The Effect of Inter-firm Ties on Performance in Financial Markets

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Abstract

The present study examines the effect of the information obtained through close inter-firm ties on the investor's risk-adjusted returns. We suggest that there is a closely connected tie between an investor and an entrepreneurial firm if the investor is a limited partner of the entrepreneurial firm's lead venture capital (VC) fund. We hypothesize that such closely connected ties convey credible, timely, and precise information regarding the underlying value of the entrepreneurial firm, which is especially valuable when market conditions are unfavorable and when the investor faces higher information asymmetry. Supporting our hypotheses, we show that investors with closely connected ties to entrepreneurial firms receive higher returns on their investments, and their returns are particularly high when investor sentiment is low (unfavorable market conditions) and when there is higher information asymmetry due to greater geographical distance.

KEYWORDS: interorganizational ties, information asymmetry, investor sentiment, investment returns, venture capital.

1. Introduction

Although substantial research has been conducted in recent years on the behavioral implications of inter-firm ties, (e.g., Gulati 1998; Gulati and Gargiulo 1999; Tsai 2001; Zaheer and Bell, 2005; Zhelyazkov and Gulati 2015), the consequences of such relationships in financial markets is relatively scarce and less well understood. Inter-firm relationships can be especially critical in financial markets as they help investors access privileged information about the underlying value of stocks in which they may invest. An investor's superior access to private information can enable the investor to make a more informed investment decision when assessing investment opportunities and hence generate higher risk-adjusted returns on its investments (hereafter "returns" for brevity). This may be especially important when investors are assessing the underlying value of entrepreneurial firms at the time of their initial public offerings (IPOs). Indeed, entrepreneurial firms typically do not have established track records and therefore face high uncertainty regarding the quality of their resources and prospects at the time of their IPO (e.g., Gulati and Higgins 2003).

In this paper, we explore the informational value of inter-firm ties in helping investors achieve higher returns on their investments in venture-backed entrepreneurial firms after their IPOs. When an institutional investor invests in a venture capital (VC) fund, the investor becomes a limited partner (LP) of the VC fund. If this particular VC fund also becomes the lead VC fund of an entrepreneurial firm, we suggest that a "closely connected tie" is formed between the investor and the entrepreneurial firm via the VC fund. We show that such closely connected ties provide credible, precise, and timely information to the investor. Relatedly, our paper reveals the information benefits of inter-firm ties in financial markets (e.g., Gulati and Higgins 2003; Cohen et al. 2008, 2010) by analyzing the informational and related monetary benefits of closely connected ties between institutional investors and entrepreneurial firms.

Venture-backed entrepreneurial firms will usually have a lead VC fund that serves as a crucial investing and endorsing partner (Gompers and Lerner 2000). The lead VC fund, in turn, will build a syndicate of other VC funds that will co-invest in the entrepreneurial venture as non-lead VC funds.

Usually, a lead VC fund is actively involved in the entrepreneurial firm's operations and strategies and is thus more likely to have access to precise and timely information about the underlying quality of the entrepreneurial firm's resources and capabilities (Gorman and Sahlman 1989, Admati and Pfleiderer 1994, Hochberg et al. 2007). In contrast, non-lead VC funds that also invest in the firm do not necessarily have access to such precise information due to their lesser involvement in the venture.

Each VC fund usually consists of a group of investors known as limited partners. We suggest and show that when an investor is closely connected to an entrepreneurial firm (i.e., when the investor is the limited partner in the entrepreneurial firm's lead VC fund), the investor has better access to privileged information regarding the underlying hard-to-observe value of the entrepreneurial firm compared to the entrepreneurial firms for which the investor lacks such connections. Relatedly, we suggest and show that an investor receives higher returns on its investments in entrepreneurial firms with whom the investor has closely connected ties, compared to its investment returns in entrepreneurial firms where the investor has no such connections. In addition, our paper shows that the information benefits of closely connected ties between an investor and an entrepreneurial firm are more salient when (*i*) market conditions are unfavorable and when (*ii)* the investor faces higher information asymmetry about the underlying value of an entrepreneurial firm's resources and prospects.

We provide empirical evidence by analyzing the investment returns of institutional investors (LPs) in entrepreneurial firms' IPOs between the years 1988 and 2014. We use various risk adjustment methods from the finance literature (e.g., Fama and French 1993, Carhart 1997) and find results supporting our findings.

By showing the impact of the closely connected ties that are formed across different types of inter-firm relationships, (i.e., ties between an investor and a VC fund, and the endorsement ties between a VC fund and its portfolio company), our paper makes an important contribution to studies on inter-firm relationships. In particular, we show that inter-firm ties can be conduits of valuable information by documenting monetary benefits of such information across different types of inter-firm relationships.

2. Theory

In financial markets, access to private information (i.e., information that is not available to other market participants) can enable an investor to gain substantial risk-adjusted returns. For entrepreneurial firms in particular, publicly available information regarding the firm's underlying value may be scarce at the time of the firm's IPO (Stuart et al. 1999; Gulati and Higgins 2003). Hence, financial markets are uniquely conducive to analyzing the impact of inter-firm ties and the associated information advantages between an investor and an investee (e.g., Hochberg, Ljungqvist, and Lu 2007; Cohen et al. 2008, 2010).

We suggest that in order for inter-firm ties between an investor and an entrepreneurial firm to generate higher returns, investors need a conduit that provides *access to timely, precise and credible information* about the underlying value of the entrepreneurial firm. Such conditions are met when an investor and an entrepreneurial firm share an intermediary who is *i)* the lead endorser of the entrepreneurial firm and at the same time is *ii)* directly connected to the investor. We refer to such ties between an investor and an entrepreneurial firm as "closely connected ties." For example, in Figure 1, Investor A and Entrepreneurial Firm 1 have a closely connected tie because Investor A has a prior direct tie to VC Fund 1, which is the lead VC Fund of Entrepreneurial Firm 1. However, no closely connected tie exists between Investor B and Entrepreneurial Firm 1, because even though Investor B is directly connected to VC Fund 2; VC Fund 2 is not a lead VC Fund of the Entrepreneurial Firm 1.[1] Below, we explain the reason why having closely connected ties between an investor and an entrepreneurial firm provides the investor with a greater information advantage compared to when the investor has no such connections.

2.1 Lead VC Fund of an Entrepreneurial Firm as Shared Intermediary

There are several reasons to consider the role of the lead VC fund compared to other VC funds that may not be a lead investor in a given entrepreneurial firm. The lead VC fund of an entrepreneurial firm is the

[1] Similarly, Investor B does not have a closely connected tie to Entrepreneurial firm 2 either. Investor B is not closely connected to Entreprenurial firm 3 either. Instead, Investor B is "distantly" connected to the Entrepreneurial Firm 3 because Investor B has direct tie to VC fund 2, which is a sister fund of the VC fund 3 since they both belong to the same VC firm B. In empirical analyses we control for such ties as well.

primary endorser of the entrepreneurial firm among all the VCs endorsing the firm prior to the firm's IPO date. Lead VCs visit the entrepreneur firm more often and stay longer for each visit than other VC funds that participate in the deal (Gorman and Sahlman 1989). Lead VCs are also actively involved in entrepreneurial firm's daily operations and strategic decisions. As a result, lead VC funds have first-hand access to information regarding the entrepreneurial firm's resources, activities, and projects at hand. Similarly, because lead VC funds almost always invest in the early rounds, they tend to accumulate more accurate and precise information regarding the underlying business of a portfolio company, along with its resources and capabilities compared to the other VC funds that invest in the entrepreneurial firm in later stages (Admati and Pfleiderer 1994, Hochberg et al. 2007). Hence, an entrepreneurial firm's lead VC fund can possess valuable private information regarding the entrepreneurial firm's underlying hard-to-observe value, which is not necessarily available to the non-lead VC funds of the entrepreneurial firm. Therefore, among various VCs that might have invested in an entrepreneurial firm, the lead VC fund of an entrepreneurial firm might have the most accurate and timely information regarding the underlying value of the entrepreneurial firm's hard-to-observe resources and prospects, thus satisfying the first condition.

2.2 Direct Ties between Lead VC Fund and Investor

Prior research has shown that inter-firm ties can be rich channels of information flow that are imbued with trust between partners (Gulati 1998, Dyer and Chu 2003, McEvily et al. 2003, Beckman et al. 2004). Under such conditions, the information conveyed between firms is vivid, timely, and more precise than the information obtained without such ties. In our context, such conditions arise when there is a direct investment tie between a VC fund and an investor. (We refer to the investor of a VC fund as its "limited partner"). Given these conditions, the investor is more likely to receive accurate, timely, and precise information through its VC fund than through other, less knowledgeable ties. Thanks to the direct investment ties between the VC fund and its limited partner (LP), LPs typically receive quarterly reports from the VC fund regarding the progress of the VC's investments. In addition, the LP of a VC fund

receives further information about the VC fund's portfolio companies through the LP's meetings with the general partners of the VC fund.

The foregoing discussion suggests that the existence of a closely connected tie between an investor and an entrepreneurial firm (through the investor's prior direct tie to the entrepreneurial firm's lead VC fund), is likely to facilitate the flow of more credible, more precise, and timely proprietary information to the investor regarding the underlying hard-to-observe value of the entrepreneurial firm, compared to information available to other market participants who lack such connections (e.g., Gulati 1998, Chung et al. 2000, Collins and Smith 2006). Hence, when the investor and the entrepreneurial firm are closely connected, the associated information advantage enables the investor to make more informed investment decisions and hence generate a higher return on its investment in the entrepreneurial firm's IPO. Therefore, we suggest that:

HYPOTHESIS 1: An investor receives a higher return on his/her investment in an entrepreneurial firm after its IPO if the investor and the entrepreneurial firm are closely connected (i.e., if the investor has direct ties to the entrepreneurial firm's lead VC fund).

2.3 The Moderating Effect of Market Conditions

During favorable market conditions, market participants in general, may be too optimistic about the upside potential of IPO firms. VC firms and entrepreneurs may try to time the market and attempt to exit their investments through IPO. As a result there will be many firms doing IPO and market valuations of these firms may be higher than their fundamental values (Baker and Wurgler, 2002). This will affect the importance of closely connected ties in investment decisions for two reasons. First, there may be simply too many IPO firms to evaluate thoroughly for LPs and VCs may not be able to conduct high-quality due diligence when assessing the underlying value of the entrepreneurial firms they have invested in (Zacharakis and Meyer 1998, Zacharakis and Shepherd 2001, Gulati and Higgins 2003). Second, if the VC firms' information reveals that the entrepreneurial firm is overvalued, LP firms' would simply not buy the stock given short selling constraints, making negative information less valuable for LPs.

On the contrary, during unfavorable market conditions, investors would attribute higher value to the information and signals conveyed by the VCs (Gulati and Higgins 2003) in identifying and buying undervalued firms' stocks. Therefore, we suggest that when market conditions are not favorable, investors give more value (or pay more attention) to the information conveyed by the entrepreneurial firm's lead VC fund. Hence, under *unfavorable* market conditions, closely connected ties between an entrepreneurial firm and an investor, which are facilitated by the entrepreneurial firm's lead VC, become marginally more important in enhancing the investor's investment return on the entrepreneurial firm. Therefore:

HYPOTHESIS 2: When stock market conditions are not favorable, the positive effect of the closely connected tie between the entrepreneurial firm and the investor on the investor's return on investment in the entrepreneurial firm's IPO is more pronounced.

2.4 The Moderating Effect of Information Asymmetry

At the time of an entrepreneurial firm's IPO, the entrepreneurial firm files documents with the SEC as part of the IPO process. In many instances, however, there is much more to know regarding the underlying hard-to-observe value of the entrepreneurial firm's resources and prospects (e.g., Gompers and Lerner, 2000; Pollock et al. 2008).

Investors' search for investment opportunities requires a costly due diligence process, where investors need to gather value-relevant information to assess the underlying value of the investment opportunities (e.g., Rangan 2000, Barnett 2008, Ragozzino and Reuer 2011). Geographic proximity can help investors to access information not only on the availability but also on the value of investment opportunities (e.g., Petersen and Rajan 2002, Reuer and Lahiri 2013). For instance, Grote and Umber (2006) showed that acquiring firms can more effectively process the tacit and complex information pertaining to the underlying value of the target firms that are located locally in comparison to geographically distant targets. In particular, Ragozzino and Reuer (2011) found that when targets are not able to reliably signal their quality, acquirers acquire local targets (as opposed to geographically distant ones), because acquirers can better access information about the underlying value of the local targets.

Supporting these findings, Ivković and Weisbenner (2007) have shown that information regarding the underlying value of the stocks is diffused more effectively in local markets. In addition, Coval and Moskowitz (2001) showed that geographical proximity to professional fund managers facilitates acquisitions of the "disproportionally value-relevant information" on the companies.

Value-relevant information on the entrepreneurial firm may not be fully reflected in the price of the entrepreneurial firm at the time of its IPO due to the entrepreneurial firm's lack of a track record on its resources, activities and performance (e.g., Stuart et al. 1999, Thomas 2002, Garmaise and Moskowitz 2004, Pollock et al. 2008). The aforementioned studies suggest that local information sources can be particularly important in enabling investors to access information regarding the underlying hard-to-observe value of the entrepreneurial firms, which is not necessarily available to the public at the time of the entrepreneurial firm's IPO (e.g., Loughran and Schultz 2005, Ivković and Weisbenner 2007). As a result, investors who are geographically more proximate to the entrepreneurial firm have information advantage compared to the investors who are at geographically distant locations. In other words, as the geographical distance between an investor and an entrepreneurial firm increases, the information asymmetry the investor faces regarding the underlying value of the entrepreneurial firm becomes higher.

When investors have relatively less information about the value of the entrepreneurial firm's resources and prospects, additional sources of information can be more important in helping the investor to make more informed investment decisions. (e.g., Stuart et al. 1999). Supporting this view, it has been shown that when a firm lacks necessary information regarding the underlying value of its potential exchange partner, the information generated by the firm's inter-firm ties becomes marginally more valuable in enabling the firm to make a more informed investment decision (e.g., Gulati et al. 2009; Ozmel et al. 2013; Reuer and Lahiri, 2014). Therefore, we suggest that when an investor faces higher information asymmetry regarding the underlying value of the entrepreneurial firm (associated with higher geographic distance), the marginal value of the information provided by the investor's closely connected ties regarding the underlying value of the entrepreneurial firm is higher. Hence we suggest that:

HYPOTHESIS 3. *As the geographic distance between an investor and an entrepreneurial firm increases, the positive effect of the closely connected tie between the entrepreneurial firm and the investor on the investor's return on investment in the entrepreneurial firm's IPO is more pronounced.*

3. Data and Methodology

3.1. Data

Our primary data sources are Thomson One Banker, SDC Platinum, and CDA/Spectrum. We obtained VC-related data from Thomson One Banker's private equity module. Data on LP investments in VCs was accessed via SDC. We found data on LP investments in entrepreneurial firms using CDA/Spectrum. CDA/Spectrum reports all institutional holdings of publicly traded securities if the holding is above $200,000 or 10,000 shares. SDC may not be comprehensive; therefore, some of the LP investments in which the LP invested in an entrepreneurial firm's lead VC fund would not be listed in our data. This led to conservative estimates in our analyses, because in some cases an entrepreneurial firm whose lead VC fund is tied directly to the LP firm would be recorded otherwise. We manually matched the names across the aforementioned databases. We included 9,597 IPOs listed on Jay Ritter's website, nearly all the domestic IPOs that were of interest of institutional investors according to Loughran and Ritter (2004). Then, we merged this data with Thomson One's Equity database of IPOs. We obtained the investment data for the entrepreneurial firms' IPOs as of the time of the first 13F filing after the stock was listed publicly. We included stocks that have a lock-up period of three months or more in order to rule out the stock distributions by the VC funds to their limited partners.

3.2. Dependent Variable

Risk-Adjusted Excess Return on Investment in Entrepreneurial Firm's IPO (Return). The dependent variable is the 3-month holding risk-adjusted excess return to the entrepreneurial firm's stock starting with the end of the quarter after the entrepreneurial firm's IPO date. We use risk adjusted returns to incorporate stock's sensitivity to various risk factors (Fama and French 1992, 1993) in calculating the value of information in generating excess returns. Excess return is the return above and beyond the return that is expected from a stock, or portfolio, based on stocks' loadings on various risk factors. Following the literature in finance, we measured the risk-adjusted excess return on the entrepreneurial firm's stock using *Carhart's 4-factor model alpha* (Carhart 1997), which is commonly used to evaluate the performance of professional investment firms. The Carhart 4-factor model, adds momentum factor to Fama-French 3-factor model, which includes size, book-to-market equity ratio and market returns as risk factors. Hence, we follow a more conservative approach in estimating the risk-adjusted excess returns associated with investing in a stock. Carhart 4-factor alpha, or excess returns, is the α of the model defined below:

$$R_{i,t} - R_{f,t} = \alpha + \beta_{market,i} * (R_{m,t} - R_{f,t}) + \beta_{HML,i} * HML_t + \beta_{SMB,i} * SMB_t + \beta_{UMD,i} * UMD_t + \varepsilon_{i,t}$$

Where $(R_{i,t} - R_{f,t})$ is the return to the stock, *i*, in excess of the risk-free (t-bill) rate for the time period. $(R_{m,t} - R_{f,t})$ is the return of the CRSP value-weighted index less the risk-free rate, HML is the return on the zero investment portfolio formed through taking a long position (e.g., buying) on high book-to-market (B/M) stocks and short (selling) on low B/M stocks. SMB is equal to the return on the zero-investment portfolio formed by buying (or having long positions on) small capitalization stocks and selling (short on) big capitalization stocks (Fama and French 1993). Similarly, UMD is the return premium on the zero-investment portfolio that would be formed by buying stocks that bring the highest returns in the past 12 months and shorting stocks that bring the lowest returns in the same period (Carhart

1997). In robustness analyses, we have used various alternative risk adjustment models to calculate the stocks' risk-adjusted excess returns including Fama–French 3-factor model (i.e., Fama–French 3-factor alpha).

3.3 Independent Variables

Closely Connected Tie–between Entrepreneurial Firm and the Investor. Closely connected tie is a dummy variable that equals 1 if the investor has invested in the entrepreneurial firm's lead VC fund before the entrepreneurial firm's IPO. Otherwise it equals 0.

Favorability of Market Conditions. We measure the favorability of market conditions using the *Market sentiment* measure of Baker and Wurgler (2002), taken from Wurgler's personal website. In unreported analyses, we also use the monthly survey measuring consumer sentiment conducted by the University of Michigan (Baker and Wurgler 2002).

Information Asymmetry. We use the *local entrepreneurial firm* dummy variable to indicate the decrease in information asymmetry that the entrepreneurial firm's investor faces. This variable takes on 1 if the investor is within 100 miles away from the entrepreneurial firm, and 0 otherwise.

3.4 Control Variables

Analyst Dummy (Analyst Coverage). To measure the extent of analyst coverage for the entrepreneurial firm, we use a dummy variable, *analyst coverage*, which equals 1 if the stock is covered by an analyst in the IBES (Institutional Brokers' Estimate System or I/B/E/S), and equals 0 otherwise (Hong et al. 2000, Chang et al. 2006). We use this to control for the publicly available information about the stock. Majority of IPO firms are not covered by an IBES analyst at the time of their IPO, therefore we mainly use this variable as a control. However, in robustness tests we also utilize this variable as an alternative measure of (the decrease in) information asymmetry.

Non-lead Fund Tie (Investor's Direct Tie to the Entrepreneurial Firm's Non-lead VC Fund). When the investor has direct ties to the entrepreneurial firm's non-lead VC fund, such ties are not closely connected ties because non-lead VC funds of an entrepreneurial firm do not have strong/close relationships with the entrepreneurial firm as do the lead VC fund. Hence, non-lead VC funds on average may not have as much access to the precise information on an entrepreneurial firm's value. However, non-lead VC funds still may have access to some value-relevant information about the entrepreneurial firm. As a result, we control for such ties to better disentangle the value-relevant information conveyed to the investor by the entrepreneurial firm's lead VC fund. This variable equals 1 if an investor has invested in a non-lead VC fund of the entrepreneurial firm's investment syndicate. Otherwise this variable equals 0.

Investor's Distant Tie to Entrepreneurial Firm (Distant Tie). Prior to the entrepreneurial firm's IPO, if the investor did not directly invest in a VC fund endorsing the entrepreneurial firm, but did invest in a sister fund of a VC fund endorsing the entrepreneurial firm, we suggest there is a "distant indirect tie" between the investor and the entrepreneurial firm. (We define sister VC funds as the funds that belong to the same VC firm.) For example, in Figure 1, Investor B has a distant tie to Entrepreneurial Firm 3. Investor B has a direct tie to VC Fund 2, which is the sister fund of VC Fund 3, which is Entrepreneurial Firm 3's lead VC fund. Such ties might increase familiarity and trust of the investor toward an entrepreneurial firm, and they may provide some information benefits as well (e.g., Gulati 1998). Therefore, we control for distant indirect ties to incorporate possible return effects and more effectively identify the information transferred through the entrepreneurial firm's lead VC fund to the investor.

Other Control Variables. We use a dummy variable called *LP active*, which equals 1 if the LP firm has invested in an IPO within the past 12 months, and otherwise this equals 0. We control for the entrepreneurial firm's market-to-book ratio *(Market to book value*), and a dummy for being listed on NASDAQ *(Nasdaq member).* We also control for the VC's and underwriter's reputations. We use Loughran and Ritter's (2004) measure for *underwriter reputation*, which we took from Jay Ritter's website. Reputation of the VCs endorsing the entrepreneurial firm is measured as the log of the VC firm's

prior number of IPOs within the last three years. If more than one VC backed the entrepreneurial firm before the IPO, then this measure is the maximum of the VC reputation among the VCs that have invested in the entrepreneurial firm before the entrepreneurial firm's IPO (*VC IPO count*). In addition, we include a dummy variable to control whether the entrepreneurial firm is VC-backed (*VC invested*). We control for the entrepreneurial firm's IPO proceeds using the log (USD amount of IPO proceeds ÷ 1000) and we call this measure *Log IPO proceeds*. Following Lowry (2009), we control for the entrepreneurial firm's working capital divided by its assets (*Wcap ratio*) and whether or not the entrepreneurial firm has a positive EBIT by using a dummy variable (*EBIT dummy*), because accounting measures might be important in affecting the risk-adjusted returns on investment in the entrepreneurial firm's IPO (e.g., Lowry 2009). In addition, we control for the entrepreneurial firm's *Age at IPO.* On average, there is less public information available about young firms, because they have been operating for fewer years, and they are less likely to have established track records compared to older firms. This increases the uncertainty that investors face when investing in younger entrepreneurial firms (Stuart *et al*. 1999). Hence, we control for the entrepreneurial firm's age at the time of IPO. *Patent citations* deferred to the entrepreneurial firm can signal the underlying quality of the entrepreneurial firm's resources (e.g., Hsu and Ziedonis 2013). Therefore, we control for the number of patent citations the entrepreneurial firm has received.

LP and VC Fund Fixed Effects. To address any possible unobserved heterogeneity stemming from the unobserved skill or ability of the LP firm to more effectively "select" undervalued stocks to invest in at the time of the stocks' IPO (Field and Lowry 2009, Chemmanur et al. 2010), we include fixed effects for every institutional investor (*LP fixed effects*). Similarly, to address possible unobserved heterogeneity arising from a VC fund's better ability to pick and invest in high quality entrepreneurial firms than the other VCs, we also control for VC fixed effects across all the models (*VC fixed effects)*.

Market/Industry Level Control Variables. First we controlled for the industry level average IPO underpricing (*industry underpricing*) for the past 12 months as of the time of the entrepreneurial firm's

IPO. We also included the *market underpricing*, which equals to the average 1st day underpricing[2] across all the IPOs during the past 90 days before the date of entrepreneurial firm's IPO. We also controlled for the *Russell2000* index.

3.5 Methodology

Our goal is to identify the investor's (i.e., the limited partner's) risk-adjusted return on his/her investments in entrepreneurial firms' IPOs when the investor has direct ties to the entrepreneurial firm's lead VC fund (i.e., when the investor has a closely connected tie to the entrepreneurial firm). We seek to contrast this to the returns on investments in entrepreneurial firms' IPOs where there is no tie between the investor and the entrepreneurial firm's lead VC fund. Therefore, our sample includes all the pairs of institutional investors and entrepreneurial firms, where the investor firm has invested in the entrepreneurial firm's IPO. Hence, our level of analysis is the investor-entrepreneurial firm; indeed, we want to measure the return to the investor's investment in the entrepreneurial firm as the outcome (dependent variable) of the extent to which the investor made more informed investment decisions. We suggest that investors should be able to identify undervalued stocks (i.e., make more informed investment decisions) more effectively if such stocks are closely connected to the investor compared to when the investor has no such connections. This suggests that among all the investments an investor has made in entrepreneurial firms' stocks at the time of the entrepreneurial firms' IPO, the ones with which the investor is closely connected are better informed investments. As such, they will generate higher risk-adjusted returns compared to the investments where investor has no such connections to the entrepreneurial firm. We run a two-way clustered OLS regression (clustered at the entrepreneurial firm and investor level), which is specified as follows:

[2] For a particular stock, we define IPO underpricing as (first-day closing price – offer price) ÷ offer price.

$$Risk-adjusted\ excess\ Return_{i,t} = \alpha + \beta_1 * Closely\ connected\ tie_{i,j} + \beta_2 * M_t + fixed\ effect_{VC} + fixed\ effect_{LP} + \varepsilon_{i,j,k}$$

Where, *Risk-adjusted excess Return*$_{i,t}$ is, the holding period risk-adjusted excess return of a stock (i.e., *Carhart 4-factor alpha*). For a pair of entrepreneurial firms, *i,* and institutional investor, *j*; if the investor *j* had invested in the lead VC fund of the entrepreneurial firm *i*, then there is a closely connected tie between the investor and the entrepreneurial firm (i.e., there is a "direct tie" between the investor and the entrepreneurial firm's lead VC fund). In that case, the closely connected tie dummy equals 1, otherwise the dummy is 0. M is the matrix including the control variables discussed above. VC fund fixed effects and investor fixed effects are included, respectively, to control for the unobserved heterogeneity stemming from the differential capabilities of investors (e.g., limited partner firms) and VC funds in selecting profitable investment opportunities. Our model is comprehensive by controlling for a large set of variables pertaining to the factors affecting an investor's ability to identify the stocks that will bring higher risk-adjusted returns.

4. Results

Table 1 reports summary statistics and Table 2 reports correlations. It seems that being Nasdaq member is highly correlated with market to book value, yet negatively and highly correlated with various factors such as IPO proceeds, age at the time of IPO, and underwriter reputation and positive EBIT. As expected, market sentiment is highly correlated with market level and industry level underpricing. Table 3 and 4 are our primary tables. Our sample consists of all the investor–entrepreneurial firm pairs during our sample period, where the investor has invested in the entrepreneurial firm's stock at the IPO or within the first quarter after the IPO. In Table 3, we analyze whether the investor is able to extract private information through its closely connected tie to the entrepreneurial firm, which will enable the investor to invest in entrepreneurial firms that will generate higher risk-adjusted returns. In particular, Hypothesis 1 suggests

that if there is a closely connected tie between the investor and the entrepreneurial firm, the investor can make a more informed investment decision when investing in stocks, which will bring higher risk-adjusted returns on the investor's investment in the entrepreneurial firm's stock.

Table 3 shows the main results, which support Hypothesis 1. Column 1 lists control variables. In Columns 2 and 3, we gradually include different types of ties, namely non-lead fund tie and distant tie, between the investor and entrepreneurial firm as control variables. Column 4 includes the full model where the main variable, *closely connected tie -between the investor and entrepreneurial firm-* is added. The positive and significant coefficient of this variable suggests that through the closely connected tie between the investor and the entrepreneurial firm (e.g., direct ties between LP and entrepreneurial firm's lead VC fund), the investor can access private information more effectively, which is not necessarily available to the others, regarding the underlying value of the entrepreneurial firm and hence earn higher excess returns. These findings suggest that an investor is better able to identify and hence invest in entrepreneurial firms that are undervalued if the investor has closely connected ties to such firms compared to when the investor does not have such closely connected ties to the entrepreneurial firms. Economic significance of the effect is also quite noticeable. Based on the results reported in Table 3, when there is a closely connected tie, the risk-adjusted excess return is higher by 19.9% per quarter.

The nonsignificant coefficient of the non-lead VC fund across different models on Table 3 is also in line with Hypothesis 1, that a non-lead VC fund is not likely to have access to accurate and timely information regarding the underlying value of an entrepreneurial firm in its portfolio. Similarly, distant ties do not seem to have a significant impact on the investor's risk adjusted return either, suggesting that distant ties do not enable the investor to access timely and accurate information regarding the entrepreneurial firm's value.

Table 4's Columns 1 and 2 compare the effect of closely connected ties between the investor (e.g., limited partner of the entrepreneurial firm's lead VC fund) and entrepreneurial firm on the investor's return on investment under low market sentiment (below median) versus high market sentiment (above median) environments. The findings support Hypotheses 2 by showing that private information

provided through closely connected ties between the investor and the entrepreneurial firm are especially salient under low market sentiment conditions, that is, when market conditions are not favorable and relatedly when investors perceive higher uncertainty regarding the outcome of investment choices. In particular, the coefficient of the closely connected tie during low market sentiment is significantly higher than the coefficient in high market sentiment environment ($p < .01$). In unreported analyses, we used an alternative measure of market sentiment based on the monthly survey of consumer sentiment conducted by University of Michigan and received results similar to those reported on Columns 1 and 2 of Table 4.

We test Hypothesis 3 in the last two columns of Table 4. As we discussed above, previous studies have shown that investors face higher information asymmetry when assessing the underlying value of geographically distant companies' stocks compared to when assessing the value of the local companies' stocks (e.g., Ivković and Weisbenner 2005, 2007). Hence, in Column 3 and 4 of Table 4, we compare the returns associated with an investor's closely connected ties in two subsamples: (*i*) where the investor faces higher information asymmetry regarding the underlying value of the entrepreneurial firm (long distance between investor and entrepreneurial firm) versus (*ii*) where the investor faces lower information asymmetry (local entrepreneurial firm). The comparison of the coefficients across long distance versus local firm subsamples suggests that investors' closely connected ties to entrepreneurial firm is significantly more important in increasing the return on investment when there is greater distance between the investor and the entrepreneurial firm compared to when the entrepreneurial firm is local to the investor ($p < 0.01$). These results provide strong support for Hypothesis 3.

4.1 Robustness tests

Alternative Measure of Risk Adjusted Excess Return (Alternative Measure of Dependent Variable). Our current return model to calculate risk adjusted excess returns following Carhart 4-factor model (1997). In robustness tests, we measured the risk-adjusted excess return based on the Fama–French 3 factor model (Fama and French, 1993) and received similar findings.

Additional Measures of Information Asymmetry. In unreported analyses, we use the extent of *analyst coverage* as another source of the decrease in the level of information asymmetry the investors perceived. As we discussed in detail in the variables section, investors may also face higher information asymmetry when evaluating the underlying value of a stock if the stock is not followed by analysts in the I/B/E/S system (e.g., Hong et al. 2000, Chang et al. 2006). Following these studies, in our supplementary analyses, we form a subsample in which the entrepreneurial firm's IPO was covered by at least one analyst in the I/B/E/S versus another subsample where the stock's IPO is not covered in the I/B/E/S to measure the extent of information asymmetry stemming from the lack of sufficient analyst coverage. Further supporting Hypothesis 3, we find that closely connected ties between the investor and the entrepreneurial firm are more valuable in increasing the returns on investment when the entrepreneurial firm is not covered in the I/B/E/S compared to when it is covered in the I/B/E/S ($p < 0.01$).

We use a firm's *patenting activity* as an additional measure of the (decrease in the level of) information asymmetry. It has been shown that high patenting activity can signal the underlying quality of a firm's technology (e.g., Hsu and Ziedonis 2013). Following previous studies, as further robustness tests, we limited our sample to the stocks that are in technology related industries and formed subsamples in which the entrepreneurial firms have above median versus below median patents at the time of the entrepreneurial firm's IPO. Supporting Hypothesis 3, we find that when the entrepreneurial firms have fewer patents than the median (i.e., in a higher information asymmetry context), the information conveyed from the entrepreneurial firms' lead VC fund to the investor through closely connected ties is particularly valuable in enabling the investor to select more effectively the entrepreneurial firms that will bring higher risk-adjusted returns (results are available on request).

Other Alternative Measures for Control Variables. In current analyses, we define as "local" an entrepreneurial firm that is within 100 miles of the LP firm. We find that the results are similar when we vary the distance threshold to 50 or 200 miles. Similarly, we used alternative measures to VC reputation (e.g., the number of VC's portfolio companies) and found qualitatively similar results.

Possible Selection Bias in LP–VC Fund Matching. We do not expect matching between LP and VC firms to affect stock returns after the IPO given that this information is publicly available. In efficient markets we expect publicly available information to be incorporated into prices. Regardless, to address a possible selection bias in matching between LPs and VC funds, in robustness tests, we have conducted 2-stage Heckman selection models, where we use distance between LP and VC firms as our instrument, and found similar results.

5. Discussion and Conclusion

In this paper, we explore the impact of inter-firm ties in financial markets on investors' ability to make more informed investment decisions and hence generate higher risk-adjusted returns on their investments in entrepreneurial firms' IPOs. We show that when there is a closely connected tie between an entrepreneurial firm and an investor (based on the investor's direct tie to the entrepreneurial firm's lead VC fund), the timely and precise information conveyed helps the investor make a more informed decision. This, in turn, generates higher risk-adjusted returns. This provides evidence that when an investor has a closely connected tie to an entrepreneurial firm, the investor can access information that helps him/her invest in stocks that will generate higher returns in contrast to investors that lack such closely connected affiliations. Indeed, investors that lack such close connections to the entrepreneurial firm do not seem to possess such an information advantage. For example, an investor's ties to the entrepreneurial firm's non-lead VC funds do not seem to enable the investor to generate such high risk-adjusted returns on its investments.

This paper contributes to the relatively few studies in finance and strategy on the impact of inter-firm ties in financial markets. It provides direct evidence of the monetary benefits resulting from the information advantage associated with investors' closely connected ties to the investees (for an exception see Cohen et al., 2008). The present paper also contributes to existing studies on inter-firm relationships

and entrepreneurship by focusing on the investor's perspective, rather than on the entrepreneurial firm's perspective. Specifically, we investigate the information benefit of having closely connected ties with an entrepreneurial firm on facilitating the investor's investment performance in that particular firm.

To the extent that it is costly to access privileged information, and to the extent that there might be critical shared intermediaries that might have better access to privileged information than other intermediaries, we suggest that our hypotheses on the information advantage of closely connected ties should hold in other contexts as well. Hence, future studies can apply our theory to contexts such as alliance networks and investigate to what extent the closely connected ties facilitated by two firms can provide privileged information. In this paper, we have focused on the investment returns in stock exchanges stemming from investing in IPO firms. Future studies might investigate closely connected ties and their return effects on investment in different types of economic exchanges such as those between buyers and suppliers.

Many studies on the impact of inter-firm ties on performance may find it very difficult to disentangle the impact of a particular inter-firm tie on the firm's performance from other factors, particularly if the firm engages in various types of activities simultaneously. In this paper, by focusing on the investment returns in the stock markets, we aim to address this issue more effectively. Indeed, if an investor has information advantage, this should be reflected in the investor's increased ability to identify undervalued stocks, which will generate higher risk-adjusted returns. This simple relationship between investor's information advantage and the ability identify stocks that generate higher risk-adjusted returns enables us better identify the monetary effect of a firm's closely connected inter-firm ties. We hope that future studies will continue to investigate the impact of inter-firm or interpersonal ties in financial markets and the monetary effects of such ties.

In this paper we also show that closely connected ties are more important in facilitating returns on investments during periods characterized by unfavorable market conditions, when geographical distance between firms is larger, as well as when entrepreneurial firm's stock at the time of IPO is not covered by an IBES analyst. In these cases, increase in information asymmetry regarding value of entrepreneurial

firms makes privileged information carried through closely connected ties even more important. Future studies should search for other factors moderating the effect of the information advantage that inter-firm ties provide.

References

Admati AR, Pfleiderer P (1994) Robust financial contracting and the role of venture capitalists. *J. Finance* 49(2):371–402.

Baker M, Wurgler J (2002) Market timing and capital structure. *J. Finance* 57(1):1–32.

Barnett ML (2008) An attention-based view of real options reasoning. *Acad. Management Rev.* 33(3):606–628.

Beckman CM, Haunschild PR, Phillips DJ (2004) Friends or strangers? Firm-specific uncertainty, market uncertainty, and network partner selection. *Organ. Sci.* 15(3):259–275.

Carhart MM (1997) On persistence in mutual fund performance. *J. Finance* 52(1):57–82.

Chang X, Dasgupta S, and Hilary G (2006) Analyst coverage and financing decisions. *J. Finance* 61(6):3009–3048.

Chemmanur TJ, Hu G, Huang J (2010) The role of institutional investors in initial public offerings. *Rev. Financial Stud.* 23(12):4496–4540.

Chung S, Singh H, Lee K (2000) Complementarity, status similarity, and social capital as drivers of alliance formation. *Strategic Management J.* 21(1):1–22.

Cohen L, Frazzini A, Malloy C (2008) The small world of investing: Board connections and mutual fund returns. *J. Political Econom.* 16(5):951–979.

Cohen L, Frazzini A, Malloy C (2010) Sell-side school ties. *J. Finance* 65(4):1409–1437.

Collins CJ, Smith KG (2006) Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Acad. Management J.* 49(3):544–560.

Coval JD, Moskowitz TJ (2001) The geography of investment: Informed trading and asset prices. *J. Political Econom.* 109(4):811–841.

Dyer JH, Chu W (2003) The role of trustworthiness in reducing transaction costs and improving performance: Empirical evidence from the United States, Japan, and Korea. *Organ. Sci.* 14(1):57–68.

Fama EF, French KR (1992) The cross-section of expected stock returns. *J. Finance* 47(2):427–465.

Fama EF, French KR (1993) Common risk factors in the returns on stocks and bonds. *J. Financial Econom.* 33(1):3–56.

Field LC, Lowry M (2009) Institutional versus individual investment in IPOs: The importance of firm fundamentals. *J. Financial Quant. Anal.* 44(3):489–516.

Fried VH, Hisrich RD (1994) Toward a model of venture capital investment decision making. *Financial Management* 23(3):28–37.

Garmaise MJ, Moskowitz TJ (2004) Confronting information asymmetries: Evidence from real estate markets. *Rev. Financial Stud.* 17(2):405–437.

Gompers P, Lerner J (2000) Money chasing deals? The impact of fund inflows on private equity valuations. *J. Financial Econom.* 55(2):281–325.

Gorman M, Sahlman WA (1989) What do venture capitalists do? *J. Bus. Venturing* 4(4):231–248.

Grote MH, Umber MP (2006) Home biased? A spatial analysis of the domestic merging behavior of US firms. Working paper 161, Johann-Wolfgang-Goethe-Universität Frankfurt am Main, Frankfurt, Germany.

Gulati R (1998) Alliances and networks. *Strategic Management J.* 19(4):293–317.

Gulati R, Gargiulo M (1999) Where do interorganizational networks come from? *Amer. J. Sociol.* 104(5):1439–1493.

Gulati R, Higgins MC (2003) Which ties matter when? The contingent effects of interorganizational partnerships on IPO success. *Strategic Management J.* 24(2):127–144.

Gulati R, Lavie D, Singh H (2009). The nature of partnering experience and the gains from alliances. *Strategic Management J.* 30(11):1213–1233.

Hallen BL (2008) The causes and consequences of the initial network positions of new organizations: From whom do entrepreneurs receive investments? *Admin. Sci. Quart.* 53(4):685–718.

Hochberg YV, Ljungqvist A, Lu Y (2007) Whom you know matters: Venture capital networks and investment performance. *J. Finance* 62(1):251–301.
Hong H, Lim T, Stein JC (2000) Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies. *J. Finance* 55(1):265–295.
Hsu DH, Ziedonis RH (2013) Resources as dual sources of advantage: Implications for valuing entrepreneurial-firm patents. *Strategic Management J.* 34(7):761–781.
Ivković Z, Weisbenner S (2005) Local does as local is: Information content of the geography of individual investors' common stock investments. *J. Finance* 60(1):267–306.
Ivković Z, Weisbenner S (2007) Information diffusion effects in individual investors' common stock purchases: Covet thy neighbors' investment choices. *Rev. of Financial Stud.* 20(4):1327–1357.
Loughran T, Ritter J (2004) Why has IPO underpricing changed over time? *Financial Management* 33(3):5–37.
Loughran T, Schultz P (2005) Liquidity: Urban versus rural firms. *J. Financial* Econom. 78(2):341–374.
Lowry M (2009) Discussion of 'shareholder litigation and changes in disclosure behavior'. *J. Accounting Econom.* 47(1):157–159.
McEvily B, Perrone V, Zaheer A (2003) Trust as an organizing principle. *Organ. Sci.* 14(1):91–103.
Nisbett RE, Ross L (1980) *Human Inference: Strategies and Shortcomings of Social Judgment* (Prentice-Hall: Englewood Cliffs, NJ).
Ozmel U, Reuer JJ, Gulati R (2013) Signals across multiple networks: How venture capital and alliance networks affect interorganizational collaboration. *Acad. Management J.* 56(3):852–866.
Petersen MA, Rajan RG (2002) Does distance still matter? The information revolution in small business lending. *J. Finance* 57(6):2533–2570.
Pollock TG, Gulati R (2007) Standing out from the crowd: The visibility-enhancing effects of IPO-related signals on alliance formation by entrepreneurial firms. *Strategic Organ.* 5(4):339–372.
Pollock TG, Rindova VP, Maggitti PG (2008) Market watch: Information and availability cascades among the media and investors in the U.S. IPO market. *Acad. Management J.* 51(2):335–358.
Rangan S (2000) The problem of search and deliberation in economic action: When social networks really matter. *Acad. Management Rev.* 25(4):813–828.
Ragozzino R, Reuer JJ (2011) Geographic distance and corporate acquisitions: Signals from IPO firms. *Strategic Management J.* 32(8):876-894.
Reuer JJ, Lahiri N (2013) Searching for alliance partners: Effects of geographic distance on the formation of R&D collaborations. *Organ. Sci.* 25(1):283–298.
Stuart TE, Hoang H, Hybels RC (1999) Interorganizational endorsements and the performance of entrepreneurial ventures. *Admin. Sci. Quart.* 44(2):315–349.
Tsai W (2001) Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Acad. Management J.* 44(5):996–1004.
Thomas S (2002) The saga of the first stock index futures contract: Benchmarks, models and learning. *J. Money, Credit, and Banking* 34(3):767–808.
Zacharakis AL, Meyer GD (1998) A lack of insight: Do venture capitalists really understand their own decision process? *J. Bus. Venturing* 13(1):57–76.
Zacharakis AL, Meyer GD (2000) The potential of actuarial decision models: Can they improve the venture capital investment decision? *J. Bus. Venturing* 15(4):323–346.
Zacharakis AL, Shepherd DA (2001) The nature of information and overconfidence on venture capitalists' decision making. *J. Bus. Venturing* 16(4):311–332.
Zaheer A., and Bell. 2005. Benefiting from Network Position: Firm Capabilities, Structural Holes, and Performance. Strategic Management Journal, Vol. 26, No. 9 (Sep., 2005), pp. 809-825.

Zhelyazkov P, Gulati R (2015) After the break-up: The relational and reputational consequences of withdrawals from venture capital syndicates. Working paper, Harvard Business School, Cambridge, MA.

Figure 1

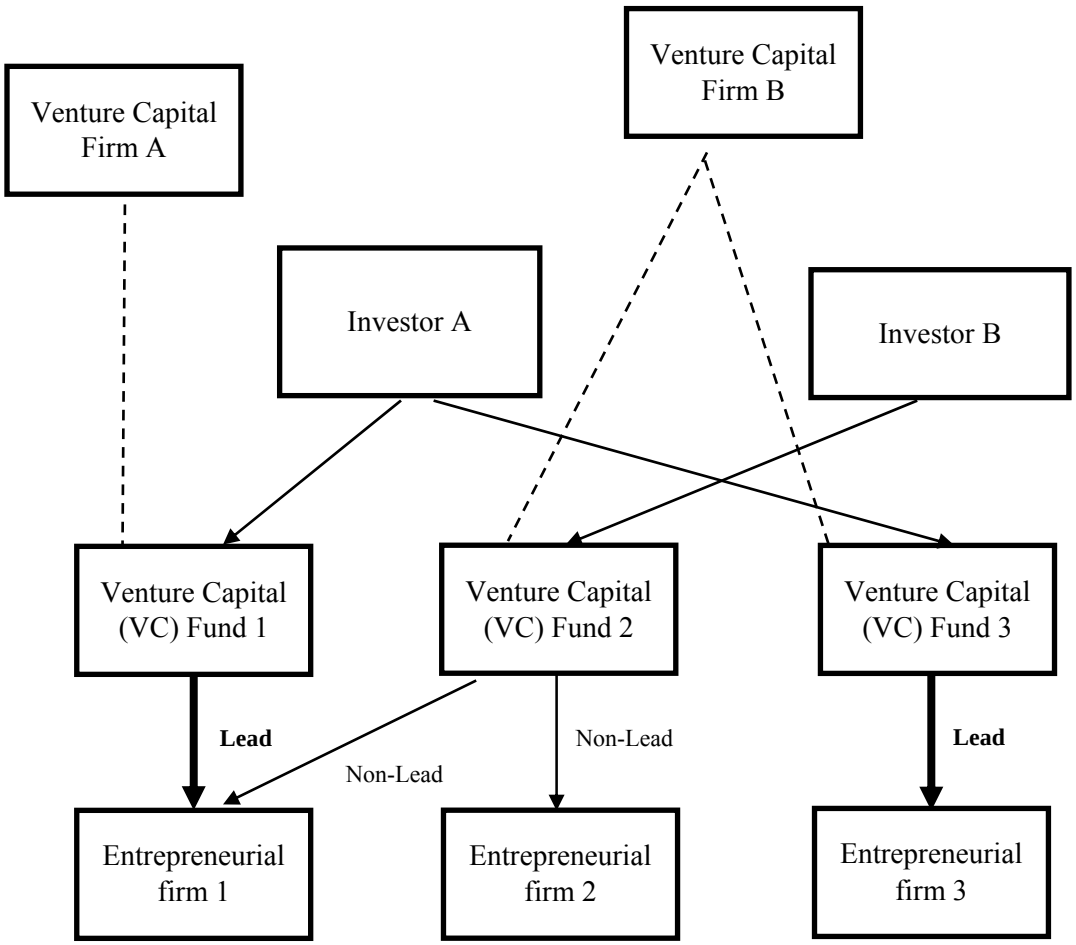
Venture Capital Firm A
Venture Capital Firm B
Investor A
Investor B
Venture Capital (VC) Fund 1
Venture Capital (VC) Fund 2
Venture Capital (VC) Fund 3
Lead
Non-Lead
Non-Lead
Lead
Entrepreneurial firm 1
Entrepreneurial firm 2
Entrepreneurial firm 3

Table 1. Summary Statistics

		SD	Mean	Min	Max
Risk-adjusted return	1	0.39	0.019	–0.89	8.66
Closely connected tie	2	0.03	0.001	0.00	1.00
Non-lead fund tie	3	0.04	0.002	0.00	1.00
Distant tie	4	0.10	0.009	0.00	1.00
Analyst coverage	5	0.50	0.49	0.00	1.00
VC IPO count	6	50.48	25	0.00	289.00
Patent citations	7	861.70	72.67	0.00	17067.00
Local entrepreneurial firm	8	0.28	0.09	0.00	1.00
LP active-dummy	9	0.13	0.98	0.00	1.00
VC invested dummy	10	0.49	0.38	0.00	1.00
Market to book value	11	1.30	1.54	5.33	11.30
Log IPO proceeds	12	1.13	4.75	–0.97	9.89
Age at IPO	13	1.07	2.47	0.00	5.11
Underwriter reputation	14	1.04	8.46	1.00	9.00
EBIT dummy	15	0.45	0.72	0.00	1.00
Wcap ratio	16	0.47	0.16	–11.13	1.00
Nasdaq	17	0.49	0.61	0.00	1.00
Market sentiment	18	0.56	0.25	–0.59	1.63
Russell2000	19	0.05	0.02	–0.19	0.26
Industry underpricing	20	0.28	0.24	–0.21	2.86
Average market underpricing	21	0.24	0.25	–0.03	1.14

Table 2 Correlations

		1	2	3	4	5	6	7	8	9	10
Risk-adjusted return	**1**	1.00									
Closely connected tie	**2**	0.06	1.00								
Non-lead fund tie	**3**	0.00	0.00	1.00							
Distant tie	**4**	0.00	0.00	0.00	1.00						
Analyst coverage	**5**	–0.04	0.00	0.00	0.01	1.00					
VC IPO count	**6**	0.00	0.04	0.05	0.12	0.05	1.00				
Patent citations	**7**	0.00	0.00	0.00	0.02	0.06	0.05	1.00			
Local entrepreneurial firm	**8**	–0.01	–0.01	0.00	–0.01	0.03	0.00	–0.02	1.00		
LP active	**9**	0.01	0.00	–0.01	–0.01	–0.01	0.01	–0.03	–0.01	1.00	
VC invested	**10**	–0.01	0.04	0.06	0.12	0.04	0.64	–0.01	–0.01	0.02	1.00
Market to book value	**11**	–0.02	0.00	0.00	0.00	–0.01	0.09	–0.02	–0.02	0.03	0.17
Log IPO proceeds	**12**	–0.03	0.00	0.00	–0.03	0.15	–0.13	0.20	0.05	–0.05	–0.30
Age at IPO	**13**	0.01	–0.02	–0.01	–0.03	0.04	–0.21	0.10	0.02	–0.02	–0.30
Underwriter reputation	**14**	–0.01	0.01	0.01	0.00	0.10	0.06	0.04	0.04	–0.02	–0.02
EBIT dummy	**15**	0.03	–0.03	–0.04	–0.06	–0.04	–0.35	–0.05	–0.01	–0.02	–0.44
Wcap ratio	**16**	0.02	–0.01	0.02	0.02	0.02	0.14	0.00	0.00	–0.01	0.17
Nasdaq member	**17**	0.00	0.02	0.02	0.05	–0.02	0.27	–0.04	–0.06	0.05	0.41
Market sentiment	**18**	–0.01	–0.03	–0.03	–0.00	0.07	0.08	–0.06	0.01	0.04	0.08
Russell2000	**19**	–0.04	0.00	0.00	–0.01	–0.07	–0.02	0.01	0.02	0.00	–0.01
Industry underpricing	**20**	–0.03	0.00	0.00	0.03	0.09	0.21	–0.01	0.00	0.04	0.24
Market underpricing	**21**	–0.08	–0.01	–0.01	0.01	0.11	0.15	–0.01	0.03	0.04	0.17

*** Correlations that are 0.01 or higher (in magnitude) are significant at 10 percent.**

Table 2. Continued-Correlations

		11	12	13	14	15	16	17	18	19	20	21
Market to book value	**11**	1.00										
Log IPO proceeds	**12**	–0.19	1.00									
Age at IPO	**13**	–0.11	0.29	1.00								
Underwriter reputation	**14**	–0.07	0.44	0.10	1.00							
EBIT dummy	**15**	–0.13	0.17	0.36	0.01	1.00						
Wcap ratio	**16**	–0.11	–0.06	0.00	0.06	–0.02	1.00					
Nasdaq member	**17**	0.22	–0.52	–0.28	–0.23	–0.35	0.07	1.00				
Market sentiment	**18**	0.14	–0.12	–0.08	–0.06	–0.23	0.03	0.23	1.00			
Russell2000	**19**	–0.01	0.04	0.01	0.00	–0.03	–0.04	–0.02	0.02	1.00		
Industry underpricing	**20**	0.21	–0.08	–0.16	0.03	–0.33	0.05	0.29	0.48	0.01	1.00	
Market underpricing	**21**	0.14	0.00	–0.14	0.04	–0.33	–0.01	0.22	0.60	0.13	0.69	1.00

*** Correlations that are 0.01 or higher (in magnitude) are significant at 10 percent.**

Table 3. Risk Adjusted Return Effects of Closely Connected Ties Between Investor and Entrepreneurial Firm

	I	II	III	IV
Closely connected tie				0.199***
				(0.073)
Non lead fund tie		–0.037	–0.038	–0.039
		(0.028)	(0.029)	(0.028)
Distant tie			–0.010	–0.007
			(0.013)	(0.010)
Analyst coverage	–0.038*	–0.039*	–0.038*	–0.038*
	(0.020)	(0.020)	(0.020)	(0.020)
VC IPO count	–0.000	–0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Patent citation	–0.000	–0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Local entrepreneurial firm	0.001	0.001	0.001	0.001
	(0.016)	(0.016)	(0.016)	(0.017)
LP active	–0.005	–0.005	–0.005	–0.005
	(0.028)	(0.028)	(0.028)	(0.028)
VC invested	–0.011	–0.011	–0.010	–0.011
	(0.037)	(0.037)	(0.037)	(0.037)
Market to book value	–0.004	–0.004	–0.004	–0.004
	(0.090)	(0.090)	(0.090)	(0.090)
Log IPO Proceeds	–0.005	–0.005	–0.005	–0.005
	(0.011)	(0.011)	(0.011)	(0.011)
Age at IPO	0.004	0.004	0.004	0.004
	(0.010)	(0.010)	(0.010)	(0.010)
Underwriter reputation	0.003	0.003	0.003	0.003
	(0.008)	(0.008)	(0.008)	(0.008)
EBIT dummy	-0.009	-0.009	-0.009	-0.009
	(0.029)	(0.029)	(0.029)	(0.029)
Wcap ratio	0.013	0.013	0.013	0.014
	(0.019)	(0.019)	(0.019)	(0.020)
Nasdaq member	0.001	0.001	0.001	0.000
	(0.019)	(0.019)	(0.019)	(0.019)
Market sentiment	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Russell2000	–0.324	–0.324	–0.324	–0.324
	(0.261)	(0.261)	(0.261)	(0.261)
Industry underpricing	0.069	0.069	0.069	0.069
	(0.073)	(0.074)	(0.074)	(0.074)
Market underpricing	–0.153	–0.153	–0.153	–0.154
	(0.111)	(0.111)	(0.111)	(0.111)
Constant	–0.269	–0.270	0.095	0.094
	(0.242)	(0.242)	(0.199)	(0.199)
Investor Fixed effects	Yes	Yes	Yes	Yes
VC fund fixed effects	Yes	Yes	Yes	Yes
Number obs.	15864	15864	15864	15864
R–square	0.120	0.120	0.120	0.120

*****, **, * represents 0.01, 0.05, and 0.10 percent significance.**

Table 4. Subsample Comparisons of Risk Adjusted Return Effects of Closely Connected Ties Between Investor and Entrepreneurial Firm

	Low Market Sentiment	High Market Sentiment	Long Distance	Short Distance (Local)
	I	II	III	IV
Closely connected tie	0.227**	–0.008	0.658***	0.127
	(0.089)	(0.026)	(0.170)	(0.086)
Non-lead fund tie	–0.0406	0.023	0.058	–0.033
	(0.032)	.	(0.082)	(0.038)
Distant tie	–0.013	–0.006	0.069	–0.026
	(0.017)	(0.004)	(0.058)	(0.020)
Analyst coverage	–0.038*	–0.099	–0.021	–0.036*
	(0.021)	(0.074)	(0.027)	(0.019)
VC IPO count	–0.000	0.003	–0.000	0.000
	(0.000)	(0.002)	(0.000)	(0.000)
Patent citations	–0.000	–0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Local entrep. firm	–0.002	0.030		
	(0.018)	(0.019)		
LP active	–0.002	0.056	0.070	0.007
	(0.028)	(0.058)	(0.055)	(0.025)
VC invested	–0.006	0.162	–0.011	–0.010
	(0.038)	(0.117)	(0.049)	(0.034)
Market to book value	–0.004	–0.009	–0.006	0.000
	(0.009)	(0.014)	(0.010)	(0.008)
Log IPO Proceeds	–0.003	0.052	–0.009	–0.002
	(0.012)	(0.047)	(0.017)	(0.011)
Age at IPO	0.007	0.004	0.019	0.003
	(0.010)	(0.024)	(0.016)	(0.009)
Underwriter reputation	0.004	–0.004	–0.009	0.001
	(0.008)	(0.034)	(0.014)	(0.007)
EBIT dummy	–0.019	0.051	0.038	0.006
	(0.032)	(0.082)	(0.041)	(0.029)
Wcap ratio	0.022	–0.389***	0.034	0.005
	(0.020)	(0.142)	(0.023)	(0.018)
Nasdaq member	0.005	–0.008	0.002	–0.002
	(0.019)	(0.078)	(0.031)	(0.019)
Market sentiment			0.003**	0.001
			(0.001)	(0.001)
Russell2000	–0.353	1.193**	–0.428	–0.244
	(0.274)	(0.600)	(0.308)	(0.244)
Industry underpricing	0.074	–0.051	0.016	0.078
	(0.078)	(0.165)	(0.089)	(0.073)
Market underpricing	–0.137	0.368	–0.221**	–0.173*
	(0.102)	(0.769)	(0.105)	(0.105)
Constant	0.220	–0.191	–0.612	0.031
	(0.243)	(0.373)	(0.718)	(0.162)
Investor fixed effects	Yes	Yes	Yes	Yes
VC fund fixed effects	Yes	Yes	Yes	Yes

*****, **, * represents 0.01, 0.05, and 0.10 percent significance.**