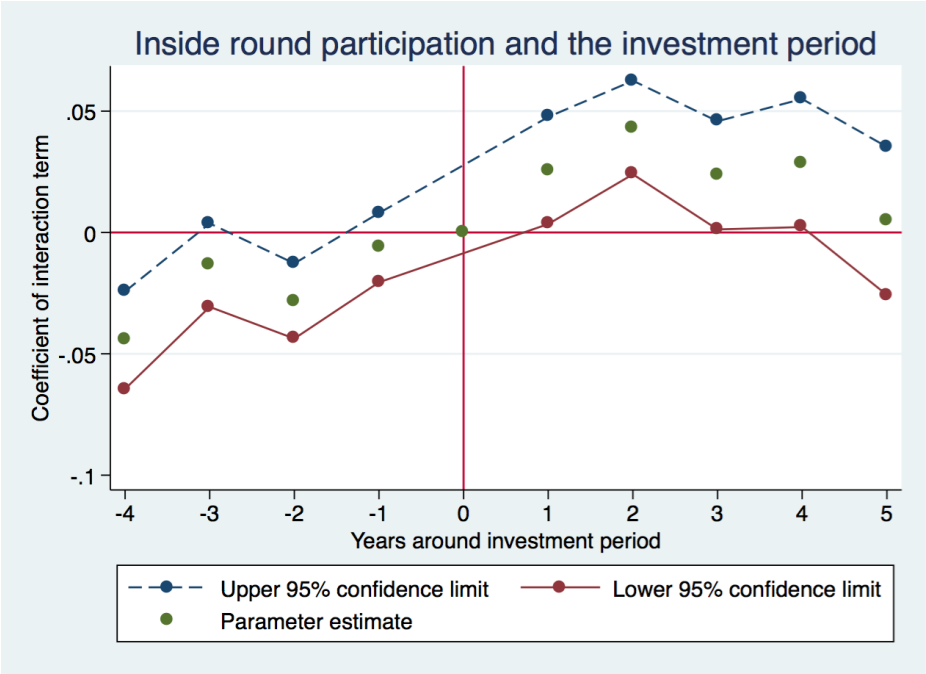

Table 1: Summary statistics

Notes: Table reports the summary statistics of the firms and financings in our sample. The main criteria for inclusion are post-first financing equity rounds for entrepreneurial firms where they have at least one traditional VC investor and received capital from 1990 to 2008. Panel A summarizes the set of entrepreneurial firms. "Information Technology" and "Healthcare" are firm industry categories. "IPO" is a dummy equal to one if the firm had an IPO by the end of the sample. "Acquired" and "Failed" are dummies for firms that were acquired or failed, respectively, by the end of the sample. "Year founded" is the year the entrepreneurial firm was founded. "First capital raised" is the capital raised in the entrepreneurial firm's first financing (in millions). "Total financings" is the total number of financings raised by the entrepreneurial firm prior to exit. Panel B summarizes the financing event characterstics, valuation measures and returns. "Round number" is the sequence of the financing event. "Syndicate size" is the count of the number of unique investors in the current financing. "Years since last fin." is the number of years between the current and previous financing. "Capital raised" is the total capital invested in the current financing. "Firm age" is the age in years of the entrepreneurial firm by the financing event measured from the founding date. "Financing year" is the year of the investment. The valuation measures – pre-money and post-money – are often missing, so the summary considers only a subsample of the data (the section titled "Valuations (when known)"). The returns are also missing for many financings (heading "Investment returns (when known)"), so "Gross multiple" summarizes the set of financing returns where we observe the exit valuation and financing valuation or the company failed. "Gross multiple" is the multiple of money earned by a hypothetical dollar invested in the financing accounting for any future dilution (zero for failed firms).

	Panel A							
	Firm characteristics							
	mean	sd	min	p25	p50	p75	max	count
Information Technology	0.53	0.50	0	0	1	1	1	10104
Healthcare	0.23	0.42	0	0	0	0	1	10104
IPO	0.11	0.31	0	0	0	0	1	10104
Acquired	0.46	0.50	0	0	0	1	1	10104
Failed	0.31	0.46	0	0	0	1	1	10104
Still active	0.13	0.34	0	0	0	0	1	10104
Year founded	1998.6	4.99	1978	1996	1999	2002	2007	10104
First capital raised (m)	5.47	8.47	0.10	1.50	3	6.29	232.6	10104
Total financings	4.41	2.13	2	3	4	5	20	10104
California	0.43	0.49	0	0	0	1	1	10104
	Panel B							
	Round-level characteristics							
	mean	sd	min	p25	p50	p75	max	count
Round number	3.35	1.50	2	2	3	4	13	22382
Syndicate size	4.15	2.68	1	2	4	5	25	22382
Years since last fin.	1.36	0.97	0.085	0.75	1.16	1.71	16.6	22382
Capital raised (m USD)	14.3	22.9	0.44	4.40	9	17	1500	22382
Firm age (as of financing)	5.04	3.65	0.13	2.41	4.12	6.72	35.5	22382
Financing year	2003.4	5.12	1990	2000	2003	2007	2015	22382
	Valuations (when known)							
	mean	sd	min	p25	p50	p75	max	count
Post-money valuation	83.1	493.0	1.04	20	39.5	80	50000	12736
Pre-money valuation	67.1	474.3	0.040	12.6	27	60.2	48500	12736
	Investment returns (when known)							
	mean	sd	min	p25	p50	p75	max	count
Gross multiple	1.63	4.42	0	0	0	1	31.0	13182

Table 2: Characteristics of the various inside variables

Notes: Table reports the characteristics of the main insideness variables discussed in Section 2.2. Panel A includes all financings where we could determine the insideness. Panel B restricts the sample to those financings where we observe a post-money valuation, which are relevant when we study returns. The "inside dollars" variables may be missing because we may not observe how much capital was provided by individual investors (e.g. investors are aggregated into buckets or we lack a unique identfier). Variables are defined in Table A.1.

	Panel A **All financings**									
	mean	sd	min	p10	p25	p50	p75	p90	max	count
Inside round	0.30	0.46	0	0	0	0	1	1	1	22382
Inside VC round	0.45	0.50	0	0	0	0	1	1	1	22382
% insider investors	0.64	0.31	0	0.20	0.50	0.67	1	1	1	22382
No new lead	0.58	0.49	0	0	0	1	1	1	1	22382
% inside dollars	0.62	0.35	0	0.083	0.34	0.60	1	1	1	13522
	Panel B **Financings with known valuation**									
	mean	sd	min	p10	p25	p50	p75	p90	max	count
Inside round	0.25	0.43	0	0	0	0	0	1	1	12736
Inside VC round	0.39	0.49	0	0	0	0	1	1	1	12736
% insider investors	0.63	0.29	0	0.25	0.44	0.67	0.91	1	1	12736
No new lead	0.53	0.50	0	0	0	1	1	1	1	12736
% inside dollars	0.59	0.33	0	0.13	0.33	0.55	1	1	1	7177

Table 3: Survey results: "When you see an inside round by peer firms, what do you think the reason was?"

Notes: The table reports the response frequency from the survey conducted in Gompers, Gornall, Kaplan, and Strebulaev (2016). Standard errors reported in parentheses. "Early stage" are the subset of VC respondents who run early-stage funds, while "Late Stage VC" are those that run late-stage funds. The remaining respondents run mixed stage or diversified funds. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	All	Early-stage VC	Late Stage VC
Kept a good deal to themselves	60%	44%***	72%***
	(3)	(4)	(7)
Avoid marking down investment	39%	34%	41%
	(3)	(4)	(7)
Show support to entrepreneurs	30%	29%	32%
	(2)	(4)	(7)
Already had needed skills	15%	9%	10%
	(2)	(2)	(4)
Overcome short-term setback at startup	73%	78%*	65%*
	(2)	(4)	(7)
Too little external capital	59%	64%**	46%**
	(3)	(4)	(7)
Other	5%	3%	4%
	(1)	(2)	(3)
Number of responses	318	131	45

Table 4: Inside vs. non-inside financing rounds

Notes: The table compares financings where there the only investors are those with an existing equity stake to those with at least one outside investor of any kind. The numbers are the mean and median respectively, by sub-sample and for the full sample (i.e. "Total"). Sample includes all entrepreneurial firms that were founded prior to 2008 to give ample time for an exit event and who had at least two financing events. The first panel considers characteristics of financings independent of whether we can calculate a return or observe a valuation. The remaining panels require non-missing data on each of these dimensions for sample inclusion. "Years VC-backed" is the number of years from the first observed VC financing to the current. "# VC investors (all)" is a count of the total number in past investors. "Pre$_t$ / Post$_{t-1}$" is the change in valuation from previous to the current financing. "Up round" is a dummy variable equal to one if this value is greater than one (less than one for "Down round" and 1 for "Flat round"). Other variables are as defined in Table A.1.

	Full sample		
	Inside round	Outside round	Total
Capital raised (m USD)	7.846	17.09	14.35
	5	11	9
Round number	4.075	3.623	3.757
	4	3	3
Years VC-backed	3.764	3.219	3.381
	3.116	2.464	2.650
Firm age (as of financing)	5.596	4.803	5.038
	4.758	3.841	4.123
Years since last fin.	1.370	1.351	1.357
	1.207	1.131	1.158
Syndicate size	2.716	4.755	4.150
	2	4	4
# VC investors $(t-1)$	4.954	4.548	4.669
	4	4	4
Number Financings	6645	15737	22382
	Financing valuations		
	Inside round	Outside round	Total
Pre$_t / Post $_t - 1$	1.369	2.091	1.911
	1.094	1.550	1.417
Up round	0.601	0.800	0.751
	1	1	1
Down or flat round	0.399	0.200	0.249
	0	0	0
Number observations	2232	6729	8961
	Financing returns		
	Inside round	Outside round	Total
Gross multiple	1.312	1.759	1.631
	0	0	0
Zero multiple	0.642	0.548	0.574
	1	1	1
Number observations	3754	9428	13182

Table 5: Entrepreneurial firm outcomes: inside vs. outside rounds

Notes: The table reports probit and OLS regressions of entrepreneurial firm outcomes on a set of observables. Column (1) uses the dependent variable "IPO" that is equal to one if the firm went public by the end of the sample. Column (2) considers "Good exit" which is equal to one if the firm had an IPO or an acquisition with a reported valuation greater than two times capital invested. "Log exit value" in column (3) is the log of the exit valuation which is either the IPO valuation or the acquisition price. The variable "Had inside round" is a dummy variable equal to one if the entrepreneurial firm ever had an inside round in its financings. The variable "Had no new lead round" is one if the firm had at least one financing event without a new, outside lead investor. Columns (3) - (6) introduce controls for whether the firm had a "down" round in its history. Robust standard errors clustered at the entrepreneurial firm founding year reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	IPO	Good exit	Log exit value Non-failed	IPO	Good exit	IPO	Good exit	Log exit value Non-failed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Had inside round	-0.218***	-0.200***	-0.293***			-0.176***	-0.178***	-0.192**
	(0.0379)	(0.0325)	(0.0553)			(0.0453)	(0.0369)	(0.0747)
Had no new lead round				-0.188***	-0.221***			
				(0.0641)	(0.0392)			
Had down round						-0.307***	-0.296***	-0.662***
						(0.0474)	(0.0457)	(0.0774)
Log total capital	0.350***	0.0947***	0.569***	0.347***	0.0928***	0.338***	0.128***	0.584***
	(0.0470)	(0.0174)	(0.0286)	(0.0474)	(0.0173)	(0.0244)	(0.0262)	(0.0553)
Total unique VCs	-0.000901	-0.000787	-0.0362***	0.000360	0.00107	-0.0176***	-0.0116	-0.0377**
	(0.00753)	(0.00615)	(0.00832)	(0.00733)	(0.00623)	(0.00670)	(0.00815)	(0.0146)
Constant	-1.525***	-0.0344	3.380***	-1.483***	0.0390	-0.972***	0.198***	3.572***
	(0.0903)	(0.0582)	(0.124)	(0.0906)	(0.0633)	(0.103)	(0.0721)	(0.173)
Observations	10104	10104	3639	10104	10104	4817	4817	2262
Pseudo-R^2	0.159	0.0436		0.156	0.0431	0.121	0.0477	
R^2			0.141					0.150
Model	Probit	Probit	OLS	Probit	Probit	Probit	Probit	OLS
Founding year FE?	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE?	Y	Y	Y	Y	Y	Y	Y	Y
Founding Year$x$Industry FE?	Y	Y	Y	Y	Y	Y	Y	Y
State FE?	Y	Y	Y	Y	Y	Y	Y	Y

Table 6: Differences in returns: log gross multiple

Notes: The table reports regressions of a the log of the gross multiple on a set of financing and entrepreneurial firm observables. The dependendent variable is the financing-level return (logged) assuming common equity for a dollar invested in the round. If the company exits via an acquisition and the reported price is less than total capital raised, we assume that the last investors receive all their capital back before earlier investors share in the return. Failed investments are assumed to recover 25% of capital (so they can be logged). All regressions are weighted least squares, where the weights reflect the propensity for a given financing to have an computable return (see Section 2.2). Column (1) presents the full sample with known returns. "Inside round" is a dummy equal to one if the financing is an inside round. Column (2) introduces the alternative dummy variable that is equal to one if none of the new investors are also the lead investor. Column (3) repeats column (1) where the recovery rate is 10% for failed investments. Column (4) excludes financings done during the 2000 and 2008 eras, when investment activity changed dramatically. Column (5) introduces VC firm fixed effects to the model in column (1). Column (6) regresses the present value of the realized cash flow discounted at 20%. Column (7) considers the risk-adjusted return using the Kaplan and Schoar (2005) PME measure (investment return over the time-matched S&P 500 return). The measure implicitly assumes a beta of one. Column (8) considers the same measure, but allows the beta of inside and outside rounds to differ according to the results in Table 7. That is, we impose the single-factor betas from Table 7 for the S&P 500 total return in the PME calculation: $(1 + \beta_i(I_T/I_t - 1))$ where β_i are the betas from the inside and outside round CAPM regressions. "Log total capital" is the log of total capital invested in the entrepreneurial firm at the time of the financing event. "Years since last fin." is the log of the years since the previous financing event. "Log firm age (yrs.)" is the log of the age of the entrepreneurial firm at the financing. "VC FE" are VC firm fixed effects. "Industry FE" are fixed effects for the entrepreneurial firm's industry. "Year FE" are fixed effects for the financing year and "Round # FE" are fixed effect for the financing sequence number. "Year X Ind. FE" are year-industry fixed effects. Robust standard errors clustered at the financing year reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Log gross multiple					PV $r = .2$	PME	PME
			Recov. 10%	No 00 or 08	FE			$\beta_I \neq \beta_O$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inside round	-0.168***		-0.260***	-0.184***	-0.129***	-1.274**	-0.186***	-0.107**
	(0.0306)		(0.0367)	(0.0218)	(0.0130)	(0.516)	(0.0505)	(0.0526)
No new lead		-0.183***						
		(0.0408)						
Log total capital	0.205***	0.205***	0.281***	0.198***	-0.00911	-0.577		
	(0.0378)	(0.0377)	(0.0468)	(0.0414)	(0.00978)	(0.502)		
Years since last fin.	-0.132***	-0.131***	-0.171***	-0.139***	-0.0776***	-1.486***	-0.185***	-0.175***
	(0.0245)	(0.0243)	(0.0312)	(0.0281)	(0.00747)	(0.341)	(0.0340)	(0.0318)
Log firm age (yrs.)	-0.131**	-0.132**	-0.157**	-0.166***	-0.102***	-1.144	-0.239***	-0.244***
	(0.0529)	(0.0526)	(0.0672)	(0.0502)	(0.0151)	(0.766)	(0.0730)	(0.0480)
Constant	-3.120***	-2.985***	-4.533***	-1.851***	-1.615***	-33.91***	-0.752**	-0.640**
	(0.159)	(0.161)	(0.202)	(0.128)	(0.145)	(1.851)	(0.274)	(0.267)
Observations	13182	13182	13182	10906	56765	13167	13091	13091
R^2	0.222	0.223	0.228	0.204	0.124	0.187	0.162	0.0714
Number firms	5968	5968	5968	5303	5949	5962	5943	5943
Number VCs					4547			
VC FE?	N	N	N	N	Y	N	N	N
Industry FE ?	Y	Y	Y	Y	Y	Y	Y	Y
Year FE ?	Y	Y	Y	Y	Y	Y	Y	Y
Year X Ind. FE?	Y	Y	Y	Y	Y	Y	Y	Y
Round # FE?	Y	Y	Y	Y	Y	Y	Y	Y

Table 7: CAPM: inside vs. outside

The table reports the log-CAPM estimates for the following model where M_{it} is the gross multiple of a VC financing:

$$\log M_{it} - \log R^f_{t\to T} = \delta(T-t) + \beta_1(\log R^m_{t\to T} - \log R^f_{t\to T}) + \beta_2 \log SMB^f_{t\to T} + \beta_3 \log HML^f_{t\to T} + \epsilon_{it}$$

where each term is divided by $\sqrt{T-t}$ or the square root of the years to exit (see Korteweg and Sorensen (2010) for discussion of this GLS correction). The intercept δ does not represent a traditional CAPM α, however, the coefficient β do map to the traditional factor loads from a standard returns regression. $R^f_{t\to T}$ represents the non-periodic risk-free return (gross multiple) for the time period t to T. Similarly, for the market return ($R^m_{t\to T}$) and Fama-French factors. Robust standard errors reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Full	Full	Inside Rounds		Outside Rounds	
	(1)	(2)	(3)	(4)	(5)	(6)
RMRF	2.297***	2.197***	1.803***	1.705***	2.496***	2.412***
	(0.0626)	(0.0815)	(0.120)	(0.135)	(0.0732)	(0.102)
SMB		-0.439**		-0.550		-0.381
		(0.223)		(0.380)		(0.267)
HML		-0.00725		-0.0925		0.0360
		(0.0449)		(0.0588)		(0.0606)
Intercept	-0.105***	-0.0892***	-0.162***	-0.116***	-0.0848***	-0.0844***
	(0.00441)	(0.0167)	(0.00890)	(0.0227)	(0.00509)	(0.0220)
Observations	13035	13035	3713	3713	9322	9322
R^2	0.117	0.118	0.101	0.106	0.130	0.131
Alpha (annual)	0.456		0.366		0.485	

Table 8: NPV under alternative recovery rates

Notes: Table reports the NPV calculation for various costs of capital and recovery rates using equation (3) and estimated using the simulation approached discussed in Section A.1. Panels A and B report the NPV distribution for a recovery rate of 25 and 10% respectively, for those investments that fail. In each panel, we report the summary of the NPV distribution for three cost of capital assumptions: 20, 15, and 10%. The NPVs are weighted by exit-rates from the full sample.

	Panel A 25% recovery								
	Mean	sd	min	25th	50th	75th	90th	Max	% < 0
NPV ($r = 20\%$)	-5.19	56.48	-112.25	-13.85	-7.65	-4.03	-1.95	1227.11	.94
NPV ($r = 15\%$)	-4.27	61.30	-112.25	-13.53	-7.65	-3.96	-1.83	1273.76	.93
NPV ($r = 10\%$)	-3.00	68.80	-112.25	-13.48	-7.63	-3.90	-1.75	1324.35	.93
	Panel B 10% recovery								
	Mean	sd	min	25th	50th	75th	90th	Max	% < 0
NPV ($r = 20\%$)	-2.22	58.10	-111.35	-10.66	-6.09	-3.24	-1.52	1228.74	.93
NPV ($r = 15\%$)	-1.90	60.76	-111.35	-10.70	-6.21	-3.30	-1.56	1275.39	.93
NPV ($r = 10\%$)	-1.73	59.20	-111.35	-10.55	-6.15	-3.25	-1.51	1325.98	.92

Table 9: Inside round participation, the fund lifecycle and returns

Notes: The first three columns of the table reports regressions of an indicator for whether an existing investor participates in the next financing event (if it occurs). A unit of observation is a VC investor-financing pair. The sample includes all follow-on investments where we can track the reinvestment decisions of investors and know their fund characteristics. "Next round inside" is a dummy variable for whether the next financing event is an inside round. The samples in all columns require a match of VC fund to investment. "Post-investment period" is a dummy variable equal to one if at the time of the next financing event, the VC invests out of a fund that is at least five years old. Column (3) reports the regressions in the main model but with entrepreneurial firm financing fixed effects, thus comparing VCs within the same syndicate. The last three columns – "Log gross multiple" – reports the regression of log gross multiple on the main controls from Table 6 and the post-investment period variable. A unit of observation is a VC investor and financing pair where we can observe the gross multiple and identify the fund that made the investment. The sample only includes those investor-financing pairs for existing investors in follow-on financings that occur. "Post-investment period" is a dummy variable equal to one if the VC investor is in the investment period of their fund at the time of the investment (i.e. year five or greater or after the next fund is raised). The interaction "Post-investment X Inside" is the interaction of this dummy and the dummy for inside round. "Fraction investors in post-inv. period" is the fraction of all insiders who are in the post-investment period of their fund at the time of the investment. "Log fund age" is the log of the fund age in years at the time of the financing. "Controls?" include syndicate size, capital raised in the round and entrepreneurial firm age. "Fin. Year FE" and "Industry FE" are fixed effects for the firm's industry and current financing year FE. "Round # FE" are fixed effects for the financing round number. Robust standard errors clustered at the VC firm reported in parentheses for columns (1) - (3) and at the entrepreneurial firm for columns (3) - (6). * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Insider invest in next round?			Log gross multiple		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-investment period	-0.0216***	-0.0346***	-0.0164**		0.000838	
	(0.00633)	(0.00647)	(0.00754)		(0.0375)	
Post-investment period X Inside	0.0190**	0.0169**	0.0388***			
	(0.00863)	(0.00816)	(0.0130)			
Next round inside	-0.0189***	-0.0223***				
	(0.00525)	(0.00524)				
Post-investment X Inside					-0.0962*	
					(0.0536)	
% post-investment X Inside						-0.106
						(0.128)
Fraction investors in post-inv. period						-0.0594
						(0.0920)
Full inside round				-0.0867***	-0.0560	-0.0496
				(0.0304)	(0.0361)	(0.0637)
Log fund age (yrs.)	0.00798	0.00675		-0.00955	-0.00250	
	(0.00490)	(0.00503)		(0.0131)	(0.0164)	
Constant	0.0836***	-0.0226	0.806***	-0.0266	-0.0333	-1.003***
	(0.0197)	(0.278)	(0.00444)	(0.487)	(0.485)	(0.295)
Observations	42407	42407	42418	22838	22838	10921
R^2	0.0563	0.0573	0.657	0.162	0.163	0.173
Number VCs	1103	1103	1103	943	943	.
Controls?	Y	Y	N	Y	Y	Y
VC firm FE?	N	Y	N	N	N	N
Financing FE?	N	N	Y	N	N	N
Round # FE?	Y	Y	N	Y	Y	Y
Industry FE?	Y	Y	N	Y	Y	Y
Fin. year FE?	Y	Y	N	Y	Y	Y

Table 10: Inside rounds and current contract features

Notes: The table reports the correlations between inside rounds and strong contract features. Contracts data from VC Experts was merged onto VentureSource financing when possible. Column (1) has a dependent variable equal to one if the financing had senior equity. Column (2) has a dependent variable equal to one if the contract has a liquidation preference greater than 1X. Column (3) has a dependent variable equal to 1 if the contract had participating preferred. Column (4) has a dependent variable equal to one of the contract had redemption rights. All variables are as defined in above tables. Robust standard errors clustered at the financing year reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Senior	$>$ 1X?	Part. Pref.?	Redemption?
	(1)	(2)	(3)	(4)
Full inside round	-0.0968	0.112	-0.0101	0.0948
	(0.0722)	(0.0986)	(0.0732)	(0.0722)
Log raised	-0.000348	-0.166***	-0.188***	-0.143***
	(0.0356)	(0.0504)	(0.0367)	(0.0356)
Years since last fin.	0.00750	-0.0498	-0.0154	-0.0420
	(0.0353)	(0.0468)	(0.0353)	(0.0362)
Observations	1906	1884	1910	1909
Pseudo-R^2	0.0665	0.0993	0.0587	0.0545
Num. firms	1392	1378	1389	1388
Mean dep. var	0.439	0.0987	0.590	0.447
Mean dep. var. | Inside	0.425	0.130	0.633	0.503
Founding Year FE?	Y	Y	Y	Y
Industry FE ?	Y	Y	Y	Y
Round # FE?	Y	Y	Y	Y

A Appendix

A.1 Simulation of NPV analysis

Recall that the calculation an insider with a previous equity stake in an entrepreneurial firm faces is:

$$\frac{E_t[V_i]e_{ijt}\prod_{s=t+1}^{T}D_{is}}{(1+r_{VC})^T} > \gamma\sum_{s=1}^{t-1}K_{ijs}+K_{ijt} \tag{4}$$

where all the terms on the left-hand side are expectations formed at time t. As such, the left-hand side is unavailable to the researcher and has to be inferred from historical data. Using the historical exit valuations ($E[V_i]$), equity stakes (e_{ijt}) and dilutive factors (D_{is}) we have a realized distribution of the left-hand side value for inside rounds. We then sample 10,000 such returns – without replacement – from distribution conditional on financing round number to estimate the means, maximum, minimum and fraction of negative values.

A.2 Figures and Tables

Figure A.1: Log capital invested excluding pseudo-bridge rounds: inside vs. outside rounds

Notes: The figure reports the kernel densities of log of capital invested in a financing event in two samples. The full sample excludes rounds that are in the bottom 10% of the size distribution and in the bottom 25th percentile of the years to next financing distribution. That is, we drop quick, small rounds that may be "rescue financings." "Outside" are those financings with at least one VC investor who is new to the pool of investors. "Inside" are those financings where all investors were previously invested in the firm.

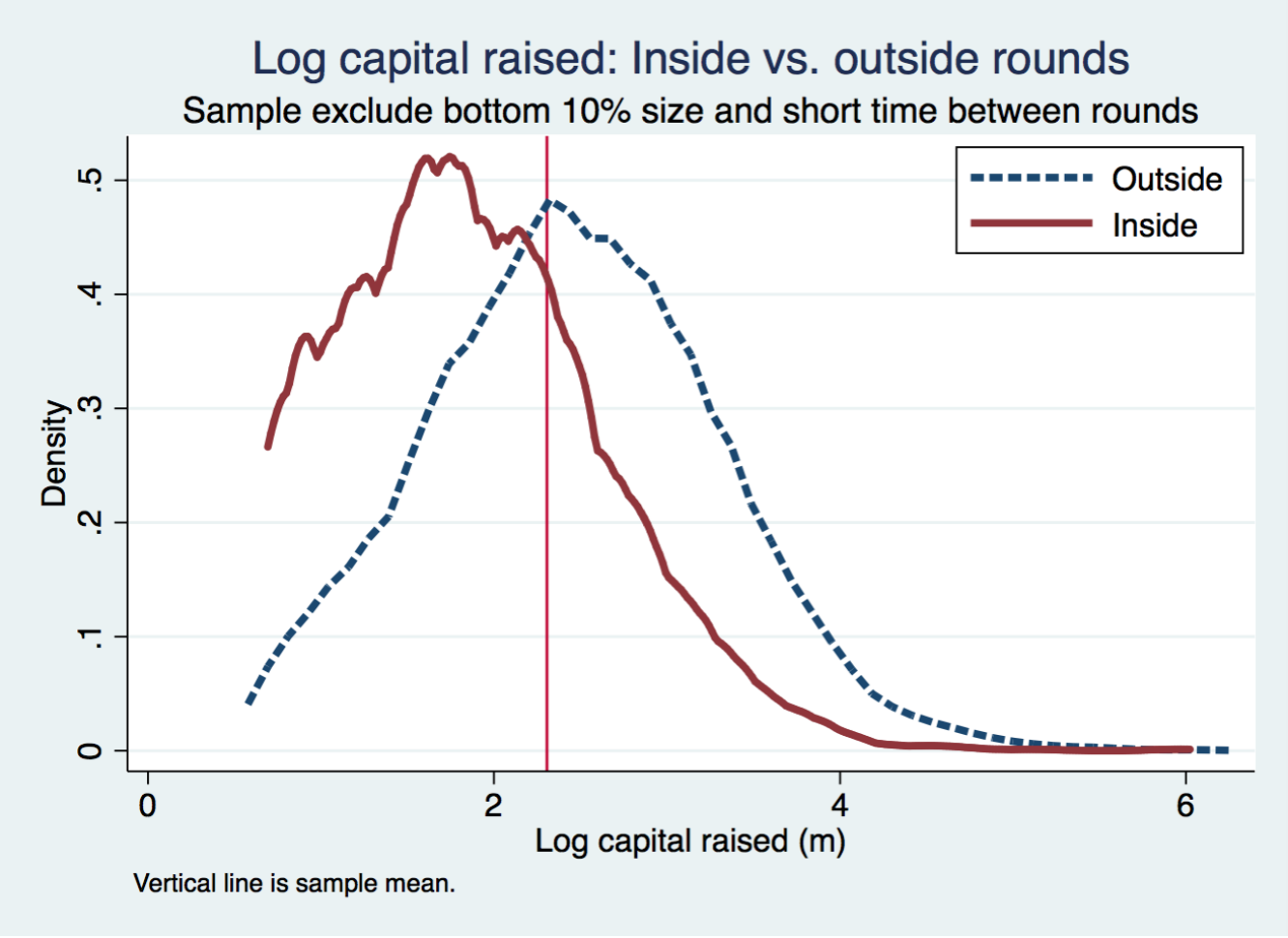

Table A.1: Main variable description

Notes: The table defines the major variables used throughout the analysis.

% insider investors	Fraction of investors in the current financing that previous invested in the entrepreneurial firm. A new investor has never invested in the company.
% investors that are outsider VC	Fraction of the investors in the current financing that are new to the set of investors and also venture capitalists (i.e. excluding angels, hedge funds and corporations).
% insider dollars (relative last syndicate)	Fraction of the dollars in a financing round provided by the investors from the previous financing syndicate.
% inside dollars	Fraction of the dollars in the financing provided by any existing investor from all previous financing events.
Inside round	A dummy variable equal to one if the all the investors in the financing invested in the previous rounds.
Full VC inside (no new non-VCs)	A dummy variable equal to one if all the investors in the current financing rounds are venture capitalists and have invested in at least one previous financing round.
% insiders participate	The fraction of inside investors (i.e. previous investors) that are investing in the current financing.
No new lead?	A dummy variable equal to one if the financing has only a lead investor that was a previous investor.
Years since last financing	Years from the last financing to the current financing.
Round number	The sequence number of the financing event.
Capital raised	The total capital invested at the time of the financing (in millions of USD).
Log total capital	The log of total capital invested in the entrepreneurial firm as of the current round.
Total unique VCs	Total number of unique investors in the entrepreneurial firm as of the current round.
Firm age (yrs.)	Age of the entrepreneurial firm from founding date to current financing date.
Syndicate size	Number of investors in the current financing round.

Table A.2: Inside vs. non-inside financing rounds without pseudo-bridge rounds

Notes: The table compares financings where there the only investors are those with an existing equity stake to those with at least one outside investor of any kind. The full sample excludes rounds that are in the bottom 10% of the size distribution and in the bottom 25th percentile of the years to next financing distribution. The numbers are the mean and median respectively, by sub-sample and for the full sample (i.e. "Total"). Sample includes all entrepreneurial firms that were founded prior to 2008 to give ample time for an exit event and who had at least two financing events. The first panel considers characteristics of financings independent of whether we can calculate a return or observe a valuation. The remaining panels require non-missing data on each of these dimensions for sample inclusion. "Years VC-backed" is the number of years from the first observed VC financing to the current. "# VC investors (all)" is a count of the total number in past investors. "Pre$_t$ / Post$_{t-1}$" is the change in valuation from previous to the current financing. "Up round" is a dummy variable equal to one if this value is greater than one (less than one for "Down round" and 1 for "Flat round"). Other variables are as defined in Table A.1.

	Full sample		
	Inside round	Outside round	Total
Capital raised (m USD)	8.987	16.98	14.94
	6	11.70	10
Round number	4.181	3.625	3.767
	4	3	3
Years VC-backed	4.035	3.304	3.491
	3.455	2.571	2.793
Firm age (as of financing)	5.859	4.879	5.130
	5.090	3.967	4.246
Years since last fin.	1.452	1.398	1.412
	1.279	1.183	1.210
Syndicate size	2.832	4.788	4.289
	2	4	4
Total VC investors	5.155	4.548	4.703
	4	4	4
Number Financings	3963	11553	15516
	Financing valuations		
	Inside round	Outside round	Total
Pre$_t / Post $_{t-1}	1.319	2.068	1.913
	1.083	1.548	1.433
Up round	0.597	0.798	0.756
	1	1	1
Down or flat round	0.403	0.202	0.244
	0	0	0
Number observations	1293	4952	6245
	Financing returns		
	Inside round	Outside round	Total
Gross multiple	1.261	1.805	1.677
	0	0.0347	0
Zero multiple	0.567	0.492	0.510
	1	0	1
Number observations	2005	6479	8484

Table A.3: Inside round participation, the fund lifecycle and returns

Notes: The first two columns of the table reports regressions of an indicator for whether an existing investor participates in the next financing event (if it occurs). The last two columns – "Log gross multiple" – reports the regression of log gross multiple on the main controls from Table 6 and the post-investment period variable. A unit of observation is a VC investor and financing pair where we can observe the gross multiple and identify the fund that made the investment. The sample only includes those investor-financing pairs for existing investors in follow-on financings that occur. "No big exits" is a dummy variable equal to one if the VC investor did not have an exit in their portfolio that returned at least two times capital invested in the previous year (at the time of the next financing event). "Fundraising" is a dummy variable equal to one if the next financing event the VC was in the process of raising a new fund. All other variables are as defined in Table 9. Robust standard errors clustered at the VC firm reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Insider invest in next round?		Log gross multiple	
	(1)	(2)	(3)	(4)
No big exits	-0.00685		0.0277	
	(0.00698)		(0.0471)	
Next inside X No big exits	-0.0102			
	(0.0116)			
Fundraising		0.0532***		-0.0199
		(0.00881)		(0.0571)
Next inside X Fundraising		0.0126		
		(0.0165)		
Next round inside	0.00673	0.00447		
	(0.00562)	(0.00557)		
No big exits X Inside			-0.0693	
			(0.0732)	
Fundraising X Inside				0.174
				(0.115)
Full inside round			-0.0776**	-0.0975***
			(0.0323)	(0.0311)
Log fund age (yrs.)			-0.00973	-0.00962
			(0.0131)	(0.0131)
Constant	-0.390**	-0.372**	-0.0261	-0.0227
	(0.165)	(0.165)	(0.487)	(0.487)
Observations	58405	58405	22838	22838
R^2	0.0525	0.0532	0.162	0.162
Number VCs	2931	2931	943	943
Controls?	Y	Y	Y	Y
VC firm FE?	N	N	N	N
Financing FE?	N	N	N	N
Round # FE?	Y	Y	Y	Y
Industry FE?	Y	Y	Y	Y
Fin. year FE?	Y	Y	Y	Y

Table A.4: Differences in returns robustness tests: log gross multiple

Notes: The table reports regressions of a the log of the gross multiple on a set of financing and entrepreneurial firm observables. "Log total capital" is the log of total capital invested in the entrepreneurial firm at the time of the financing event. "Years since last fin." is the log of the years since the previous financing event. "Log firm age (yrs.)" is the log of the age of the entrepreneurial firm at the financing. "VC FE" are VC firm fixed effects. "Industry FE" are fixed effects for the entrepreneurial firm's industry. "Year FE" are fixed effects for the financing year and "Round # FE" are fixed effect for the financing sequence number. "Year X Ind. FE" are year-industry fixed effects. Robust standard errors clustered at the financing year reported in parentheses. * , **, *** represent significance at the 10%, 5% and 1% level respectively.

	Log gross multiple					
	Inside 2X, Outside 1X		All	No small/quick	All	All
	All	Incl. Missing				
	(1)	(2)	(3)	(4)	(5)	(6)
Inside round	-0.154***	-0.142***		-0.157***	-0.150***	-0.126***
	(0.0299)	(0.0290)		(0.0378)	(0.0314)	(0.0418)
% inside dollars			-0.243***			
			(0.0705)			
Capital ramp down X Inside					0.151*	
					(0.0757)	
Capital ramp down					-0.293***	
					(0.0570)	
Inside X Cold industry						-0.140**
						(0.0645)
Cold industry						0.209
						(0.213)
Log total capital	0.207***	0.198***	0.217***	0.176***	0.211***	0.206***
	(0.0371)	(0.0367)	(0.0411)	(0.0441)	(0.0380)	(0.0378)
Years since last fin.	-0.132***	-0.128***	-0.143***	-0.125***	-0.123***	-0.134***
	(0.0245)	(0.0243)	(0.0319)	(0.0235)	(0.0255)	(0.0249)
Log firm age (yrs.)	-0.130**	-0.128**	-0.137**	-0.173***	-0.126**	-0.132**
	(0.0528)	(0.0508)	(0.0607)	(0.0566)	(0.0520)	(0.0526)
Constant	-3.132***	-3.130***	-2.999***	-0.982***	-3.133***	-3.149***
	(0.161)	(0.155)	(0.218)	(0.255)	(0.161)	(0.157)
Observations	13182	14186	8615	8786	13182	13182
R^2	0.220	0.215	0.234	0.199	0.224	0.223
Number firms	5968	6828	4530	4714	5968	5968
VC FE?	N	N	N	N	N	N
Industry FE ?	Y	Y	Y	Y	Y	Y
Year FE ?	Y	Y	Y	Y	Y	Y
Round # FE?	Y	Y	Y	Y	Y	Y
Year X Ind. FE?	Y	Y	Y	Y	Y	Y