Does Venture Capital Syndicate Size Matter?

Mesut Tastan, Sonia Falconieri and Igor Filatotchev

Cass Business School
City University London
106 Bunhill Row, London

Abstract

This paper empirically investigates the impact of venture capital (VC) syndicate size on the IPO and post-IPO performance of investee companies. After controlling for endogeneity problems, we provide evidence that firms backed by larger VC syndicates experience greater underpricing and lower post-IPO profitability. We suggest that this might be the result of coordination problems and conflict of interests that characterize large VC syndicates. Additionally, we find that the impact of VC syndicate size on IPO underpricing is mitigated by the existence of alternative monitoring mechanisms such as leverage and bank loans. This indicates that the certification role of leverage and bank loans is able to curb the costs associated with large VC syndicates.

Key Words: Syndicates, venture capital, bank monitoring, corporate governance, IPO performance

"*Too many people on the board, misalignment of interests,…, whenever you've got at least four VCs sitting around a table, you run the risk of a decision vacuum …***"**

-- Brad Feld – *Managing Director of Foundry Group*.

Introduction

The impact of venture capital (VC) financing on IPOs performances has attracted a lot of research over the years as it provides an indirect test of whether VCs do indeed create value for their portfolio companies. Two contrasting hypothesis have emerged and received support in the literature. Specifically, some papers provide support to the *certification hypothesis* according to which VC backing results in lower first day returns at the IPO date because, in essence, VCs certify the quality of the companies they take public (Megginson and Weiss (1991)). In contrast, several other papers document the opposite result that is that VC backing seems to be associated with larger underpricing (Hamao et al. (2000), Lee and Wahal (2004), Gompers and Lerner (1997)). This evidence is consistent with the *grandstanding hypothesis* (Gompers, 1996) according to which VCs tend to take firms public prematurely in order to increase their reputation.

The majority of venture capital literature compares VC backed IPOs with non VC backed ones. However, Tian (2011) in a recent paper documents that approximately 88% of VC backed firms that went public in the period between 1980 and 2005 are funded by a syndicate (i.e. by two or more VCs). Yet, despite this impressive figure, to date there are very few papers that try to assess whether firms that are taken public by (large) VC syndicates exhibit different performances from firms that are taken public by a single venture capitalist.

This paper aims to shed some light on this specific dimension of VC financing by investigating the impact of VC syndicate size on the short and long term performances of IPOs in the period between 1990 and 2007.

Why should we expect that IPO firms backed by large VC syndicates perform differently from those backed by small VC syndicates? VC syndicates can be thought of as an example of multiple principals monitoring a common agent in a moral hazard environment, where these principals are likely to have conflicting interests and misaligned objectives. The finance literature both theoretical and empirical have often stressed how similar circumstances tend to suffer from coordination, communication and free riding problems which ultimately prevent an optimal solution of the agency problem. For instance, extensive empirical evidence documents a negative relation between corporate board size and firm performance (Yermack, 1996; Eisenberg et al, 1998; Bennedsen et al, 2008). Jensen (1993) suggests the following explanation for such outcome summarized in his statement "*When boards get beyond seven or eight people they are less likely to function effectively and are easier for the CEO to control*". Along the same lines, Hermalin and Weisbach (2003) conclude that "*large boards exacerbate some free riding problems among directors vis-à-vis the monitoring of management*". Similarly, in the banking literature Carletti et al. (2007) theoretically show that multiple-bank lending is characterized by a strong free riding problem among principals which, in instances where the conflict of interest is very severe, might ultimately result in under-monitoring of the agent and hence a poor mitigation of the moral hazard problem.[1]

[1] Khalil et al (2007) prove a very similar result in a more general multiple-principals context stressing the role of conflicting preferences among principals.

We suggest that coordination and free-riding problems are likely to plague large VC syndicates as well, particularly taking into account the wide diversity of VCs often involved in syndicates and, hence, the likelihood of conflicting preferences and objectives among them (Hellmann et al., 2008; Chemmanur et al., 2011). In a recent paper, Du (2011) looks at the dynamics of heterogeneous VC syndicates and points that while heterogeneity "provide valuable learning opportunities for the group members in the long term" nonetheless it makes communication and coordination within the group less effective. Consistent with her arguments she provide empirical evidence that in general VCs prefer to form alliances with similar VCs and that heterogeneous syndicates tend to have less successful exits but higher survival rates.[2]

The contribution of this paper is twofold. Firstly, we test our conjecture that large VC syndicates suffer from conflicts of interest, and hence lead to poor performances of the companies they take public. We look at both short and long term IPO performances whereby the short term performances are proxied by the usual first day return (underpricing) whereas, similarly to Tian (2011), we use several different measures of long term performances including industry adjusted ROA and long term Cumulative Abnormal Returns (CAR). [3]

Secondly, we investigate whether the existence of alternative monitoring mechanisms such as leverage and bank financing is able to curb the inefficiencies caused by large VC

[2]It is worth noticing that in this paper we take the syndicate size as given and do not address the question of why VCs come together in a syndicate. There is an extensive literature that investigates this problem and has outlined several reasons for why VC syndicates are formed. Specifically, the theory suggests that diversification benefits (Lockett and Wright (1999, 2001), the need of a second opinion (Lerner (1994), Casamatta and Haritchabalet (2007), Cestone, Lerner, and White (2006)), and value creation by complementary skills (Brander, Amit and Antweiller (2002)) seem to be main incentives to form a syndicate.

[3] VC firms tend to maintain significant equity holdings after the IPO as documented by Megginson and Weiss (1991) who find that VC ownership reduces from 36.6% of the firm to 26.3% after the IPO date for a sample of IPOs between 1983 and 1987. This evidence has been recently confirmed by Krishnan et al (2011) who find that on a sample of US IPOs between 1993 and 2004 the lead VC's equity position decline from 9.4% to 8.05%, 7.70% and 6.62 respectively in the first, second and third year after the IPO. This evidence suggests that VC firms keep playing an important role in their portfolio companies even after the exit.

syndicates. Evidence documents that the existence of credit relationships reduces IPO underpricing because it signals the quality of the company (Slovin and Young, 1990; Schenone, 2004), hence it is possible that the certification role of other lenders mitigate the negative impact, if any, of large VC syndicates.

After controlling for the endogeneity of VC syndicate size, we find that our results support both our hypothesis. We document that IPOs backed by large VC syndicates experience larger underpricing as well as weaker long term operating and stock performances than IPOs backed by small VC syndicates. Furthermore, we find that this effect is mitigated by the existence of bank loans and leverage. Our results are robust to alternative measures of VC syndicate size and diversity.

The closer paper to ours is Tian (2011) which compares the performances of syndicate-backed and single-backed IPO companies. His IPOs sample runs from 1980 till 2005. His results show that syndicate-backed IPOs generally outperform single-backed IPOs in the short as well as in the long run. He further documents that VC syndicates are more likely to successfully exit their investment through either IPOs or M&As. However, Tian does not differentiate VC syndicates according to their size which is instead the focus of our analysis, and, although in his analysis he controls for the number of VCs, this variable never appears to be significant. In his concluding remarks, Tian himself acknowledges that his results are to some extent at odds with the potential cost associated to VC syndication. The novelty of our paper is to explore this specific dimension of VC financing in greater detail, and also to investigate possible ways to mitigate the costs associated with large VC syndicates through alternative governance mechanisms.

The rest of the paper is organized as follows. In Section 2 we describe our sample. The methodology and testable hypothesis are detailed in Section 3. In Section 4 we discuss the results of our analysis and Section 5 concludes.

2. Data

The main results provided in this study rely on the various sources of databases namely Securities Data Corporation (SDC) New Issues, Venture Economics, Loan Pricing Corporation's Dealscan (LPC), Compustat, and CRSP. The sample is composed of IPOs that receive VC funding during the period 1990-2007.

IPO related features come mainly from SDC Platinum New Issues. To be consistent with earlier studies, we eliminate financial firms (SIC codes between 6000 and 6999), utilities (SIC codes between 4900 and 4999), equity carve outs, foreign issues, depository offerings, Real Estate Investment Trusts (REITs), closed-end-fund investments, unit issues, leveraged buyouts (LBOs) and IPOs with offer price less than 5 dollars. Those exclusions initially yield 4389 initial public offerings that include both VC backed and non-VC backed companies. We obtain supplementary company level characteristics such as company age at the time of IPO and underwriter bank reputation from Prof. Jay Ritter's website[4].

Venture Economics is one of the main sources that have been extensively used by literature to acquire information on VC firm characteristics and round level funding. It provides details such as disclosed round amount, VC firm investment focus, VC firm affiliation, round number among others. The record of venture backed IPO offerings come from merging SDC New Issues

[4] http://bear.cba.ufl.edu/ritter/ipodata.htm

with SDC Venture Economics tapes[5]. During the matching process, We spot several observations in SDC New Issues database that are mistakenly coded as non-VC backed although we can find corresponding round based financing records in Venture Economics. Thus, such observations are included in our final sample and hence labeled as companies that are backed by VC. For the period 1990-2007, we are able to identify that there are 3195 VC firms providing financing for investee companies and that total number of rounds is 4170. We then use Compustat to obtain the accounting and balance sheet data for all sample observations. Firm returns are calculated using stock price information from CRSP.

Private loan agreements are retrieved from Loan Pricing Corporation's DealScan (LPC) during the sample period. DealScan supplies details on coupon, deal maturity, loan size, use of proceeds, syndicating banks, general covenants, and seniority structure. DealScan coverage for all commercial U.S. loans in early 90s ranges from 50% to 75%. The coverage ratio improves after 1995. To match our IPO sample with the bank variables, we use GVKEY number and name of the company provided by DealScan[6]. We identify 787 bank loan agreements of 446 sample companies (out of the final IPO sample) that have banking relationships through bank loans before the IPO date. After all filtering and merging, our final sample is composed of 1265 VC backed IPOs.

3. Methodology

Consistently with the previous discussion, the aim of the analysis is to test the following three hypotheses about the impact of VC syndicate size on IPO performances:

[5] We perform matching by using Cusip numbers. For the observations that have missing Cusip, we complete the matching manually by company name.

[6] We are indebted to Prof. Michael Roberts for sharing Compustat identifiers that allow me to merge Dealscan Loan data to accounting data from Compustat. See Chava and Roberts (2008) for a description of these identifiers.

- **H_1:** IPO underpricing is positively related to VC syndicate size
- **H_2**: Leverage/Bank financing reduces negative impact (if any) of VC syndicate size on IPO underpricing.
- **H_3:** Long-run performance of VC backed IPOs are negatively associated with VC syndicate size.

Below we detail the methodology used to test our hypothesis.

3.1 Baseline regression

In order to test our hypotheses on the impact of syndicate size on IPO underpricing and post-IPO performance and the hypothesis on the moderation effect of leverage, we start with simple ordinary least squares. Specifically, OLS takes the form

$$\begin{aligned}(OLS):\ Underpricing = {} & \alpha + \beta_1\, VC\ Synd.\ Size + \beta_2\, Leverage\ (or\ Bank\ loan) \\ & + \beta_3\, VC\ Synd.\ Size * Leverage + \beta_4\, Log\ (Lead\ VC\ Tot\ Inv.) \\ & + \beta_5\, Log(Company\ age) + \beta_6\, Log(Sales) + \beta_7\, Log(Proceeds) \\ & + \beta_8\, Lockup\ Days + \beta_9\, Nasdaq\ Dummy + \beta_{10}\, Internet\ Dummy \\ & + \beta_{11}\, Underwriter\ Rank + \beta_{12}\, Pre\text{-}IPO\ Market\ Average + \\ & + Industry\ Dummy + Year\ Dummy \qquad (1)\end{aligned}$$

The dependent variable in equation (1) is IPO *Underpricing* defined by the ratio of difference between first day closing price and offer price to offer price. Our main variable of interest is the independent variable *VC Syndicate Size.* Since VC firms spread the financing over multiple stages, round based data from SDC Venture Expert database have repeated VCs in different rounds. Thus, we count the number of distinct VCs that provide capital before the IPO date and take the sum as our VC syndicate size proxy. Following James and Wier (1990) and Chahine and

Georgen (2011), we define *Leverage* as the ratio of long term debt (Compustat data item *dltt*) to total assets (Compustat data item *at*)[7] in the fiscal year before the IPO date. It has been documented that leverage significantly plays a role in reducing the IPO underpricing (Habib and Ljungqvist (2001)). Thus, as VC syndicate size increases, leverage can have a moderation effect by means of monitoring channels. Banks also provide monitoring that is relatively tight and more effective than that of public debt. The proxy for banking relationship is the last bank loan amount to total assets by IPO date[8]. In order to test the moderation effect of leverage or bank monitoring stated in the hypothesis H_2, we include the interaction term: *VC Synd. Size * Leverage.*

Gompers (1996) argues that VC reputation is an important asset for future fundraisings. Consistent with this, he finds that VC firms are unable raise future funding when they fail to take their portfolio companies public. As a result, young VC firms tend to rush the portfolio company for an early IPO and hence suffer from higher underpricing until they build reputation. To control for VC reputation factor, we follow Lee and Wahal (2004) and define first the lead VC firm as the venture firm that makes the first investment. Then, we use natural logarithm of *Lead VC Total Investment* as reputation measure in the regression.

Asymmetric information models posit that greater ex-ante uncertainty is likely to result in higher underpricing (Rock 1986, Beatty and Ritter1986). Many studies provide the empirical finding that less uncertainty decreases the level of underpricing (see for example Ritter (1984), Megginson and Weiss (1991), and Ljungqvist and Wilhelm (2003)). To account for ex-ante uncertainty, we use the variables company age, sales and IPO proceeds as proposed by Habib and Ljungqvist (2001) and Cliff and Denis (2004). *Company age* is the difference between year of IPO date and the

[7] Alternative leverage proxies such as total debt to total assets provide qualitatively similar results.
[8] The presence of bank loan does not necessarily imply an effective monitoring since the loan could be redeemed well before the IPO date or the IPO firm could time the loan strategically to signal to investors. For robustness, thus, we also look at the two-year window before the IPO date and rule out bank loan observations that lie outside this period.

year of date when the company is founded. *Sales* stand for company size and represent net company sales in the fiscal year before issuance (Compustat data item *sale*). *Proceeds* is the offer size in terms of net proceeds. Prior studies above find that older and bigger companies are less risky and hence underpriced less. Thus, we expect to find a negative coefficient on company age sales and proceeds. To be consistent with earlier studies, we take the natural logarithm of these three variables (see also Loughran and Ritter (2004)).

Lockup days represent the length of trading restriction in days. Brav and Gompers (2003) find that lockup period is likely to be a commitment channel that reduces moral hazard problem. This implies that longer lockup length is more likely for firms that are subject to greater moral hazard problems. Thus, we expect to find a positive relation between this variable and first day unerpricing.

Smart and Zutter (2003) and Bradley and Jordan (2002) argue that IPOs in Nasdaq exchange are expected to be smaller and riskier than average. This argument about the listing information adds another layer to ex-ante uncertainty and hence it is expected that exchange detail can explain the variation in first day returns. To control for this effect, we include *Nasdaq dummy* which takes value one if the firm is listed in Nasdaq and zero otherwise. The same intuition above applies to internet stocks. Ljungqvist and Wilhelm (2003) and Loughran and Ritter (2004) find that internet firms are associated with significant higher initial returns. We include *Internet dummy* that is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter.

Underwriter Rank is Loughran and Ritter underwriter rank classification from 1 to 9. Information based models argue that efforts by underwriter are crucial when there is high information asymmetry between the IPO issuer and the underwriter. Moreover, companies,

especially the VC backed ones, might have incentives to attract high quality intermediaries to benefit from certification roles of those institutions and reduce the asymmetry of information (Megginson and Weiss (1991), Habib and Ljungqvist (2001)).

Market conditions and waves in IPO placements can predict the first day returns to some extent. For example, Bradley and Jordan (2002) report that more than 35 percent of IPO underpricing can be explained by incorporating the hot issue market during 1999 into their sample. Since our sample covers the bubble period 1999-2000 as well as the recession after 2001, we control for market and industry conditions by including industry dummies, year dummies and *Pre-IPO Market Average* defined as mean value-weighted CRSP index return over the month before the issue date (Loughran and Ritter (2004), Lowry and Schwert (2004)). [9]

3.2 *Endogenous VC syndicate size and 2SLS*

One potential problem with VC syndicates is the concern that VC firms form syndicates for a reason. That is, the decision to syndicate has determinants that can be missing in the standard OLS analysis. For example, the expected results that small syndicates are likely to enjoy less underpricing and greater post-IPO performance can actually stem from portfolio company specific features. More specifically, ex-ante deals that are likely to have better potential might draw more VC attention and lead to small syndicates because of less uncertainty. Reverse causality, hence, indicates that results attributed to the small syndicates come from promising investment opportunities. This omitted variable problem makes the OLS coefficients biased. Following Tian (2011), we tackle endogeneity in syndicate formation by instrumental variable method and propose the following first stage model:

[9] We control for outliers as well.

$$\textit{(First Stage): VC Synd. Size} = \alpha + \beta_1 \textit{ Lead VC Industry Concentration} +$$
$$+ \beta_2 \textit{ Start-up} + \beta_3 \textit{ Early Stage} + \beta_4 \textit{ Expansion} + \beta_5 \textit{ Other} + \beta_6 \textit{ Buyout} + \beta_7 \textit{ Later Stage}$$
$$+ \beta_8 \textit{ Leverage} + \beta_9 \textit{ Log (Lead VC Tot Inv.)} + \beta_{10} \textit{ Log(Company age)} +$$
$$+ \beta_{11} \textit{ Log(Sales)} + \beta_{12} \textit{ Log(Proceeds)} + \beta_{13} \textit{ Lockup Days} + \beta_{14} \textit{ Nasdaq Dummy}$$
$$+ \beta_{15} \textit{ Internet Dummy} + \beta_{16} \textit{ Underwriter Rank} + \beta_{17} \textit{ Pre-IPO Market Average} +$$
$$+ \textit{ Industry Dummy} + \textit{ Year Dummy} \qquad (2)$$

We divide the proposed instruments into two classes: Lead VC specific instrument and portfolio company specific instruments. Lead VC firm specific instrument is industry concentration from Tian (2011) who uses a slightly different version. *Lead VC Industry Concentration* (VC IC) is basically the sum of squares of average number of portfolio companies that invested in each 18 different industries[10]. More specifically, VC IC for the VC firm *k* is calculated as $IC_k = \sum_{i=1}^{i=18}(c_{i,t,k}/c_{i,t})^2$, where $c_{i,t,k}$ is the number of companies that the lead VC firm *k* invested in industry *i* in year *t* and $c_{i,t}$ denotes the total number of investee companies in industry *i* in year *t*. In cases where the sample company has more than one lead VC firm, We take equally weighted mean of IC as our concentration proxy. Lead VC firms that have higher industry concentration are more likely to form syndicates to diversify the risk away. This intuition entails a positive coefficient on this variable in the first stage regression in the equation (2) above.

Portfolio company specific instruments include company age and company stage dummies at the first investment. *Company age* is the difference between founding date of the company and the year of the first investment round. Venture Expert classifies company stage related variables into six categories: *start-up/seed*, *early*, *expansion*, *later*, *buyout/acquisition*, and *other*. In order

[10] Those industries are Biotechnology, Business Service, Communications, Computer Hardware, Computer Other, Computer Software, Construction, Consumer Related, Financial Services, Industrial/Energy, Internet Specific, Manufacturing, Medical/Health, Other, Semiconductor, and Transportation.

to make reasonable comparison between coefficient estimates, we select *later* stage class as the base group. In this setting, we expect to find positive coefficients for all company stage dummy variables. The intuition is as follows: *Early* stage companies at the first round are expected to depend more VC financing and expertise than *Later* stage companies do. This implies that *Early* stage companies are likely to attract more VC firms than the base group, *Later* stage companies. The same argument applies to the rest of company stage variables as well.

Second stage model of 2SLS routine is identical to equation (1) with the exception that we replace VC syndicate size variable by its predicted values from the first stage regression.

4. Results

a. Summary Statistics

The distribution of VC backed IPOs over the sample period (1990-2007) is presented in Panel A in Table 1. The number of issues does not seem to be distributed evenly because of the recession periods 1990-1991, 2001, and 2007 as well as the internet bubble during 1999-2000. Dot.com period has a total of 331 IPOs, covering approximately 26 percent of the full sample. The mean syndicate size is 6.83 for the sample period and 7.55 for the internet bubble period. Panel B reports number of VC backed IPOs and mean syndicate size over 12 different industries. For the industry classification, we use Fama-French 12 industry groups. Like year distribution of the data, industry distribution is not well stretched either. Higher fraction of IPOs from high-technology and healthcare / medical industries leads to notably clustering. This observation is also documented by Megginson and Weiss (1991) and the others.

<Insert Table 1 here>

Panel A in Table 2 shows the summary statistics of main variables used in the subsequent analysis. 89 percent of the final sample is Nasdaq IPOs and 18 percent is internet companies.

Lock-up days does not show any sign of variation with a mean of 180 and a median of 177. Mean market return during the month before the IPO date is 6 percent. This indicates that VC firms take market condition into account when deciding for floatation.

Summary statistics for small and large syndicates are given in Panel B in Table 2. If the VC syndicate is above the median value 6, then the syndicate is labeled as large. Otherwise, the syndicate is regarded as small. Companies backed by small syndicates are underpriced 10 percent, on average, less than companies backed by large syndicates. The difference is statistically significant at one percent level. Although it is apparent that small VC syndicates have portfolio companies that are older, it not so obvious to say that those companies are more established and larger than portfolio companies of large syndicates. The mean difference in net proceeds is just around one million dollars but it is not significant. Small syndicates seem to make us of leverage and bank loans more than the other group does. This is partly because large syndicates infuse more equity funding which leaves less room for debt-like capitals. As a result, moderation effect introduced by leverage or monitoring should be more pronounced for relatively small syndicates if cross monitoring is likely to reduce potential agency costs.

The fraction of internet firms and Nasdaq listing is greater for large syndicates than the small syndicates. Mean lock-up period, pre-market return and lead VC total investment do not significantly vary across the two groups.

<Insert Table 2 here>

Pair-wise Pearson correlations in Table 3 reveal important relationship between dependant variable and IPO performance. First, VC syndicate size is positively and significantly correlated with underpricing. This provides initial evidence that the number of VC firms in a syndicate for a successful floatation has a negative effect on IPO underpricing, indicating

potential agency problems such as misalignment of interests and coordination problem, and poor monitoring. Syndicate size is negatively correlated with company age at IPO date. This means that large syndicates might have incentives to bring portfolio companies to IPO at relatively early stages. Untabulated statistics show that this incentive is more pronounced for large syndicates.

<Insert Table 3 here>

There is a significant and negative correlation between leverage and underpricing at one percent level. Taken together with the figures presented in Table 2, it indicates that external monitoring brought by leverage (or bank loan) can have a moderator impact on IPO performance as the VC syndicate size increases.

b. Syndicate size and IPO performance

Parameter estimates of OLS regression in equation (1) are given by Table 4. In model (1), we exclude leverage related variables and their interaction to test our first hypothesis on the relation between VC syndicate size and IPO underpricing. Consistent with the descriptive statistics and correlation matrix, we find that VC syndicate size variable takes a positive and significant coefficient in explaining the IPO underpricing. This finding is very robust under different settings. Company age and log of net proceeds reveal expected coefficients at 1 percent significance level, verifying that mature and larger firms enjoy less underpricing (Loughran and Ritter (2004), Cliff and Denis (2004)). Coefficient estimate of VC firm experience measured by the lead VC total investment at the time of IPO is not significant. As expected, internet firms are underpriced 29 percent more than a IPO firm that is not classified as internet company.

<Insert Table 4 here>

c. Syndicate size, Banking relationships, and underpricing

Second column in Table 4 shows that leverage significantly reduces IPO underpricing. This finding is in line with previous studies by James and Wier (1990), Habib and Ljungqvist (2001), Schenone (2004) and Chahine and Georgen (2011). To investigate whether the use of debt mitigates potential agency problems and leads to better performance, we run the model where we introduce the interaction term between leverage and syndicate size. The coefficient estimate of the interaction term in third column is -0.085 and statistically significant at 5 percent level[11]. Thus, we argue that leverage does attenuate the negative effect of syndicate size on underpricing and it is likely to be an alternative governance mechanism that curbs the potentials costs of forming syndicates.

As argued by banking literature, bank loans that are usually senior and short-term can serve a better disciplining function compared to public debt. To analyze the impact of cross monitoring by bank loans, we run the models with the bank loan variable. Like the estimate of leverage in previous setting, bank loan coefficient in the forth column is negative and significant. In the model, we suppress leverage to circumvent the possibility that both regressors pick the same effect[12].

In the last column of Table 4, the interaction term *VC syndicate size x Bank loan* has a coefficient of -0.010, significant at 1 percent level. This finding provides support for the second hypothesis that external monitoring by banks can be an alternative governance mechanism to reduce inefficiency created by large VC syndicates.

d. Endogenous VC syndicate size

[11] In the model, we suppress the direct effect of leverage since there is a .88 correlation between the interaction term and the leverage.

[12] In fact, model with both variables still have negative and significant coefficient on leverage and bank loan dummy even though bank variable has smaller magnitude.

In order to show that results characterized by VC Syndicate size are not driven by IPO firm specific features, we control for endogeneity by running a two stage least squares (2SLS). VC syndicate size variable is a discrete count variable and its distribution is different from the normal distribution, violating the standard assumption of normality in linear regression. Thus, we employ Poisson regression to predict the syndicate size in the first stage given by the equation (2) (See Greene (2008) and Wooldridge (2006) for a discussion of comparison between standard OLS and Poisson regressions)[13]. In an instrumental variable approach, two conditions must hold. First condition is about the relevancy. That is, instruments should be correlated with endogenous variable. Andersen-Rubin Wald test rejects the null hypothesis that instruments are irrelevant. As shown in Table 5, almost all instruments take significant coefficients in explaining the syndicate size. High t-statistics, as suggested by Staiger and Stock (1997), is another indication that instruments are highly correlated with endogenous variable. Moreover, Stock and Yogo test reveals that our instruments are not weak in explaining the he right hand side endogenous variable VC syndicate size. Second condition is the exclusion restriction. This requirement is based on the assumption that instruments are not correlated with left hand side independent variable. Testing second condition is possible when there is more than one instrument. Hansen J statistics for overidentification test fails to reject that instruments are uncorrelated with our dependent variable underpricing.

Table 5 reports the coefficient estimates of the first stage regressions. Portfolio companies that are classified as "Startup, Early, Expansion or Other" at the first investment round are likely to have greater syndicate size than the companies that are in "Later" class. Apart from the coefficient estimate of "Buyout" variable, all coefficients on company related variables are positive and significant at one percent level. The coefficient estimate on "Startup" variable is

[13] A simple OLS in the first stage generates very similar results to those of Poisson regression.

0.69 and greatest in magnitude, verifying the intuition that entrepreneurs who seek for VC financing at the very early stages of the company are expected to be funded by more VC firms than the rest of the IPO companies.

<Insert Table 5 here>

In the second stage of 2SLS, we retained the same variables used in the OLS but replace the size proxy by its predicted value from the first stage. Consistent with OLS results, Table 6 indicates that predicted size variable is positively associated with underpricing in all five models. Although per unit changes in a categorical variable size are significant, they may not be economically relevant. One standard deviation change in syndicate size ends up with 4.5 percent increase in underpricing. Thus, the impact is economically significant as well. This finding strongly supports our first hypothesis. More specifically, costs and inefficiencies implied by greater syndicate size are positively correlated with IPO underpricing. Columns (2) and (3) show that moderation effect of leverage or bank loans stand still under 2SLS framework.

<Insert Table 6 here>

e. Post- IPO Performance of syndicates

To measure post-IPO performance, we use three proxies: i.) Return on assets (ROA), ii.) ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets and iii.) cumulative abnormal returns (CAR). Following Krishnan et al. (2011), we adjust first two measures, namely ROA and EBITDA/Total assets, for industry effects. To do this, we first identify the sample IPO firm's industry classification based on Fama-French 48 industry categorization. For each industry group, we calculate the median ROA and EBITDA/ Total assets. Then the median values are subtracted from the ROA and EBITDA/Total assets of the IPO firm. CAR is the last long-run performance measure. For an IPO firm *i,* it is defined as

$CAR_{i,n} = \sum_{t=1}^{n} AR_{it}$ where $AR_{it} = R_{it} - E(R_{it})$ is the abnormal return in month *t*. Here, $E(R_{it})$ represents the expected return and it is replaced by value weighted (and equally weighted) monthly market return.

We carry out long run performance calculations above for small and large syndicates, and then look at the differences in means. Univariate results are presented in Table 7. Consistent with hypothesis 2, all three measures refer to the same inference. That is, companies that are backed small VC syndicates have better post-IPO performance. Differences in means for all three post-IPO measures are significant at 1 percent level and persistent up to 3 years after the IPO date.

<Insert Table 7 here>

Results in Table 7 do not take endogeneity into account. The apparent underperformance of companies backed by large syndicates might stem from endogeneous syndicate decision (Tian (2011)). As argued earlier, companies that have greater growth potential but less prospects for realizing notable profitability after the IPO date are likely to be funded by more VC firms. This indicates that lower post IPO performance of companies backed by large syndicates is not a casual outcome of VC syndicate size. In order to verify univariate results in Table 7, we run both OLS and 2SLS regressions where the dependent variables are mean industry adjusted ROA, EBITDA/Total Assets and CAR over the three year period after the IPO date. Table 8 shows the regression results. Like estimates of OLS, coefficient estimates on syndicate size in 2SLS regressions are all negatively associated with post-IPO performance measures. Column (2) indicates that one additional VC firm into a syndicate reduces mean EBITDA/Total assets by 2.2 percent. Noting that sample mean EBITDA/Total assets is -11 percent, we highlight that the

impact of syndicate size on the post-IPO EBITDA/Total assets is economically significant along with statistical significance ($p \leq 0.001$). In sum, OLS and 2SLS results support the conclusion driven in Table 7: as syndicate size increases post-IPO firm performance deteriorates in three years period after the IPO date.

<Insert Table 8 here>

f. Robustness Checks: Alternative VC syndicate size measures

VC syndicate size is the key variable for our main results in Tables 1-8. For robustness, we re-examine all three hypotheses under different measures of VC syndicate size. As discussed earlier, venture capital syndicates are likely to suffer from misalignment of interests, different objectives, communication and coordination problems, and poor monitoring when the syndicate size increases. Our proxy for size and hence implied costs is simply the number of syndicating VC firms. One potential concern is the following. When similar VC firms from the same industry come together, the conflicts are expected to be minimized. In this case, the number of VC firms as a size proxy is not enough in capturing the potential problems associated with syndicates. To overcome this issue, we propose two alternative syndicate size measures. First one is the number of different industry preferences in a syndicate. Venture economics has 88 different industry classifications and it provides industry preferences for almost 80 percent of whole VC firms in this database. Our second alternative size proxy is about the VC firm type. One can argue that investment bank affiliated VC firms and corporate VC firms might have different objectives and different investment horizons. To be able to control this type of conflicts, we look at the number of different VC types in a syndicate. Although Venture Economics has 14 different VC type categorizations, it is noteworthy that 66 percent of all VC firms fall into "private" type VC classification.

Table 9 presents results under two alternative syndicate size measures we define above. In the interest of brevity, we only provide OLS results where we use dependent variable underpricing for testing hypotheses 1 and 2 and use dependent variable EBITDA/Total Assets for testing hypothesis 3. Both syndicate size measures take positive and significant coefficients in models where we regress underpricing on other controls. This implies that results attributed to potential downsides of syndicates stay the same under three different size definitions.

<Insert Table 9 here>

5. Conclusion

In this paper, we investigate the impact of principal-principal agency conflicts within venture capital syndicates on the performance of portfolio companies. We quantify the conflicts by means of syndicate size defined as the number of syndicating VC firms. Then, we explore the effect of syndicate size on pre- and post- IPO performance and examine if alternative governance mechanism by leverage or bank loans attenuates the impact of agency conflicts on performance.

We first document that as syndicate size increases the portfolio company experience more underpricing at the time of IPO. This result is robust under several empirical specifications. Second, consistent with findings in banking literature, we find that monitoring by banks or implied monitoring by the presence of debt plays a moderation effect when syndicate size increases substantially. In other words, when the syndicate gets large, extent of poor governance and agency conflict can be mitigated via cross monitoring by means of debt-like securities. Third, we show that the impact of syndicates on performance is not limited to IPO underpricing. The effect appears to remain significant up to three years of being public. More specifically, we document that post-IPO profitability, measured by returned on assets and other two proxies, of

companies that are backed by small syndicates is higher than that of companies backed by large syndicates.

We show that our empirical findings are robust to different specification such as alternative proxies for VC syndicate size. Overall results suggest that potential agency problems within syndicates such as less coordination, costly monitoring, or free-riding problems among the principals are difficult to mitigate and have persistent negative effect on company performance. One implication of our analysis is that entrepreneurs can enjoy better short and long-term IPO performance when they can limit the number of VC firms and obtain external debt financing via bank loans.

References

Bennedsen, Morten, Hans C. Kongsted, and Kasper M. Nielsen, 2008, The causal effect of board size in the performance of small and medium-sized firms, *Journal of Banking and Finance* 32**,** 1098-1109.

Bradley, Daniel J., and Bradford D. Jordan, 2002, Partial adjustment to public information and IPO underpricing, *Journal of Financial and Quantitative Analysis* 37, 595-616.

Brander, James A., Raphael Amit, and Werner Antweiler, 2002, Venture Capital Syndication: Improved Venture Selection vs. Value-Added Hypothesis, *Journal of Economics and Management Strategy* 11, 423-452

Brav, Alon, and Paul Gompers, 2003, The role of lock-ups in initial public offerings, *Review of Financial Studies 16*, 1–29.

Casamatta, Catherine and Carole Haritchabalet, 2007, Experience, Screening and Syndication in Venture Capital Investments, *Journal of Financial Intermediation* 16, 368-398.

Carletti, Elena, Vittoria Cerasi, and Sonja Daltung, 2007, Multiple-bank lending: Diversification and free-riding in monitoring, *Journal of Financial Intermediation* 16, 425-451

Cestone, Giancinta, Josh Lerner, and Lucy White, 2006, The Design of Syndicates in Venture Capital, Working paper, Harvard University and University of Salerno.

Chahine, Salim, and Marc Georgen, 2011, VC Board Representation and Performance of US IPOs, *Journal of Business Finance & Accounting 3*, 413-445.

Chava, Sudheer and Michael R. Roberts, 2008, How does financing impact investment? The role of debt covenants." *Journal of Finance* 63, 2085-2121.

Chemmanur, Thomas J., and Xuan Tian, 2011, "Peer Monitoring, Venture Capital Syndication, and the Dynamics of Venture Capitalist Interactions," Working Paper, Boston College.

Cliff, Michael T., and David J. Denis, 2004, Do Initial Public Offering Firms Purchase Analyst Coverage with Underpricing?, *Journal of Finance* 59, 2871-2901.

Du, Qianqian, 2011, Birds of a feather or celebrating differences? The formation and impact of venture capital syndication, working paper.

Eisenberg, Thedore, Stefan. Sundgren, and Martin T. Wells, 1998, Larger Board Size and Decreasing Firm Value in Small Firms, *Journal of Financial Economics* 48, 35-54.

Gompers, Paul A., 1996, Grandstanding in the venture capital industry, *Journal of Financial Economics* 42, 133-156.

Gompers, Paul, and Josh Lerner, 1997, Venture capital and the creation of public companies: do venture capitalists really bring more than money? *Journal of Private Equity 1*, 15–32.

Greene, William H., 2008, Econometric analysis, 6th Edition, Prentice-Hall, Upper Saddle River, NJ.

Habib, Michel A, and Alexander P. Ljungqvist, 2001, Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence, *Review of Financial Studies* 14, 433-458.

Hamao, Yasushi, Frank Packer, and Jay R. Ritter, 2000, Institutional affiliation and the role of venture capital: Evidence from initial public offerings in Japan, *Pacific-Basin Finance Journal 8*, 529-558.

Hellman, Thomas, Laura Lindsey, and Manju Puri, 2008, Building Relationships Early: Banks in Venture Capital, *Review of Financial Studies* 21, 513-541.

Hermalin, Benjamin E., and Michael S. Weisback, 2003, Boards of directors as an endogenously determined institution: A survey of the economic literature, *FRBNY Economic Policy Review* 9**,** 7-26

James, Christopher and Peggy Wier, 1990, Borrowing relationships, intermediation and the cost of issuing public securities, *Journal of Financial Economics* 28, 149-171.

Jensen, Michael C., 1993, The modern industrial revolution, exit, and the failure of internal control systems, *Journal of Finance* 48, 831-880.

Khalil, Fahad, David Martimort and Bruno Parigi, 2007, Monitoring a common agent: Implications for financial contracting, *Journal of Economic Theory* 135, 35-67.

Krishnan, C. N. V., Vladimir I. Ivanov, Ronald W. Masulis, and Ajai K. Singh, 2011, Venture Capital Reputation, Post-IPO Performance and Corporate Governance, *Journal of Financial and Quantitative Analysis 46,* 1295-1333.

Lee, Peggy M., and Sunil Wahal, 2004, Grandstanding, certification and the underpricing of venture capital backed IPOs, *Journal of Financial Economics* 73, 375-407.

Ljungqvist, Alexander P., and William J. Wilhelm, 2003, IPO Pricing in the Dot-com Bubble, *Journal of Finance* 58, 723-752.

Lockett, Andy and Mike Wright, 1999, The Syndication of Private Equity: Evidence from the UK, Venture Capital 1, 303-324.

Lockett, A., Mike Wright, 2001, The Syndication of Venture Capital Investments, Omega 29, 375-390.

Loughran, Tim, and Jay Ritter, 2004, Why has IPO Underpricing Changed Over Time? *Financial Management* 33, 5-37.

Lowry, Michelle and William G. Schwert, 2004, Is the IPO pricing process efficient?, *Journal of Financial Economics* 71, 3-26.

Megginson, William L., and Kathleen H. Weiss, 1991, Venture capitalist certification in initial public offerings, *Journal of Finance* 46, 879-903.

Schenone, Carola, 2004, The Effect of Banking Relationships on the Firm's IPO Underpricing. *Journal of Finance* 59, 2903-2958.

Slovin, Myron B., and John E. Young, 1990, Bank lending and initial public offerings, *Journal of Banking & Finance* 14, 729-740.

Smart, Scott B. and Chad J. Zutter, 2003, Control as a motivation for underpricing: a comparison of dual and single-class IPOs, *Journal of Financial Economics* 69, 85-110.

Staiger, Douglas and James H. Stock, 1997, Instrumental variables regressions with weak instruments, *Econometrica 65*, 557–586.

Tian, Xuan, 2011, The Role of Venture Capital Syndication in Value Creation for Entrepreneurial Firms, *Review of Finance*, 1-39.

Wooldridge, Jeffrey M., 2006, Introductory Econometrics: A modern Approach, Third Edition, South-Western.

Yermack, David, 1996, Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40, 185-211.

Table 1. Sample distribution over time and industry

Panel A: VC backed IPO frequencies by year

Year	Number of VC backed IPOs	Mean VC Syndicate Size
1990	23	6.83
1991	65	7.8
1992	84	7.9
1993	98	7.12
1994	60	5.6
1995	106	6.2
1996	141	5.6
1997	84	5.61
1998	59	4.86
1999	172	7.06
2000	159	8.03
2001	21	5.76
2002	13	6.62
2003	17	7.65
2004	45	9.02
2005	35	6.69
2006	32	6.69
2007	51	7.63
Total	1265	6.83

Panel B: VC backed IPO frequencies by industry

Industry Classification	Number of VC backed IPOs	Mean VC Synd. Size
Consumer Non-Durables	20	3.75
Consumer Durables	11	3.27
Manufacturing	31	5.45
Oil, Gas and Coal Extraction	8	3.25
Chemicals and Allied Products	7	6.14
Business Equipment	619	6.94
Telephone and Television Transmission	68	6.01
Utilities		
Wholesale, Retail and Services	71	5.77
Healthcare, Medical Equipment and Drugs	326	7.86
Finance		
Others- Mines, Constr, BldMt, Trans, Hotels.	104	5.89

Table 2. Summary Statistics

Panel A: Full sample summary statistics

Variable	Minimum	Mean	Median	Std Dev	Maximum
Underpricing	-1.00	0.35	0.14	0.62	5.25
VC syndicate size	2.00	6.83	6.00	4.34	21.00
Leverage	0.00	0.16	0.05	0.25	1.15
Bank loan	0.00	0.25	0.00	0.43	1.00
Company age	0.00	8.87	6.00	10.75	107.00
Total Lead VC invst.	0.53	485.23	201.50	755.91	4635.24
Net proceeds	2.71	50.93	36.16	53.41	657.88
Pre Market Ret	-0.29	0.06	0.06	0.13	0.37
Sales	0.00	47.18	14.71	150.97	3421.49
Internet dummy	0.00	0.18	0.00	0.38	1.00
Under. Rank	1.00	7.89	8.25	1.38	9.00
Nasdaq dummy	0.00	0.89	1.00	0.31	1.00
Lock-up days	90.00	177.17	180.00	37.80	365.00

Panel A reports the descriptive statistics of 1265 VC backed IPOs completed during 1990-2007. *Underpricing* defined by the ratio of difference between first day closing price and offer price to offer price. *VC Syndicate Size* is the number of distinct VCs that provide capital before the IPO date. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. Lead VC firm is the venture firm that makes the first investment. *Bank loan* is the ratio bank loan amount to total assets. *Total Lead VC Investment* is the total invested amount (in millions) across all other companies in a given IPO year. *Company age* is the difference between year of IPO date and the year of date when the company is founded. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Proceeds* is the offer size in terms of net proceeds. *Lockup days* represent the length of trading restriction in days. *Nasdaq dummy* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet dummy* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Underwriter Rank* is from Loughran and Ritter underwriter rank classification. *Pre-IPO Market Average is* defined as mean value-weighted CRSP index return over the month before the issue date.

Panel B: Summary statistics for two subsamples

Variable	Small Syndicates	Large Syndicates	Differences in means
Underpricing	0.31	0.41	0.10***
VC syndicate size	3.73	10.75	7.02***
Leverage	0.19	0.12	-0.07***
Bank loan	0.29	0.20	-0.09***
Company age	10.00	7.43	-2.58***
Total Lead VC invst.	488.47	481.13	-7.33
Net proceeds	51.48	50.23	-1.25
Pre Market Ret	0.06	0.05	-0.01
Sales	61.78	28.91	-32.88***
Internet dummy	0.15	0.21	0.06***
Under. Rank	7.77	8.05	0.28***
Nasdaq dummy	0.86	0.92	0.06***
Lock-up days	178.57	175.39	-3.19
Num. of obs.	707	558	

This panel presents the descriptive statistics for the sample firms that are backed by small or large VC syndicates. If the VC syndicate size is greater than 6, then the syndicate is coded as *Small Syndicate*. Otherwise, it is labeled as *Large Syndicate.* Last column reports the differences in means. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 3. Pearson Correlation Matrix

	Underp.	VC Syn Size	Leverage	Bank loan	Company Age	Tot Lead VC Invs.	Market Ret	Proceeds	Sales	Internet Dummy	Nasdaq dummy	Und. Rank
Underp.	1.000											
VC Syn Size	0.102	1.000										
Leverage	-0.122	-0.142	1.000									
Bank loan	-0.009	-0.048	0.071	1.000								
Company age	-0.121	-0.090	0.258	-0.023	1.000							
Total lead VC Invs	0.069	-0.008	-0.044	0.055	-0.103	1.000						
Market Ret	0.100	-0.033	-0.013	-0.036	-0.026	-0.017	1.000					
Proceeds	0.340	0.045	0.148	0.019	0.054	0.194	0.057	1.000				
Sales	-0.071	-0.101	0.173	0.018	0.303	0.129	-0.023	0.263	1.000			
Internet dummy	0.440	0.093	-0.120	0.098	-0.128	0.086	0.002	0.275	-0.082	1.000		
Nasdaq dummy	0.054	0.079	-0.162	-0.001	-0.107	-0.017	0.045	-0.055	-0.276	0.092	1.000	
Und. Rank	0.205	0.140	0.052	0.048	-0.008	0.151	0.013	0.515	0.119	0.161	0.053	1.000

This table reports the pairwise Pearson correlations. *Underpricing* defined as the first day initial return. *VC Syndicate Size* is the number of distinct VCs that provide capital before the IPO date. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. *Bank loan* is the ratio bank loan amount to total assets. *Lead VC Firm Investment* is the total invested amount (in millions) across all other companies in a given IPO year. *Company age* is the difference between year of IPO date and the year of date when the company is founded. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Proceeds* is the offer size in terms of net proceeds. *Nasdaq dummy* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet dummy* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Underwriter Rank* is from Loughran and Ritter underwriter rank classification. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date.

Table 4. OLS regressions for the impact of syndicate size and for the moderation effect of leverage on underpricing

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	-0.907***	-0.930***	-0.921***	-0.902***	-0.906***
VC Syndicate size	0.009**	0.008**	0.011***	0.008**	0.009**
Leverage		-0.197***			
VC Syndicate size x Leverage			-0.016**		
Bank loan				-0.055***	
VC Synd. x Bank Loan					-0.010***
Log Lead VC Firm Investment	0.002	0.001	0.002	0.003	0.003
Log Company Age	-0.046**	-0.039*	-0.043**	-0.048**	-0.048**
Log sales	-0.003	0.000	-0.002	-0.004	-0.004
Log net proceeds	0.217***	0.226***	0.219***	0.215***	0.214***
Lock-up Days	0.001**	0.001**	0.001**	0.001**	0.001**
Nasdaq dummy	0.004	-0.010	-0.002	0.002	0.002
Internet Dummy	0.292***	0.282***	0.288***	0.297***	0.295***
Underwriter rank	0.002	0.003	0.003	0.004	0.004
Mean Market return	0.394***	0.384***	0.394***	0.380***	0.383***
Industry dummy	YES	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES	YES
R-square	0.37	0.38	0.39	0.37	0.38
Numb. of obs.	1258	1258	1258	1258	1258

This table presents baseline OLS results. In all columns, dependent variable is IPO *Underpricing* defined as the first day initial return. *VC Syndicate Size* is the number of distinct VCs that provide capital before the IPO date. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. *Bank loan* is the ratio bank loan amount to total assets. *Lead VC Firm Investment* is the total invested amount (in millions) across all other companies in a given IPO year. *Company age* is the difference between year of IPO date and the year of date when the company is founded. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Proceeds* is the offer size in terms of net proceeds. *Lockup days* represent the length of trading restriction in days. *Nasdaq dummy* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet dummy* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Underwriter Rank* is from Loughran and Ritter underwriter rank classification. *Pre-IPO Market Average is* defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 5. First stage Poisson regression for determinants of VC Syndicate size

Variable	Estimates	Standard errors
Intercept	0.785***	0.188
Lead VC related instrument		
Lead VC Industry Concentration	-0.093	0.070
Portfolio company related instruments		
Start-up	0.697***	0.065
Early	0.461***	0.065
Expansion	0.288***	0.068
Other	0.590***	0.105
Buyout	-0.109	0.101
Other controls		
Leverage	-0.073	0.054
Log Lead VC Firm Investment	0.014*	0.008
Log Company Age	0.093***	0.021
Log sales	-0.011*	0.006
Log net proceeds	-0.012	0.023
Lock-up Days	-0.001	0.001
Nasdaq dummy	0.053	0.040
Internet Dummy	0.204***	0.037
Underwiter rank	0.073***	0.011
Mean Market return	-0.165*	0.087
Industry dummy	YES	YES
Year dummy	YES	YES
R-square	0.37	0.38
Numb. of obs.	1258	1258

This table provides first stage coefficient estimates. The dependent variable is VC syndicate size and defined as the number of syndicating VC firms before the IPO date. Instruments are classified into two groups: (i) Lead VC related instrument and (ii) Portfolio company related instruments. The rest of the independent variables from the OLS regression are given by other controls. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 6. 2SLS regressions for the impact of syndicate size and for the moderation effect of leverage on underpricing

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	-0.976***	-0.981***	-0.994***	-0.968***	-0.970***
VC Syndicate size	0.030***	0.024***	0.030***	0.029***	0.029***
Leverage		-0.171***			
VC Syndicate size x Leverage			-0.021***		
Bank loan				-0.052***	
VC Synd. x Bank Loan					-0.008***
Log Lead VC Firm Investment	0.001	0.001	0.001	0.001	0.001
Log Company Age	-0.053**	-0.046**	-0.049**	-0.055**	-0.055**
Log sales	0.003	0.004	0.004	0.001	0.002
Log net proceeds	0.222***	0.229***	0.225***	0.220***	0.220***
Lock-up Days	0.001**	0.001**	0.001**	0.001**	0.001**
Nasdaq dummy	-0.004	-0.015	-0.011	-0.006	-0.006
Internet Dummy	0.270***	0.267***	0.266***	0.276***	0.275***
Underwiter rank	-0.009	-0.006	-0.007	-0.007	-0.007
Mean Market return	0.402***	0.391***	0.397***	0.388***	0.390***
Industry dummy	YES	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES	YES
R-square	0.35	0.38	0.39	0.38	0.38
Numb. of obs.	1258	1258	1258	1258	1258

This table reports second stage results where dependent variable is underpricing. *VC Syndicate size* is the predicted value from the first-stage regression. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. *Bank loan* is the ratio bank loan amount to total assets. *Lead VC Firm Investment* is the total invested amount (in millions) across all other companies in a given IPO year. *Company age* is the difference between year of IPO date and the year of date when the company is founded. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Proceeds* is the offer size in terms of net proceeds. *Lockup days* represent the length of trading restriction in days. *Nasdaq dummy* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet dummy* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Underwriter Rank* is from Loughran and Ritter underwriter rank classification. *Pre-IPO Market Average is* defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 7. Univariate Analysis of Post-IPO Performance.

Year	Small VCs Syndicates	Large VCs Syndicates	Differences in Means
		ROA	
1	-0.039	-0.084	0.045***
2	-0.101	-0.194	0.093***
3	-0.190	-0.281	0.091**
		EBITDA/Total Assets	
1	-0.043	-0.111	0.068***
2	-0.073	-0.160	0.087***
3	-0.093	-0.183	0.090***
		Value Weighted CAR	
1	0.083	0.011	0.072
2	0.125	-0.031	0.156**
3	0.237	0.069	0.168**
		Equally Weighted CAR	
1	0.074	-0.026	0.100**
2	0.084	-0.122	0.206***
3	0.167	-0.054	0.221***

This table provides univariate results of comparing long-run IPO performance of VC backed sample IPOs. We divide the sample into two groups: IPOs that are backed by small syndicates and large syndicates. If the number syndicating VC firms exceed the median value, 6, then the sample IPO company is labeled as small VC syndicate. Long-run performance measures are industry adjusted ROA and EBITDA/Total Assets. We also include stock return performance in terms of CAR as third measure. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 8. OLS and 2SLS regressions for post-IPO profitability

	ROA		EBITDA/Total Assets	
Variable	OLS	2SLS	OLS	2SLS
Intercept	-0.718***	-0.690***	-0.646***	-0.601***
VC Syndicate size	-0.008***	-0.016***	-0.008***	-0.022***
Leverage	-0.006	-0.021	0.083**	0.058*
Log Lead VC Firm Investment	0.005	0.006	0.003	0.005
Log Company Age	0.105***	0.106***	0.080***	0.082***
Log net proceeds	0.047**	0.045**	0.043***	0.040***
Lock-up Days	-0.001**	-0.001**	-0.001**	-0.001**
Nasdaq dummy	0.068*	0.071**	0.062**	0.068**
Internet Dummy	-0.174***	-0.165***	-0.090***	-0.076***
Underwiter rank	0.041***	0.045***	0.040***	0.047***
Industry dummy	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES
R-square	0.19	0.19	0.23	0.23
Numb. of obs.	1238	1238	1234	1234

Dependent variables are industry adjusted mean ROA and EBITDA/Total Assets during the three-year period after the IPO date. In 2SLS results, VC syndicate size is the predicted values from the first stage regression. Heteroskedasticity robust standard errors are clustered for two-digit SIC industry classification. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

Table 9. 2SLS results for testing all hypotheses with alternative syndicate size measures

	Panel A: Size Proxy by VC Industry Preferences			Panel B: Size Proxy by VC Type		
	Underpricing	Underpricing	ROA	Underpricing	Underpricing	ROA
Intercept	-0.970***	-0.991***	-0.685***	-1.097***	-1.129***	-0.605***
VC Syndicate size	0.049***	0.050***	-0.030***	0.070***	0.084***	-0.049***
Leverage			-0.017	-0.169***		-0.023
VC Syndicate size x Leverage		-0.037***			-0.049***	
Log Lead VC Firm Investment	-0.004	-0.004	0.009	0.002	0.002	0.005
Log Company Age	-0.047**	-0.044**	0.102***	-0.047**	-0.049**	0.108***
Log sales	0.002	0.004		0.002	0.002	
Log net proceeds	0.223***	0.227***	0.044**	0.226***	0.224***	0.047**
Lock-up Days	0.001**	0.001**	-0.001**	0.001***	0.001***	-0.001**
Nasdaq dummy	-0.012	-0.019	0.078**	-0.024	-0.022	0.077**
Internet Dummy	0.280***	0.273***	-0.168***	0.263***	0.261***	-0.162***
Underwriter rank	-0.011	-0.009	0.048***	0.003	0.003	0.040***
Mean Market return	0.381***	0.376***		0.395***	0.399***	
Industry dummy	YES	YES	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES	YES	YES
R-square	0.38	0.38	0.19	0.38	0.38	0.19
Numb. of obs.	1258	1258	1238	1258	1258	1238

This table reports second stage results for testing three hypotheses with alternative VC syndicate size measures. Panel A provides results where syndicate size is the sum of different industry preferences in syndicate before the IPO date. Panel B presents findings where syndicate size is the sum of different VC types such as private, investment bank and corporate VC. In each panel, columns 1, 2 and 3 provides test results for the hypotheses 1, 2 and 3 respectively. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.