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Size and Diversity in VC syndicates and their impact on IPO performance

Abstract

This paper investigates the impact of venture capital (VC) syndicate size and composition on the IPO and post-IPO performances of investee companies in an attempt to shed some light on the extent to which larger and more diverse syndicates are more likely to suffer from internal agency problems which might hinder the decision making process and lead to less value added for their portfolio companies. The question is of great relevance because, while the vast majority of the empirical literature compares VC backed IPOs with non VC backed ones, most VC funding is provided by syndicates of two or more financiers.

We construct alternative measures of size as well as diversity based on several VC characteristics such as age, geographic location, type and affiliation of VC firms and find that larger and more diverse syndicates are associated with higher underpricing and lower valuation at the IPO date. Furthermore we provide evidence that that diversity and size are negatively correlated to the long term performance of the IPO firms and this finding is robust to several alternative measures of long term performance.

Key Words: Syndicates, venture capital, crisis, IPO Valuation, , corporate governance, IPO performance

1. Introduction

The ability of venture capitalists to create value for their portfolio companies has been an extensively investigated topic in finance. Part of this literature has addressed this question by studying how venture capital (VC hereafter) financing impacts on the performances of their portfolio companies at and after their IPO date. The vast majority of this literature compares VC-backed IPOs with non-VC-backed ones providing mixed evidence as to the role of VC financing. In doing so, these empirical studies treat VC financing as uniform. However, VC firms can differ along several dimensions including affiliations, age, reputation and more. Yet, very little research has been done to date to explore in greater depth whether, and if so to what extent, the size and composition of VC syndicates plays a role in determining the short and long run IPO performance of their portfolio companies.

This paper aims to fill this gap by looking at a sample of VC-backed US IPOs in the period between 1985 and 2012. We find that the VC syndicate size and diversity have a significantly negative impact on both short and long term IPO performance, after controlling for other relevant factors that can affect them. The question is of great relevance because in fact the majority of VC backed IPOs are financed by two or more VCs. In our sample for instance roughly 70% of the total number of IPOs is backed by a VC syndicate, in line with what documented in other papers (Tian, 2012).

Various arguments have been put forward to explain the preference of VCs to syndicate a deal rather than going solo. Some of the benefits from syndication include the ability to achieve a better risk diversification (Lockett and Wright, 1999, 2001), the opportunity to take advantage of a second opinion particularly in cases of high uncertainty (Lerner, 1994; Casamatta and Hartichabalet, 2007; Cestone, Lerner, and White, 2006), the value added due to complementary skills and expertise (Brander, Amit and Antweiller, 2002), and finally the opportunity to build a network that can ensure a better deal flow in the future (Lockett and Wright, 2001).

On the other hand, more recent papers also highlight that VC syndicates, like all alliances involving the sharing of formal control, are likely to suffer from internal agency problems and higher coordination costs which can potentially undermine their effectiveness and their ability to add value to their portfolio companies (Wright and Lockett, 2003; Chemmanur and Tian, 2011). Additionally, as size grows VC syndicates are also more likely to involve different types of investors with divergent objectives thereby becoming more diverse and heterogeneous and hence further exacerbating the risk of internal agency conflicts (Du, 2011; Chahine et al., 2012)

This paper explores in greater depth the relationship between VC syndicate financing and the IPO performance of their portfolio companies. It is well known that VCs bring value to their investees through their expertise, business guidance and close monitoring. We conjecture that larger and more diverse VC syndicates might fail to achieve this as they are more likely to face internal agency and coordination problems which can result in weaker oversight and monitoring of their ventures and in a reduced ability to align the interests of the syndicate members. If this is the case, we would then expect these agency problems to have a negative effect on their portfolio firm's performance and, specifically, lead to poorer IPO performance.

We analyse both short and long term IPO performance where the short term performance is measured by the first day return (underpricing) as well as by the company's market valuation (Purnanandam and Swaminathan, 2004; Tian, 2011). Similarly, we use several indicators to capture long term performance including industry adjusted Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA), Cumulative Abnormal Returns (CAR) and Tobin Q over one to three years after the IPO.

Our variables of interest are the size of the VC syndicate and its diversity. We propose several alternative measures of size in order to better capture the dynamics of VC syndicate over the life of a project as size often change from round to round. Similarly, we construct a two diversity measures based on four different diversity indicators such as VC age, VC type, VC affiliation, VC country of origin. The first measure is a simple composite index similar to the one proposed by Chahine et al. (2012) while the second is obtained from a principal component analysis. To the best of our knowledge, we are the first employing such a broad set of measures of size and diversity.

Our findings document that larger and more diverse VC syndicates are associated with significantly higher underpricing and lower IPO valuation. We also find that this negative impact is long lasting as VC size and diversity also translate in significantly poorer long term performance.

Only a few papers have analysed the effect of VC syndicates . Tian (2012) for instance compares the value creation of VC syndicates as opposed to that of a single VC. The author looks at several dimensions to assess the value creation which include the exit mode, the degree of innovation, and also short and long run IPO performances for a sample of IPOs between 1980 and 2005. The author documents that VC syndicates outperform single VC. He does not however explore in depth the impact of syndicate size or composition. Chehine et al. (2012) instead investigate the impact of VC syndicate diversity on earnings management for a sample of 274 UK and US VC backed IPOs and find that more diversity is associated with significantly more earnings management. They also document that diversity is positively correlated to IPO underpricing. Their paper differs from this one because in that we look at a much larger sample of US IPOs over a longer period of time and also construct many alternative proxies for size and diversity whereas they focus on a single diversity index constructed based only on affiliation, age and nationality of VC.

The rest of the paper is organized as follows. Section 2 describes the sample. The methodology and our hypothesis are detailed in Section 3 while the results are discussed in Section 4. Section 5 is about the robustness checks and the last section concludes.

2. Literature Review

This paper contributes to two main strand of the literature on VC financing: the literature on the costs and benefits of VC syndicates, and more generally of financial syndicates, and the literature on the performances of VC backed IPOs. In this section, we present a brief overview of both.

2.1. Costs and benefits of VC syndication

There is an extensive literature that attempts to explain why venture capitalist usually syndicate their deals. Several different hypothesis have been proposed to identify the benefits of syndication.

For instance, the *diversification hypothesis* postulates that syndication allows VC firms to reduce their risk exposure by diversifying their portfolio thereby allowing them to make larger investments that would otherwise be difficult (Lockett and Wright (1999, 2001)). Various papers support the *second opinion hypothesis* which argues that syndication allows VC firms to get a credible second expert opinion regarding the value of the investment project which is of particular value when the project is perceived as highly uncertain (Lerner (1994), Casamatta and Hartichabalet (2007), Cestone, Lerner, and White (2006)). An alternative explanation suggest that VC firms can conceal their underperformance and hence maintain a high likelihood of future fund raising by collaborating with reputable and successful VC peers, which is known as the *window dressing hypothesis* (Lockett and Wright (2001), Bygrave (1987), Sorenson and Stuart (2002)). Finally, the *value adding hypothesis* conjectures instead that syndication allows VC firms to exploit their complementary skills and specific expertise thereby adding more value to their portfolio companies.

More recently, Tian (2012) explores the link between VC syndication and innovation and finds that VC syndicate promotes innovation, measured by number of patents granted and total number of citations, more than individual VC and this is reflected in better IPO and post-IPO performances.

There are however also costs associated with syndication. For instance Bruton et al. (2010) argue that different demands from limited partners and different incentives of each syndicate member can lead to *principal-principal* conflicts of interests within the syndicate which can ultimately result in inefficient monitoring of the portfolio companies. (Hochberg, Ljungqvist, and Lu (2007)).

In a recent paper, Chemmanur and Tian (2011) develop a model to explain the dynamics of VC syndicate formation. Their model formalizes the idea that VCs need to provide effort in order to add value to the entrepreneur's project and in the context of co-financing, they may be encouraged to free-ride on one another thereby causing an under-effort provision. In this framework, they are able to predict which types of venture should opt for a single VC rather than a syndicate and how, in the latter case, the composition of the VC syndicate evolves over time.

Similarly, in the banking literature Carletti et al. (2007) theoretically examine the effect of free-riding problems in the context of multiple banking relationships. They argue that as the number of banks increases, the benefits from more risk diversification need to be traded off against more severe free riding problems resulting in sub-optimal monitoring efforts.

Our paper does not enter in the merit of why VC syndicates are formed, but, conditionally on the project being syndicated, rather focuses on whether the size and the degree of diversity of the syndicate affects the IPO and post-IPO performances of portfolio companies. As size and diversity grow, it is likely that the benefits from syndication can be counterbalanced by the increasing inefficiencies. For instance, participating VCs might have very different objectives and this can cause misalignment of interests.

It is for instance well documented that corporate VCs have very different strategic objectives than independent VCs (Hellmann, 2002; Arping and Falconieri, 2010). Chahine et al. (2012) examine the relation between the degree of diversity within a VC syndicate and earnings management in a sample of 274 VC-backed IPOs in UK and US. They construct an index of VC syndicate diversity that encompasses several dimensions such as VC affiliation, age, and origin. Their findings show that VC syndicate diversity increases the likelihood of earnings management and the impact is stronger for US IPOs. The authors interpret their results suggesting that more diverse syndicates suffer from more severe *principal-principal problems* that exacerbates internal conflicts of interests and ultimately lead to poor monitoring of the investee companies. They also document that earning management leads to a poorer IPO performance.

Du (2011) also examines the effect of heterogeneity on the performance of VC syndicates. She argues that the costs of heterogeneity in terms of miscommunication, misaligned objectives and often inefficient decision making need to be traded off against the benefits in terms of learning opportunities in the long run. Consistent with her conjecture, she provides evidence that more heterogeneous syndicates tend to have lower exit rates but longer survival rates.

2.2. VC funding and IPO performances

2.2.1 Short run IPO performances

An extensive empirical literature compares the IPO performance of VC-backed firms with non VC-backed ones. In the short term, IPO performances is typically measured by the level of underpricing, that is the price spike of a firm's stock at the opening of the trading on the secondary market. The existing evidence is however mixed.

Using a matched sample of 320 VC-backed and non VC-backed IPOs between 1983 and 1987, Megginson and Weiss (1991) document that VC-backed IPOs exhibit lower underpricing than non-VC-backed IPOs. They explain this evidence by arguing that VC financing provides certification to outside investors about the quality of the listing company, and thus mitigates the adverse selection problem. They also show that VC-backed IPOs typically have more experienced underwriters and lower underwriting fees. Barry et al. (1990) specifically examine the relation between IPO underpricing and the quality of monitoring provided by venture capitalists. For a sample of 433 VC-backed US IPOs completed during the period 1978-1987, the authors document that VC firms hold quite large equity positions, and take approximately one-third of the IPO's board seats. They interpret this evidence as suggesting that VCs closely monitor their portfolio companies and hence are able to certify the quality of the offering. They conjecture that IPO underpricing should decrease with the quality of monitoring and propose six different proxies of the VCs' quality of monitoring to test this conjecture, one of these being the number of venture capitalists. Their findings suggest that the number of VCs carries the expected negative sign but with a weak statistical and economic significance.

On the other hand, Gompers (1995) develops a theoretical model that demonstrates that new venture capital firms have an incentive to take their portfolio companies public earlier than what would be optimal in order to increase their reputation and hence their future fund flow, the so called "grandstanding hypothesis". Lee and Wahal (2004) test the prediction of Gompers' model on a sample of 6,413 IPOs between 1980 and 2000 of which 37% consists of VC-backed IPOs. After controlling for the endogeneity of the VC financing decision, they find that VC-backed IPOs are underpriced more than non VC-backed IPOs and the difference ranges from 2% in the period 1980-1998 to 25% during the internet bubble (1998-2000). They interpret this result by arguing that a successful IPO enables VC to raise more funds in the future and confirm their conjecture by documenting a positive relationship between IPO underpricing and future fund-raising. Finally, Bradley and Jordan (2002) show that the first day return of VC-backed IPOs is not significantly different from that of non VC-backed IPO after controlling for industry, listing exchange and underwriter quality.

At present, few papers have investigated whether the size and the diversity of the VC syndicate plays a role in explaining the first day return. Tian (2011) for instance compares the value creation of VC syndicates as opposed to that of a single VC. The author looks at several dimensions to assess the value creation which include the exit mode, the degree of innovation, and also short and long run IPO performances for a sample of IPOs between 1980 and 2005. In this paper, in contrast, we specifically focus on the effect of the size as well as the composition of VC syndicates on IPO performances.

2.2.2. *Long Run IPO performance*

Evidence shows that VC firms tend to maintain significant equity holdings as well as seats in the board long after the IPO is completed.

Using a sample of US IPOs between 1983 and 1987, Megginson and Weiss (1991) document that VC ownership reduces from 36.6% of the firm before the IPO date to 26.3% after the offer date. The authors argue that this works as a commitment device or "bonding mechanism". Barry et al. (1990) reveal that, in their sample of 433 US VC-backed IPOs between 1978 and 1987, 58% of the VCs do not sell any of their shares and those who do sell, liquidate on average 6.6% of their equity stake. They also confirm that VCs maintain a significant representation in the firm's board.

Cumming and MacIntosh (2003) and Krishnan et al. (2011) find similar results on more recent samples. The latter links VC reputation, measured by the IPO market shares in the three years prior to the IPO, to larger shareholding and more board representation in the three years after the IPO and find that this results in better long term performances of their IPO companies for a sample of US IPOs between 1993 and 2004. This evidence has spurred a lot of empirical research aiming at assessing how the VC presence in the post-IPO period impacts on the companies' long-run performance.

Jain and Kini (1995) compare the long-run operating performance of VC-backed IPOs and non-VC-backed IPOs during the period 1976-1988. They construct a matched sample of 272 VC-backed and non VC-backed and compare the post-IPO operating performance measured by return on assets, cash flows/total assets, sales growth and capital expenditure growth. They find that VC-backed IPOs significantly outperform non-VC-backed ones for each of their measures over three years after the IPO date.

Brav and Gompers (1997) investigate the long-run performance of VC-backed IPOs by looking at the cumulative abnormal stock returns on a sample of 934 VC-backed IPOs between 1972 and 1992. They construct the CAR measure using different benchmarks and find that the results critically depends on the methodology used. Finally, Tian (2012) compare the long run performances of VC syndicate backed IPOs with those of single VC-backed IPOs. He provides evidence that syndicates results in higher post IPO innovation as measured by number of patents granted as well as total number of citations. He also finds that VC syndicates are associated to better post IPO performances than single VC backed companies.

In addition to covering a much more recent sample of IPOs that ends in December 2012, our paper differs from Tian's in that we mainly focus on the diversity of VC syndicates as a consequence of an increased size.

3. Data and Sample Selection

The data used in this study are obtained from various sources including Securities Data Corporation (SDC) New Issues, Dealogic, Venture Economics, Compustat, and CRSP. The sample is composed of VC-backed IPOs over the period January 1985- December 2012.

IPO related measures come from SDC Platinum New Issues and are cross checked with Dealogic. In line 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. We obtain supplementary company level characteristics such as company age at the time of IPO and underwriter bank reputation from Jay Ritter's website[1].

We use Venture Economics to extract information about VC characteristics as well as their financing such as disclosed round amount, VC firm investment focus, VC firm affiliation and round number among others. The record of venture-backed IPOs come from merging SDC New Issues with SDC Venture

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

Economics tapes[2]. As highlighted by Tian (2011), there are some discrepancies between SDC and Venture Economics. Specifically, during the matching process, we identify several observations that SDC New Issues database mistakenly code as non-VC-backed for which we can in fact find corresponding round based financing records in Venture Economics. These observations are included in our final sample.

Balance sheet data are collected from Compustat and return data are obtained from Center for Research in Security Prices at the University of Chicago (CRSP). After all filtering and merging, our final sample is composed of 1424 VC-backed IPOs of which 1159 are backed by VC syndicates (with the remaining backed by single VC).

4. Methodology

4.1 VC syndicate size and IPO underpricing

We start our analysis by investigating the relation between VC syndicate size and IPO underpricing. Hence, we test the following hypothesis.

H1: *IPO underpricing is related to the size of the VC syndicate.*

To this purpose , we run the following OLS regression [3]

$$\begin{aligned} Underpricing &= \alpha + \beta_1\, VCSize + \beta_2 LeadVCRep + \beta_3 Log(Sales) + \beta_4\, Log(Age) \\ &+ \beta_5\, Log(Proceeds) + \beta_6\, Rank + \beta_7 Nasdaq + \beta_8 Internet + \beta_9\, MarketReturn + \beta_{10}\, LockUp \; + \\ &\beta_{11} Above + Industry\ Dummies + Year\ Dummies \qquad (1) \end{aligned}$$

The dependent variable in equation (1) is IPO *Underpricing* defined as $\frac{1}{100}\cdot\frac{P-OP}{OP}$ where, in line with most of the existing literature, *P* is the first available closing price after floatation and *OP* is the offering price[4]. On the right hand side of equation (1), our variable of interest is *VCSize*. We use three different measures of syndicate size. Following Tian (2011), the first measure is *VCtotal* defined as the sum of distinct VCs that provide financing to the firm until the IPO date. This measure however includes VCs that have exited prior to the IPO and so does not correctly reflect the number of VCs providing funds, and hence exercising control, in any given round which for many companies in our sample change from round to round. In order to capture the round level dynamics of syndicate size, we construct a second measure of VC syndicate size defined as the average of the number of distinct VCs providing financing at each

[2] We perform matching by using Cusip numbers. For the observations that have missing Cusip, we carry out the matching with company names.

[3] A comprehensive list of the key variables used in our analysis can be found in Appendix A.

[4] Our underpricing measure comes directly from SDC. To calculate underpricing for missing values in SDC, we obtain first available closing price from CRSP

round until the IPO date which we denote by *RoundVCSize*. Finally we also use a dummy *VCSizeLarge* which takes value one if the *RoundVCSize* if above the sample median and zero otherwise. [5]

Previous papers argue that more reputable lead VC are associated to more effective VC syndicate. Hence, to control for VC reputation, we take the reputation of the lead VC where the lead VC is defined, following Lee and Wahal (2004), as the venture firm that makes the first investment across all financing rounds. Our reputation proxy, *LeadVCRep*, is then defined as the lead VC's IPO market share during the three year period prior to the first investment round which, similar to Krishnan et al. (2010) and Nahata (2008), for a given IPO, is constructed as the aggregate net proceeds of all IPOs backed by the same lead VC normalized by the aggregate net proceeds of all VC backed IPOs over the three years prior to the first round of financing. For example, if the portfolio company had received the first financing in 1994, then VC reputation measure is the ratio of total net proceeds from IPOs backed by the same lead VC between 1991 and 1993 to the total net proceeds of all VC backed IPOs completed over the same years. In those cases where the portfolio company has multiple lead VCs, the reputation is taken to be the average reputation of all lead VCs. [6].

We also control for several firm's characteristics known to affect underpricing such as the (log of) sales, company age, and IPO proceeds. We expect A*ge* and *Sales* to be negatively correlated with IPO underpricing while *Proceeds* is usually positively related to the first day return.

We further include a number of variables to control for IPO characteristics that are known to affect underpricing. Specifically, IPOs listed on the Nasdaq are expected to be smaller, riskier than average, and often from high-tech industries so in line with other papers (Corwin and Harris, 2001) we control for this by including in our regression a dummy variable *Nasdaq* which takes value one if the firm is listed on the Nasdaq and zero otherwise. We expect this dummy to have a positive coefficient. Similarly, the variable *Internet* is a dummy that takes value one if the IPO firm is identified as an internet company in the database compiled by J. Ritter and zero otherwise and control for the fact that internet stocks are considered more uncertain and hence positively correlated to underpricing

The variable *Rank* denotes the lead underwriter's rank which we obtain from Loughran and Ritter's (2004) classification. The underwriter's rank ranges from 1 to 9 with higher rank denoting more reputable underwriters. Generally, higher underwriter's reputation should lower underpricing although the existing evidence is mixed .We also control for the lock up period as it has been argued in the literature that

[5] The results do not change if the dummies defined with respect to the sample mean.

[6] The results are robust to alternative definitions of the lead VC such as the VC who makes the largest investment and also to a measure of IPO market share based on the number of IPOs conducted rather than the total proceeds. We also try a VC syndicate reputation measure constructed as the average IPO market share of all the distinct VCs financing the firm until the IPO date. Results remain unchanged.

underpricing can be exploited by insiders to build momentum so that when the lock up expires they can liquidate their shares at a higher price. The variable *LockUp* thus indicated the length of the lock up period in days. The variable *Above* is a dummy variable that takes value 1 if the IPO is priced above the top of the range and zero otherwise. It captures hot IPOs that are usually associated with higher underpricing.

Finally, we control for market and industry conditions by including industry dummies, year dummies and the variable *MarketReturn* defined as the mean value-weighted CRSP index return over the month before the issue date (Loughran and Ritter, 2004)..

4.2 VC Diversity and IPO underpricing

VCs differ along many different dimensions such as age, location and type. Diverse VCs may have mis-aligned objectives which would exacerbate internal agency conflicts. It is possible then that it is not size *per se* that causes a syndicate to be dysfunctional but rather the fact that as size increases so does the diversity of the syndicate. In order to investigate this link we test the following second hypothesis:

H2: *IPO underpricing is related to the degree of diversity of the VC syndicate*.

We do so by running regression (1) where *VCsize* is replaced by *VCdiveristy*. We capture the diversity of a VC syndicate by constructing a diversity index based on four different VCs characteristics: age, country of origin, industry preferences and affiliation and using two different approaches. The first proxy is a composite index constructed, similarly to Chahine et al. (2012), by counting the total number of different affiliations and industry preferences represented in the syndicate. To identify the type of affiliation, we use the affiliation classification compiled by Venture Economics which categorizes VCs in 14 different affiliations.[7] Similarly, we rely on the industry classification defined by Venture Economics which recognizes 62 different industries. We are not able to identify the industry preferences of all the VCs in our sample. As a matter of fact 682 out of the 3512 distinct VCs which make an investment at any given round do not have any industry preferences. There are also additional 242 VCs whose industry preference is labeled as unknown.[8]. As for age, we partition our sample of distinct VCs in four different age brackets and we then count how many age brackets are represented in each syndicate. The four brackets are (0-5; 6-13; 14-24; 25+) so if in a given syndicates there are only VCs belonging to the range (0-5) and (25+)

[7] We are aware that previous papers (Hellmann et al., 2008 and Chemmanur et al., 2013) suggests that VentureXpert misreport the affiliation of many VCs particularly for corporate and bank affiliated VCs. However we thing that in any thing the misclassification is playing against us by underestimating the affiliation-related diversity of the syndicate.
[8] Removing these two types of groups from our sample does not change our results.

we assign that syndicate an age score equal to 2. Finally for each VC we also identify the country of origin. There are 33 different countries in our sample so for each round we count the number of distinct countries represented. We then assign the syndicate a country score equal to the average of this number across all financing rounds. Our diversity index, VC*DivIndex*, is finally obtained as the sum of each individual score.

Our second diversity index is constructed by employing Principal Component Analysis (PCA). PCA has the advantage, compared to the composite index, to identify a diversity score able to explain more variance and is particularly suited in our case where all the four VC characteristics used are highly correlated. The PCA analysis will generate a number of components equal to the number of variables used and the first principal component identified accounts for most of the variance in the data, the second component for the second largest and so on so forth. Only components accounting for maximal variance are retained which are those with eigenvalues larger than one. We label this second diversity proxy as *VCDivPCA*.

Finally, we also use a third diversity measure defined as a dummy variable VC*DivHIGH* which takes value 1 if the syndicate has a diversity index above the sample median and zero otherwise. [9]

4.3. Controlling for Endogeneity: Instrumental Variable and 2SLS

A potential limitation of our OLS analysis is that the decision to syndicate might not be exogenous but rather affected by firm level characteristics.

A first raw test to verify whether our analysis is indeed biased due to an endogeneity problem we re-run our OLS regression removing from the sample single VC backed IPOs. In this way, we are de facto removing the decision to syndicate. We show that our results do not change if we do so and we interpret that as an indication that our analysis does not suffer from a strong endogeneity problem.

However, it might still be the case that the size and the diversity of any given syndicate are not random. In order to deal with this problem, we employ an instrumental variable (IV) approach in a 2SLS regression. Similar to Chahine et al. (2012), our instrument of choice is a dummy variable that takes value 1 if the VC firms is located in California or Massachusetts and zero otherwise. The rationale behind this choice is that firms located near VC clusters are more likely to be backed by more and more diverse VCs.

We thus run the following first stage regression to determine the VC syndicate size (diversity)

$$VCSize(Diversity) = \alpha + \beta_1 VC\_Cluster + \beta_2 LeadVCRep + \beta_3 Log(Sales) + \beta_4 Log(Age) + \beta_5 Log(Proceeds) + \beta_6 Rank + \beta_7 Nasdaq + \beta_8 Internet + \beta_9 MarketReturn + \beta_{10} LockUp + \beta_{11} Above + Industry\ Dummies + Year\ Dummies \qquad (2)$$

[9] Results are robust if we define the dummy with respect ot the sample mean.

Where *VC_Cluster* is our instrument and the rest of the controls are the same as in the previous regressions. The predicted value of *VCsize(Diversity)* obtained from the first stage regression is then replaced to our variable of interest into the second stage regression that is otherwise the same as the OLS regression in equation (1).

4.4. VC syndicate size and long-run firm performance

As previously discussed evidence shows that VC firms tend to maintain significant equity holdings as well as seats in the board long after the IPO is completed. In fact even where VCs do not seat on board they do however influence the appointment of directors. This is the kind of decisions that would become more complicated if they had to be agreed by a larger number of very diverse VCs.

The last step of our analysis is hence to assess the effect of VC syndicate size and diversity on the long term performances of the portfolio companies that are taken public. Our hypothesis is:

H3: *The long-run performances of VC-backed IPOs depend on the size and diversity of the VC syndicate.*

In order to test the above hypothesis we run the following regression:

$$LTperform = \alpha + \beta_1\, VCSize(Diversity) + \beta_2 LeadVCRep + \beta_3 Log(Sales) + \beta_4\, Log(Age) + \beta_5\, Log(Proceeds) + \beta_6\, Rank + \beta_7 Nasdaq + \beta_8 Internet + \beta_9\, MarketReturn + \beta_{10}\, LockUp + \beta_{11} Above + Industry\ Dummies + Year\ Dummies \tag{3}$$

Where we employ operating as well as stock performance indicators. The first measure is the industry adjusted average earnings before interest, taxes, depreciation, and amortization to the firm's total assets ratio, *EBITDA/TA* , over the three years following the IPO.[10] The second proxy is the firm's Tobin Q defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is equal to the book value of assets minus the book value of common equity plus the number of shares outstanding times the market price. We then take the average of the Tobin's Q values calculated at 1, 2 and 3 years after the IPO date. Finally we also look at long term stock price performances by

[10] In order to adjust the ratio for possible industry effects we identify for each IPO firm its industry classification based on the Fama-French 48 industry categorization. Then we calculate the median EBITDA/TA for each industry group and subtract these median values from the EBITDA/TA ratio of each sample firm in that industry.

measuring the firm's value weighted industry adjusted cumulative abnormal returns (CAR) in the three years after the IPO date. CARs are constructed as follows. For a given IPO firm i, the CAR is defined as $CAR_{i,n} = \sum_{t=1}^{n} AR_{it}$ where $AR_{it} = R_{it} - E(R_{it})$ is the abnormal return of firm *i* in month *t*. $E(R_{it})$ represents the expected return and it is replaced by value weighted market return based on the NYSE, AMEX and Nasdaq indices obtained from WRDS over the three years period preceding the IPO date .

In the next section we present and discuss our findings.

5. Results

5.1. Summary Statistics

The distribution of VC-backed IPOs over the sample period (1985-2012) is presented in Panel A of Table 1. It appears clear that the number of issues is not evenly distributed across the sample period. Not surprisingly, the peak of the IPO activity takes place during the internet bubble years, followed by a slowdown in the subsequent years. The Dotcom period has a total of 371 IPOs, covering approximately 20 percent of the full sample and during this period there is also the largest proportion of VC backed IPOs. More interestingly for the purpose of our analysis, overall more than 81% of the aggregate number of VC backed IPOs are backed by multiple VCs.

Panel B reports the distribution of VC-backed IPOs and average syndicate size across 12 different industries. The industry classification is based on Fama-French 12 industry groups. As before, we note that the IPO distribution is not homogeneous across industries as the largest share of IPOs belong to high-tech and healthcare / medical industries.

<Insert Table 1 here>

Panel A in Table 2 shows the summary statistics of the main variables used in the subsequent analysis. As far as our variables of interest are concerned, we find that the mean (median) syndicate size is 5.25 (4). The mean (median) of the round level VC size is smaller and equal to 2.70 (2.29). As for the diversity index, we note that the mean(median) is 7 (7.69) but there is a higher volatility.

Panel B in Table 2 provides summary statistics for small and large syndicates and a difference in means test for all relevant variables. A VC syndicate is deemed to be large when its round level VC size is below the mean value of 3. The table highlights a significant difference in the size of underpricing which appears to be 8% smaller in companies backed by small VC syndicates and the difference is statistically significant at 1%.

Large VC syndicates also seem to be more involved in younger and smaller companies - when looking at the value of sales and total assets - than small VC syndicates. These differences are also statistically significant at 1%. This suggests that the larger underpricing associated with firms backed by larger VC syndicates might in fact be the consequence of these companies being on average riskier than those backed by small VC syndicates. We do take this into account in our empirical analysis by including control variables that capture the firm's riskiness.

Finally in Panel C of Table 2 we report the outcome of the PCA analysis based on the four VC characteristics age, type, affiliation and country of origin. The result shows that only the first principal component satisfies the selection criterion that requires the eigenvalue to be larger than one and also explains over 65% of the total variance. Hence we retain only that component to be employed as diversity proxy in our analysis.

<Insert Table 2 here>

5.2 Syndicate size, diversity and IPO performance

Table 3 reports the results of a baseline OLS regression where the dependent variable is IPO underpricing and controlling for each of our measures of size and diversity. The regression outcome shows that the coefficient estimates of all of our variables of interest are of the expected sign and statistically significant at 1 per cent level. The economic magnitude of the impact is also relevant as an increase of 1 VC in the round level syndicate size leads to an increase of almost 2 per cent of the underpricing. Results are similar for diversity. Looking at the two dummies *VCDivHigh* and *VCSizeLarge* provides a more intuitive interpretation of the economic significance of the results as large syndicates appear to be 6 per cent more underpriced than small syndicates and the same holds for more diverse syndicate as opposed to less diverse syndicates.

With regard to the other explanatory variables, the results show that the coefficient estimates of the log of net proceeds have the expected sign and are statistically significant at 1 percent level. Also in line with previous papers we find that *Above* has a strong positive and significant impact on underpricing as well as market return.

Table 4 performs the same OLS regression on the sample of only syndicate backed IPOs, that is excluding IPOs backed by one VC. The results remains qualitatively the same although the economic magnitude of the effect of our variables of interest become larger.

Overall the results presented in Table 3 and 4 provide initial support to our conjecture that underpricing is positively correlated to VC syndicate size and diversity. However, as discussed above, our findings could be biased by the potential endogeneity of our variables of interest. Before drawing any more conclusion we need to address the endogeneity problem which we do in the next Section.

<Insert Table 3 and 4 here>

5.3 Endogenous VC syndicate size

We explained in the previous section that the decision to syndicate might not be exogenous. We address this problem in two different ways. Firstly, we re-run our OLS regression by removing from our sample the single VC backed IPOs which were instead included in the previous analysis so that we no longer have to worry about the syndication decision as our sample only includes syndicated backed IPOs which are 1159 in our full sample or 82 per cent of the total sample.

The OLS results for this new sample are reported in table 4 and are very much in line with those presented in Table 3 with the coefficient estimates of all of our variables of interest exhibiting a stronger economic significance than before. This provides some preliminary indication that our OLS analysis does not suffer from a serious endogeneity problem.

However, to ascertain this further we conduct a 2SLS regression based on Equation (2). Results for the first and second stage are presented in Table 4. Column (1) report the first stage result when our dependent variables are *VCSize* and *RoundVCSize* and shows that our instrument, *VC_Cluster*, has a strong explanatory power of our proxies of size and diversity. In Columns (3) and (4) we report the second stage where our variables of interest have been replaced with the predicted value obtained from stage 1. As we can see the results are in line with the OLS one although the magnitude of the coefficient is larger. In the remaining Columns (4) to (6) we present the 2SLS result for our diversity proxies *VCDivIndex* and *VCDivPCA* which, like the size proxies, confirm the OLS results. At the bottom of the table we include the output of the Stock-Yogo test and the Sargan-Hansen Endogeneity Test which together confirm the validity of the instrument employed but also indicate a relatively mild endogeneity problem.
Reassured by these results, in the rest of our analysis we will focus on the OLS regressions on the sample of syndicated backed IPOs only. [11]

< Insert Table 5 here >

[11] For brevity we do not report the 2SLS results for our dummies *VCDivHigh* and *VCSizeLarge* but they are in line with the others. They available from the authors upon request.

5.4 *Post- IPO Performance of syndicates*

In this section, we discuss the result of our analysis for post-IPO performances. The aim is to understand whether the inefficiencies associated to large and diverse VC syndicates might have a long lasting impact on the investee companies and therefore translate in poorer long term performances.

We employ three different measures of long term performances. Table 6 reports the results of the OLS regression where the dependent variable is the average of the (median industry adjusted) EBITDA/TA over the three years period after the IPO date which provide support to our hypothesis that larger and more diverse syndicates do negatively impact on the long term performances of their portfolio companies long after the IPOs. The coefficient estimates of all our variables of interest have the predicted negative sign and are statistically significant. Larger and more diverse syndicates appear to have an EBITDA/TA ratio approximately 2.5 per cent smaller than smaller and more homogeneous syndicates.

<Insert Table 6 here>

These finding are further confirmed by regression results in Table 7 where the dependent variable is now the firm's average Tobin's Q over the three years after the IPO date. The economic significance of the effect is substantial as larger and more diverse syndicates appear to have an average Tobin's Q approximately 30 per cent smaller and this is statistically significant at 5 per cent level.

<Insert Table 7 here>

Finally, in Table 8 we present the results of the regression where the dependent variable is the firm's value weighted CAR over the three years after the IPO date. As in the other cases, the coefficient estimates of our variables of interest remains generally negative as predicted by our hypothesis, statistically significant and with an economic significance that suggests that larger and more diverse syndicates underperform smaller and less diverse syndicate by approximately 20 per cent.

<Insert Table 8 here>

All the findings of the long term analysis together provide strong support to our conjecture which are consistent with the analysis of the short term performance. [12]

5.5 VC Syndicate size and IPO valuation

Some papers (Purnanandam and Swaminathan, 2004; Chemmanur et al. 2013, Tian, 2011) challenge the suitability of underpricing as a measure of short term IPO performances on the ground that the underlying assumption that the secondary market price converges to the firm's intrinsic value immediately after the start of trading might in fact not hold in reality. Purnanandam and Swaminathan (2004) document that the equity of IPO firms is generally overvalued (relative to the intrinsic value) at the time of the IPO and this overvaluation increases during the first trading day. Consistently, Chemmanur et al. (2013) argue that the larger underpricing observed by VC backed IPOs might in fact be the consequence of a larger overvaluation over the intrinsic value at the IPO date. Hence they claim that an analysis of VC backed IPOs only based on underpricing can be misleading and suggest instead to complement it by also looking at the IPO valuation.

Following their argument, in this Section we extend our analysis of short term performances by using the IPO valuation as our dependent variable instead of IPO underpricing. IPO valuation is constructed following the methodology pioneered by Purnanandam and Swaminathan (2004).[13] For each IPO firm, we first calculate the price multiples based on EBITDA as follows:

$$\left(\frac{Price}{EBITDA}\right)_{IPO} = \frac{Offer\ Price\ \times CRSP\ shares\ outstanding}{EBITDA\ in\ the\ previous\ year}$$

We also look at price multiples of sample firms using secondary market price rather than offer price. That is, our second set of price multiples take the form:

$$\left(\frac{SM\ Price}{EBITDA}\right)_{IPO} = \frac{Secondary\ Market\ Price\ \times CRSP\ shares\ outstanding}{EBITDA\ in\ the\ previous\ year}$$

Our next step is to match each IPO firm with a comparable industry peer that is already public. The price multiples for public companies take the form:

[12] All the results of this section remain unchanged if we analyse the long term performance year by year instead of taking the average over the three year period after the IPO date and are available from the authors upon request.
[13] Purnanandam and Swaminathan (2004) exclude sample firms with negative earnings. Doing this significantly reduces our sample to its half but results stay qualitatively similar.

$$\left(\frac{Price}{EBITDA}\right)_{Match} = \frac{Market\ Price\ \times CRSP\ shares\ outstanding}{EBITDA\ in\ the\ previous\ year}$$

The matching is done based on the Propensity score along several dimensions. Firstly, the matching requires the matched firm to be in the same Fama-French 48 industry as the sample IPO firm. Secondly, matched firms have similar sales, return on assets (ROA), profit margin (EBITDA/Sale) and sale growth (mean three year future sales normalized by the sale in the given year). Finally, for each fiscal year we obtain propensity scores by running the following Logit regression:

$$P\left(\mathbb{I}_{ipo}\right)_{i,t} = \alpha + \beta_1 Sales + \beta_2 ROA + \beta_3 Profit\ Margin + \beta_4 Sales\ Growth$$

Where dependent variable, $\mathbb{I}_{ipo}$, is a dummy variable taking value 1 if the given firm *i* goes to public in the given year *t*. Then, the predicted values from the regression above provide us the propensity scores. After generating propensity scores for sample firms and their industry peers, we find the matched firms by minimizing the difference between predicted scores. We then run the OLS and 2SLS as in equations *(1)* and *(2)* but using the following IPO valuation proxies as dependent variables:

$$\left(\frac{P}{V}\right) \quad = Log\left(\left|\frac{(Price/EBITDA)_{IPO}}{(Price/EBITDA)_{Matched}}\right|\ \right)\ or\ \left(\frac{MP}{V}\right) \quad = Log\left(\left|\frac{(SM\ Price/EBITDA)_{IPO}}{(Price/EBITDA)_{Matched}}\right|\right)$$

Table 9 reports the OLS results obtained by using (P/V) as our measure of IPO valuation and are generally consistent with the results on underpricing to the extent that they show that larger and more diverse VC syndicates negatively impact on the IPO firm's valuation.[14]

< Insert Table 9 here >

5.6 Robustness tests

In the VC literature fund size, defined as the logarithm of fund size in million dollars, has been also associated to the valuation of portfolio firms (Cumming and Dai, 2011). To control for the possible effect of fund size, we re-run our regression including fund size as defined in Cumming and Dai (2011) but the control variable is never significant and it does not impact on the significance of our variables of interest. Similarly, the distance between the lead VC and the portfolio company has been shown to potentially affect the performance of VC investments (Cumming and Dai, 2010). We try to control for the effect of

[14] VCtotal is marginally significant at 10%.

distance by constructing a dummy *Distance* that takes value 1 if the portfolio company shares the same zip code as the lead VC and 0 otherwise. We are able to construct this variable only for 980 firms in our sample. We do find that distance increases underpricing but has no effect on long term performance but it does not impact on any of our variables of interest .

In a more recent paper Cumming and Dai (2012) also shows that it is not uncommon for the lead VC to change over the course of the investment. They show that switching lead VC can affect capitals flow and the firm future valuation. In our analysis, we already control for several measure of lead VC reputation which is never significant, however to further control for the possible impact of switching lead VC we construct a dummy variable *Switch* which takes value 1 if the lead VC has switched at least once between the first round of financing and the IPO date, and zero otherwise. Almost fifty per cent of our sample switches lead VC at least once, however including this control in our regressions does not alter our results and it does not appear to have a significant effect on IPO performance.

Finally a limitation of our analysis is that, due to lack of data, we cannot control for the VC ownership which could intuitively play a role as size and diversity might matter only when VCs have a large share of ownership. We attempt to partially overcome this limitation by constructing a proxy of ownership defined as the ratio of the total amount of VC funding until the IPO date to the IPO firm's total assets. We then split our sample based on median value of this proxy, which is 11% , into LOW and HIGH ownership subsamples and we run our OLS regressions on these subsamples separately. The results show that the effect of size and diversity remain qualitatively similar but consistently with our expectations the economic magnitude of the effect is larger in the HIGH ownership subsample. [15]

6. Conclusion

The vast literature on venture capital financing has extensively addressed the question of why venture capitalists syndicate deals. While the benefits of syndication are generally well understood, i.e. risk sharing and complementary expertise, there is still very little understanding of the cost associated to syndication and more importantly of when and how, if at all, they impact on the performances of their portfolio companies.

This paper sheds some light on this particular aspect of venture capital financing by exploring the effect of size and diversity of VC syndicates on the IPO and post-IPO performances of their investee companies.

[15] For the sake of brevity, the results of the robustness tests are omitted but available from the authors upon request.

VC syndicates are not static. On the contrary their size and composition changes over time which is something that the empirical literature so far has not properly accounted for. By constructing several measures of size and diversity we try to capture the dynamics of the composition of VC syndicates and address the question of whether larger and more diverse VC syndicates are more likely to suffer from coordination problems and internal agency conflicts that ultimately result in a negative impact on the IPO performance of their portfolio companies.

We employ multiple measures of short and long term IPO performances to test our conjecture. Aafter controlling for possible endogeneity problems and several other factors that can affect our dependent variables, we provide strong evidence in support of our hypothesis that indeed IPO firms backed by larger and more diverse VC syndicates underperform those backed by smaller and less diverse syndicates in the short and in the long term and that this underperformance has a significant economic magnitude.

References

Arping, Stefan, and Sonia Falconieri, 2010, Strategic versus Financial Investors: The Role of Strategic Objectives in Financial Contracting", *Oxford Economic Papers* 62, 691-714.

Barry, Christopher, Chris Muscarella, John Peavy, and Michael Vetsuypens, 1990, The Role of Venture Capital in the Creation of Public Companies: Evidence from the Going-Public Process, *Journal of Financial Economics* 27, 447-472.

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, 1997, Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies, *Journal of Finance 52,* 1971-1821.

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, Jonathan D. Arthurs, Igor Filatotchev, and Robert E. Hoskisson, 2012, The Effects of Venture Capital Syndicate Diversity on Earnings Management and Performance of IPOs in the US and UK: An Institutional Perspective, *Journal of Corporate Finance* 18, 179-192.

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

Chemmanur, Thomas J., Elena Loutskina and Xuan Tian, 2013, Corporate Venture Capital, Value Creation and Innovation, *Review of Financial Studies,* forthcoming.

Corwin, Shane A., and Jeffrey H. Harris, 2001, The Initial Listing Decisions of Firms that Go Public, *Financial Management* 30, 35-55.

Cumming, Douglas and Na Dai, 2010, Local Bias in Venture Capital Investment, *Journal of Empirical Corporate Finance,* 17, 362-380

Cumming, Douglas and Na Dai, 2011, Fund Size, Limited Attention and valuation of venture capital backed firms, *Journal of Empirical Finance*, 18, 2-15

Cumming, Douglas and Na Dai, 2012, Why do entrepreneurs switch lead venture capitalist?, *Entrepreneurship Theory and Practice*, 37, 999-1017

Cumming, Douglas and Jeffrey G. MacIntosh, 2003, A Cross-Country Comparison of Full and Partial Venture Capital Exits, *Journal of Banking & Finance* 27, 511-548.

Du, Qianqian, 2011, Birds of a Feather or Celebrating Differences? The Formation and Impact of Venture Capital Syndication, working paper.

Gompers, Paul A., 1995, Optimal Investment, Monitoring, and the Staging of Venture Capital, *Journal of Finance* 50, 1461-1489.

Gompers, Paul A., 1996, Grandstanding in the Venture Capital Industry, *Journal of Financial Economics* 42, 133-156.

Gompers, Paul A., 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.

Hellmann, Thomas, 2002, A Theory of Strategic Venture Investing, *Journal of Financial Economics* 64, 285-314.

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

Hochberg, Yael V., Alexander Ljungqvist and Yang Lu, 2007, Whom You Know Matters: Venture Capital Networks and Investment Performance, *Journal of Finance* 62, 251-301.

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.

Lerner, Josh, 1994, The Syndication of Venture Capital Investments, *Financial Management* 23, 16-27.

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

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

Megginson, William L., and Kathleen H. Weiss, 1991, Venture Capitalist Certification in Initial Public Offerings, *Journal of Finance* 46, 879-903.

Nahata, Rajarishi, 2008, Venture Capital Reputation and Investment Performance, *Journal of Financial Economics* 90, 127-15.

Purnanandam, Amiyatosh K., and Bhaskaran Swaminathan, 2004, Are IPOs Really Underpriced, *The Review of Financial Studies* 17, 811-848.

Staiger, Douglas and James H. Stock, 1997, Instrumental Variables Regressions with Weak Instruments, *Econometrica 65*, 557–586.

Tian, Xuan, 2012, The Role of Venture Capital Syndication in Value Creation for Entrepreneurial Firms, *Review of Finance*, 1-39.

Wright M. and A. Lockett, 2003, The structure and Management of Alliances: Syndication in the Venture Capital Industry, *Journal of Management Studies,* 40, 2073-2102

Table 1. Sample distribution over time and industry

Panel A: All VC (Multiple VC) backed IPO frequencies by year

Year	*Number of All VC(Multiple VC) backed IPOs*	*Mean VC (Multiple VC) Syndicate Size*	*Year*	*Number of All VC(Multiple VC) backed IPOs*	*Mean VC (Multiple VC) Syndicate Size*
1985	11 (7)	4.64 (6.71)	1999	162 (141)	5.05 (5.65)
1986	44 (37)	7.50 (8.73)	2000	154 (138)	5.60 (6.14)
1987	39 (33)	7.97 (9.24)	2001	22 (17)	3.27 (3.94)
1988	18 (17)	7.94 (8.35)	2002	25 (16)	3.60 (5.06)
1989	20 (14)	6.65 (9.07)	2003	15 (15)	5.33 (5.33)
1990	24 (17)	5.38 (7.18)	2004	50 (41)	6.16 (7.29)
1991	61 (50)	6.41 (7.60)	2005	32 (19)	3.78 (5.68)
1992	83 (66)	6.42 (7.82)	2006	34 (29)	4.29 (4.86)
1993	92 (76)	5.84 (6.86)	2007	46 (39)	4.89 (5.59)
1994	55 (43)	4.11 (4.98)	2008	5 (5)	4.40 (4.40)
1995	99 (74)	4.82 (6.11)	2009	9 (5)	4.56 (7.40)
1996	128 (97)	4.13 (5.13)	2010	22 (19)	4.82 (5.42)
1997	76 (60)	4.13 (4.97)	2011	22 (20)	6.23 (6.75)
1998	49 (38)	4.24 (5.18)	2012	27 (26)	5.11 (5.27)
			Total	1424 (1159)	5.25 (6.22)

Panel B: All VC (Multiple VC) backed IPO frequencies by industry

Industry Classification	*Number of All VC(Multiple VC) backed IPOs*	*Mean VC (Multiple VC) Syndicate Size*
Consumer Non-Durables	29 (17)	3.52 (5.29)
Consumer Durables	9 (7)	2.89 (3.43)
Manufacturing	36 (21)	3.75 (5.71)
Oil, Gas and Coal Extraction	11 (8)	2.45 (3.00)
Chemicals and Allied Products	13 (10)	6.69 (8.40)
Business Equipment	693 (588)	5.52 (6.33)
Telephone and Television Transmission	71 (55)	4.72 (5.80)
Utilities		
Wholesale, Retail and Services	106 (76)	3.93 (5.09)
Healthcare, Medical Equipment and Drugs	312 (274)	6.20 (6.92)
Finance		
Others- Mines, Constr, BldMt, Trans, Hotels.	144 (103)	4.09 (5.32)

Table 2. Summary Statistics

Panel A: Full sample summary statistics

Variable	Min	Median	Mean	Std Dev	Max
Underpricing	-0.99	0.11	0.26	0.42	2.29
VCTotal	1.00	4.00	5.25	4.31	26.00
RoundVCSize	1.00	2.29	2.70	1.66	7.67
VCDivIndex	3.00	7.00	7.69	3.52	26.50
VCDivPCA	-2.11	-0.31	0.00	1.62	8.89
Total Assets (MM$)	0.28	20.93	93.82	535.28	16915.00
LeadVCRep (%)	0.00	0.00	0.01	0.02	0.12
Sales (MM$)	0.00	19.23	78.56	344.14	10079.00
Age	0.00	7.00	10.30	13.05	117.00
Proceeds (MM$)	2.20	37.20	66.29	423.36	15830.80
Rank	1.00	8.13	8.01	1.42	9.00
Internet	0.00	0.00	0.17	0.38	1.00
Nasdaq	0.00	1.00	0.86	0.35	1.00
Lock-up	15.00	180.00	181.35	42.78	730.00
Market Return	-0.58	0.06	0.05	0.14	0.58
Above	0.00	0.00	0.23	0.42	1.00

Panel A reports the descriptive statistics of 1424 VC-backed IPOs completed during 1985-2012. *Underpricing* is defined by the ratio of difference between first available closing stock price and offer price to offer price and divided by 100. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCDivPCA* is the principal component calculated based on four dimensions that we used for computing diversity index. *VCLarge* is one if the diversity index of the syndicate is larger than 4, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Above* takes value one if the IPO is priced above the original filing price range and zero otherwise.

Panel B: Summary statistics for two subsamples

Variable	Small Syndicates	Large Syndicates	Differences in means
Underpricing	0.23	0.32	-0.09***
VCTotal	3.27	9.20	-5.93***
RoundVCSize	1.73	4.63	-2.90***
VCDivIndex	5.70	11.65	-5.95***
VCDivPCA	-0.88	1.76	-2.64***
Total Assets (MM$)	117.5	46.44.	71.06***
LeadVCRep (%)	0.01	0.01	0.00
Sales (MM$)	99.93	35.85	64.08***
Age	11.80	7.30	4.50***
Proceeds (MM$)	72.49	53.89	18.60
Rank	7.88	8.28	-0.40***
Internet	0.16	0.20	-0.04**
Nasdaq	0.84	0.88	-0.04**
Lock-up	182.4	179.2	3.20
Market Return	0.06	0.05	0.01
Above	0.22	0.20	-0.02
Num. of obs.	949	475	

This panel presents the descriptive statistics for the sample firms that are backed by small or large VC syndicates. If the mean VC syndicate size per round is less than or equal to 3, 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% and 5% levels are represented by *** and ** respectively.

Panel C. Principal Component Analysis

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	2.61124402	1.87452839	0.6528	0.6528
2	0.73671563	0.21968790	0.1842	0.8370
3	0.51702773	0.38201511	0.1293	0.9662
4	0.13501262		0.0338	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4
VC Firm Nationality	0.375405	0.926033	-.009187	0.038074
VC Firm Age	0.573469	-.204206	-.258590	-.750043
VC Firm Industry	0.548178	-.253475	-.463933	0.648087
VC Firm Type	0.479275	-.191084	0.847238	0.126370

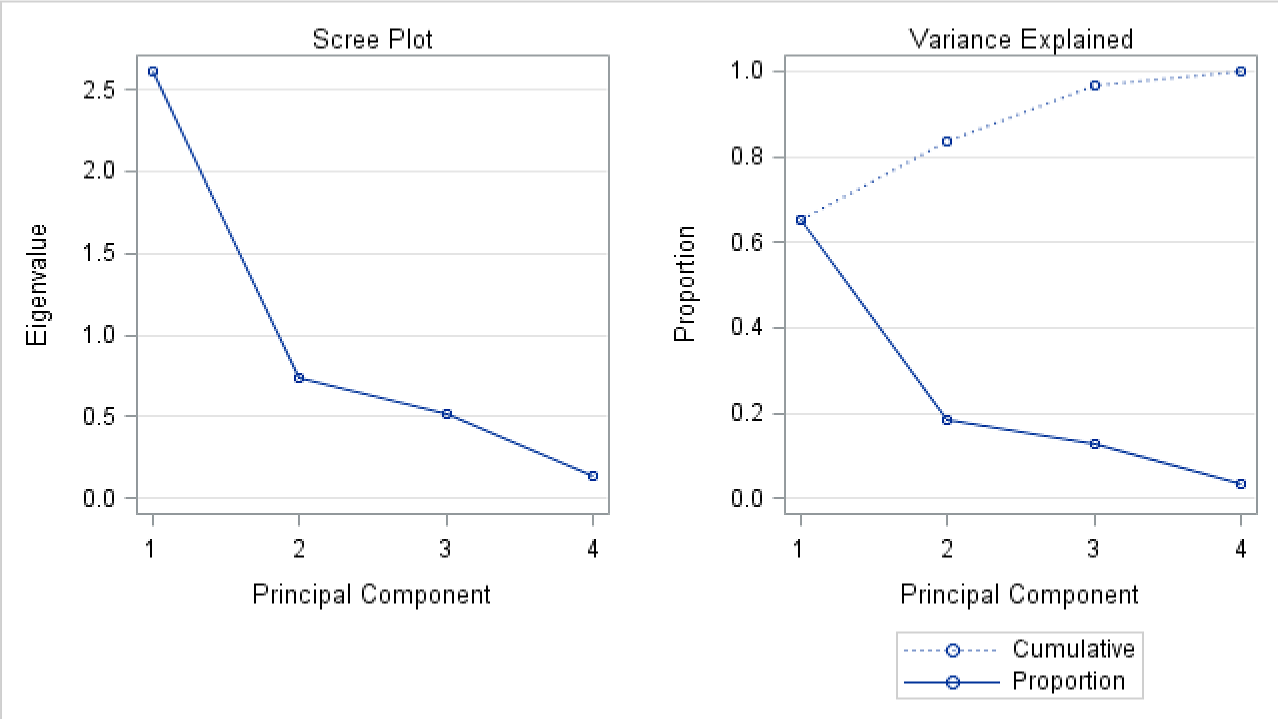

Table 3. OLS regressions for the impact of VC syndicate size and diversity on IPO underpricing

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-0.258**	-0.268***	-0.286***	-0.305***	-0.232**	-0.269***	-0.269***
	(0.102)	(0.102)	(0.102)	(0.103)	(0.102)	(0.102)	(0.103)
VCTotal		0.006***					
		(0.003)					
RoundVCSize			0.018***				
			(0.006)				
VCDivIndex				0.010***			
				(0.003)			
VCDivPCA					0.021***		
					(0.006)		
VCSizeLarge						0.058***	
						(0.021)	
VCDivHigh							0.060***
							(0.021)
LeadVCRep	-0.589	-0.596	-0.627	-0.619	-0.605	-0.644	-0.641
	(0.389)	(0.388)	(0.388)	(0.389)	(0.388)	(0.387)	(0.387)
Log Sales	-0.012	-0.01	-0.009	-0.009	-0.009	-0.009	-0.010
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Log Age	-0.027**	-0.027**	-0.023	-0.022	-0.022	-0.024	-0.023
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Log Proceeds	0.055***	0.055***	0.055***	0.055***	0.055***	0.055***	0.055***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Rank	0.005	0.002	0.001	0.001	0.001	0.002	0.002
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Internet	0.132***	0.129***	0.129***	0.130***	0.130***	0.131***	0.130***
	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
Nasdaq	0.013	0.012	0.012	0.012	0.011	0.012	0.011
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Lockup	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Market Return	0.217***	0.225***	0.225***	0.225***	0.227***	0.223***	0.223***
	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)
Above	0.330***	0.330***	0.330***	0.331***	0.331***	0.329***	0.329***
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
Industry dummies	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES
R-square	0.41	0.42	0.42	0.42	0.42	0.42	0.42
Numb. of obs.	1424	1424	1424	1424	1424	1424	1424

This table reports baseline OLS results where dependent variable is underpricing. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCDivPCA* is the principal component calculated based on four dimensions that we used for computing diversity index. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Above* takes value one if the IPO is priced above the original filing price range and zero otherwise. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively.

Table 4. OLS regressions for the impact of VC syndicate size on underpricing [only syndicate backed IPOs]

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-0.337*** (0.123)	-0.335*** (0.123)	-0.363*** (0.124)	-0.384*** (0.124)	-0.300** (0.124)	-0.346*** (0.123)	-0.345*** (0.124)
VCTotal		0.007*** (0.003)					
RoundVCSize			0.020*** (0.007)				
VCDivIndex				0.011*** (0.003)			
VCDivPCA					0.023*** (0.007)		
VCSizeLarge						0.060*** (0.023)	
VCDivHigh							0.062*** (0.022)
LeadVCRep	-0.582 (0.451)	-0.568 (0.451)	-0.618 (0.451)	-0.606 (0.453)	-0.586 (0.452)	-0.640 (0.449)	-0.632 (0.448)
Log Sales	-0.009 (0.008)	-0.008 (0.008)	-0.007 (0.008)	-0.007 (0.008)	-0.007 (0.008)	-0.007 (0.008)	-0.007 (0.008)
Log Age	-0.037** (0.018)	-0.039** (0.018)	-0.031 (0.018)	-0.031 (0.018)	-0.031 (0.018)	-0.032 (0.018)	-0.031 (0.018)
Log Proceeds	0.063*** (0.020)	0.062*** (0.020)	0.063*** (0.020)	0.062*** (0.020)	0.062*** (0.020)	0.063*** (0.020)	0.063*** (0.020)
Rank	0.008 (0.009)	0.005 (0.009)	0.003 (0.009)	0.003 (0.009)	0.003 (0.009)	0.004 (0.009)	0.005 (0.009)
Internet	0.114*** (0.042)	0.111*** (0.042)	0.114*** (0.042)	0.114*** (0.042)	0.114*** (0.042)	0.115*** (0.042)	0.115*** (0.042)
Nasdaq	0.010 (0.022)	0.010 (0.022)	0.011 (0.022)	0.010 (0.022)	0.010 (0.022)	0.010 (0.022)	0.009 (0.022)
Lockup	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Market Return	0.241*** (0.077)	0.251*** (0.077)	0.250*** (0.077)	0.249*** (0.077)	0.253*** (0.077)	0.247*** (0.077)	0.248*** (0.077)
Above	0.331*** (0.033)	0.333*** (0.033)	0.333*** (0.033)	0.335*** (0.033)	0.334*** (0.033)	0.331*** (0.033)	0.331*** (0.033)
Industry dummies	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES
R-square	0.41	0.42	0.42	0.42	0.42	0.42	0.42
Numb. of obs.	1159	1159	1159	1159	1159	1159	1159

This table reports baseline OLS results where dependent variable is underpricing. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCDivPCA* is the principal component calculated based on four dimensions that we used for computing diversity index. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Above* takes value one if the IPO is priced above the original filing price range and zero otherwise. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively.

Table 5. 2SLS regressions for the impact of VC syndicate size and diversity on IPO underpricing

	First Stage VCSize	Second Stage Underpricing	Second Stage Underpricing	First Stage VCDivIndex	Second Stage Underpricing	Second Stage Underpricing
Intercept	0.747 (1.375)	-0.296*** (0.105)	-0.376*** (0.118)	4.469*** (1.156)	-0.446*** (0.138)	-0.142 (0.117)
VCTotal		0.023** (0.01)				
RoundVCSize			0.075** (0.033)			
VCDivIndex					0.038** (0.017)	
VCDivPCA						0.090** (0.040)
VC_Cluster	1.925*** (0.233)			1.164*** (0.184)		
LeadVCRep	-0.528 (6.458)	-0.615 (0.396)	-0.001 (0.008)	2.237 (4.914)	-0.711* (0.415)	-0.657 (0.415)
Log Sales	-0.248*** (0.071)	-0.005 (0.007)	-0.007 (0.016)	-0.255*** (0.06)	-0.001 (0.008)	0.001 (0.008)
Log Age	0.023 (0.185)	-0.026** (0.013)	0.058*** (0.017)	-0.549*** (0.128)	-0.005 (0.017)	-0.005 (0.017)
Log Proceeds	0.028 (0.206)	0.056*** (0.017)	-0.015 (0.01)	0.021 (0.183)	0.056*** (0.017)	0.055*** (0.017)
Rank	0.389*** (0.084)	-0.006 (0.008)	0.121*** (0.039)	0.465*** (0.069)	-0.015 (0.011)	-0.016 (0.011)
Internet	0.364 (0.345)	0.122*** (0.039)	0.008 (0.021)	0.195 (0.266)	0.123*** (0.039)	0.122*** (0.039)
Nasdaq	0.049 (0.372)	0.010 (0.020)	0.001 (0.001)	0.129 (0.302)	0.006 (0.021)	0.005 (0.022)
Lockup	0.001 (0.003)	0.001 (0.001)	0.253*** (0.069)	0.003 (0.003)	0.001 (0.001)	-0.001 (0.001)
Market Return	-1.333* (0.757)	0.249*** (0.068)	0.332*** (0.029)	-0.790 (0.615)	0.249*** (0.069)	0.262*** (0.07)
Above	-0.237 (0.271)	0.332*** (0.029)	0.075** (0.033)	-0.245 (0.220)	0.335*** (0.029)	0.335*** (0.029)
Industry dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
R-square	0.18	0.39	0.38	0.19	0.38	0.38
Stock - Yogo Weak Identification Test		67.96***	46.23***		39.74***	32.87***
Sargan-Hansen Endogeneity Test		3.27*	3.43*		3.35*	3.52*
Numb. of obs.	1424	1424	1424	1424	1424	1424

This table shows first and second stage of 2SLS regressions where *VC_Cluster* is our instrument and *VCTotal, RoundVCSize, VCDivIndex* and VCDivPCA are predicted values from the first stage regressions. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet* is equal to one if the IPO firm is identified as internet company in the database compiled by J. Ritter. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively. Standard errors are provided in parentheses.

Table 6. OLS regressions for the impact of VC syndicate size and diversity on post-IPO profitability measured by EBITDA/Total Assets

Variable	EBITDA	EBITDA	EBITDA	EBITDA	EBITDA	EBITDA
Intercept	-0.236*** (0.075)	-0.221*** (0.076)	-0.212*** (0.076)	-0.248*** (0.076)	-0.227*** (0.075)	-0.230*** (0.075)
VCTotal	-0.005*** (0.002)					
RoundVCSize		-0.010*** (0.004)				
VCDivIndex			-0.005*** (0.002)			
VCDivPCA				-0.011*** (0.004)		
VCSizeLarge					-0.027** (0.012)	
VCDivHigh						-0.026** (0.012)
LeadVCRep	-0.142 (0.272)	-0.105 (0.272)	-0.112 (0.273)	-0.117 (0.273)	-0.112 (0.272)	-0.111 (0.275)
Log Sales	0.068*** (0.006)	0.068*** (0.006)	0.068*** (0.006)	0.068*** (0.006)	0.068*** (0.006)	0.068*** (0.006)
Log Age	0.023** (0.010)	0.019* (0.010)	0.018* (0.010)	0.019* (0.010)	0.019* (0.010)	0.019* (0.010)
Log Proceeds	-0.03*** (0.011)	-0.031*** (0.011)	-0.031*** (0.011)	-0.031*** (0.011)	-0.032*** (0.011)	-0.031*** (0.011)
Rank	0.012** (0.006)	0.012** (0.006)	0.012** (0.006)	0.012** (0.006)	0.011** (0.006)	0.011** (0.006)
Internet	-0.07*** (0.021)	-0.07*** (0.021)	-0.071*** (0.021)	-0.071*** (0.021)	-0.071*** (0.021)	-0.071*** (0.021)
Nasdaq	0.017 (0.018)	0.017 (0.018)	0.017 (0.018)	0.017 (0.018)	0.017 (0.018)	0.017 (0.018)
Lockup	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Market Return	-0.083 (0.044)	-0.079 (0.044)	-0.079 (0.044)	-0.081 (0.044)	-0.076 (0.044)	-0.076 (0.044)
Underpricing	0.012 (0.019)	0.012 (0.020)	0.012 (0.020)	0.012 (0.020)	0.011 (0.020)	0.011 (0.019)
Industry dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
R-square	0.44	0.43	0.43	0.43	0.43	0.43
Numb. of obs.	901	901	901	901	901	901

Dependent variables are industry adjusted return mean EBITDA/Total Assets during the three-year period after the IPO date. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. We drop single VC backed IPOs from the sample. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCDivPCA* is the principal component calculated based on four dimensions that we used for computing diversity index. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively

Table 7. OLS regressions for the impact of VC syndicate size and diversity on Tobin's Q

Variable	Tobin's Q	Tobin's Q	Tobin's Q	Tobin's Q	Tobin's Q	Tobin's Q
Intercept	5.749***	5.871***	5.977***	5.577***	5.804***	5.779***
	(1.640)	(1.652)	(1.660)	(1.614)	(1.640)	(1.640)
VCTotal	-0.027					
	(0.015)					
RoundVCSize		-0.092**				
		(0.047)				
VCDivIndex			-0.049**			
			(0.021)			
VCDivPCA				-0.119**		
				(0.048)		
VCSizeLarge					-0.336**	
					(0.145)	
VCDivHigh						-0.295**
						(0.144)
LeadVCRep	2.053	2.346	2.275	2.213	2.235	2.227
	(2.945)	(2.926)	(2.915)	(2.910)	(2.911)	(2.909)
Log Sales	-0.198***	-0.202***	-0.201***	-0.203***	-0.205***	-0.201***
	(0.06)	(0.061)	(0.060)	(0.060)	(0.060)	(0.06)
Log Age	-0.419***	-0.451***	-0.456***	-0.456***	-0.453***	-0.456***
	(0.106)	(0.109)	(0.109)	(0.109)	(0.108)	(0.109)
Log Proceeds	-0.331**	-0.337**	-0.333**	-0.331**	-0.335**	-0.335**
	(0.161)	(0.16)	(0.159)	(0.159)	(0.159)	(0.16)
Rank	0.203**	0.214***	0.215***	0.217***	0.211**	0.207**
	(0.085)	(0.083)	(0.083)	(0.082)	(0.084)	(0.084)
Internet	-0.411	-0.416	-0.424	-0.424	-0.425	-0.430
	(0.318)	(0.318)	(0.318)	(0.318)	(0.317)	(0.317)
Nasdaq	0.203	0.203	0.203	0.208	0.202	0.205
	(0.184)	(0.184)	(0.184)	(0.184)	(0.184)	(0.184)
Lockup	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Market Return	-1.345**	-1.351***	-1.362***	-1.393***	-1.338**	-1.336**
	(0.525)	(0.522)	(0.521)	(0.519)	(0.52)	(0.52)
Underpricing	1.337	1.347	1.352	1.356	1.352	1.345
	(0.348)	(0.349)	(0.349)	(0.349)	(0.349)	(0.349)
Industry dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
R-square	0.27	0.27	0.27	0.27	0.27	0.27
Numb. of obs.	915	915	915	915	915	915

Dependent variables are valuations calculated by sale comparables and Tobin's Q. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. We drop single VC backed IPOs from the sample. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCDivPCA* is the principal component calculated based on four dimensions that we used for computing diversity index. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Underpricing* is first day return. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively

Table 8. OLS regressions for the relation of VC syndicate size and diversity on CAR

Variable	CAR[1,36]	CAR[1,36]	CAR[1,36]	CAR[1,36]	CAR[1,36]	CAR[1,36]
Intercept	-0.239 (0.397)	-0.232 (0.400)	-0.194 (0.403)	-0.366 (0.395)	-0.290 (0.396)	-0.273 (0.396)
VCTotal	-0.026*** (0.009)					
RoundVCSize		-0.046 (0.026)				
VCDivIndex			-0.021 (0.012)			
VCDivPCA				-0.055** (0.026)		
VCSizeLarge					-0.198** (0.080)	
VCDivHigh						-0.191** (0.079)
LeadVCRep	-0.321 (2.057)	-0.294 (2.066)	-0.315 (2.068)	-0.348 (2.062)	-0.205 (2.049)	-0.211 (2.057)
Log Sales	0.058** (0.026)	0.058** (0.026)	0.059** (0.026)	0.058** (0.026)	0.055** (0.026)	0.058** (0.026)
Log Age	-0.020 (0.066)	-0.035 (0.067)	-0.035 (0.067)	-0.036 (0.066)	-0.039 (0.067)	-0.041 (0.067)
Log Proceeds	-0.142** (0.056)	-0.133** (0.056)	-0.132** (0.055)	-0.131** (0.055)	-0.131** (0.055)	-0.131** (0.055)
Rank	0.123*** (0.034)	0.122*** (0.034)	0.121*** (0.034)	0.123*** (0.034)	0.122*** (0.034)	0.121*** (0.034)
Internet	-0.096 (0.120)	-0.102 (0.121)	-0.103 (0.121)	-0.102 (0.121)	-0.103 (0.120)	-0.102 (0.120)
Nasdaq	0.025 (0.098)	0.025 (0.099)	0.026 (0.098)	0.026 (0.098)	0.024 (0.098)	0.028 (0.099)
Lockup	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Market Return	-0.494 (0.271)	-0.493 (0.271)	-0.486 (0.271)	-0.501 (0.271)	-0.496 (0.271)	-0.493 (0.27)
Above	-0.300 (0.099)	-0.301 (0.099)	-0.304 (0.099)	-0.304 (0.099)	-0.299 (0.099)	-0.299 (0.099)
Industry dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
R-square	0.07	0.07	0.07	0.07	0.07	0.07
Numb. of obs.	1144	1144	1144	1144	1144	1144

Dependent variables are cumulative abnormal return in the window [1,36] after the IPO date. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. We drop single VC backed IPOs from the sample. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Above* takes value one if the IPO is priced above the original filing price range and zero otherwise. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively

Table 9. OLS regressions for the relation between VC syndicate and post-IPO valuation based on EBITDA comparables

Variable	Ebitda_Comp	Ebitda_Comp	Ebitda_Comp	Ebitda_Comp	Ebitda_Comp	Ebitda_Comp
Intercept	1.111 (0.752)	1.194 (0.754)	1.238 (0.758)	0.982 (0.751)	0.840 (0.813)	0.850 (0.812)
VCTotal	-0.023 (0.013)					
RoundVCSize		-0.062** (0.033)				
VCDivIndex			-0.029** (0.015)			
VCDivPCA				-0.066** (0.033)		
VCSizeLarge					-0.088 (0.115)	
VCDivHigh						-0.140 (0.113)
LeadVCRep	-0.614 (2.757)	-0.487 (2.762)	-0.553 (2.757)	-0.590 (2.758)	-1.581 (3.100)	-1.565 (3.101)
Log Sales	0.092*** (0.035)	0.09*** (0.035)	0.092*** (0.035)	0.091*** (0.035)	0.086** (0.039)	0.085** (0.039)
Log Age	-0.363*** (0.092)	-0.390*** (0.093)	-0.391*** (0.093)	-0.389*** (0.093)	-0.354*** (0.098)	-0.361*** (0.099)
Log Proceeds	0.192* (0.103)	0.188* (0.103)	0.192* (0.103)	0.193* (0.103)	0.081 (0.146)	0.080 (0.146)
Rank	0.060 (0.041)	0.066 (0.041)	0.065 (0.040)	0.066 (0.040)	0.088* (0.049)	0.091* (0.048)
Internet	-0.287* (0.167)	-0.290* (0.167)	-0.292* (0.167)	-0.290* (0.167)	-0.378** (0.180)	-0.378** (0.180)
Nasdaq	-0.112 (0.159)	-0.113 (0.159)	-0.112 (0.159)	-0.109 (0.159)	-0.107 (0.180)	-0.104 (0.180)
Lockup	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Market Return	-0.372 (0.391)	-0.372 (0.391)	-0.365 (0.391)	-0.376 (0.391)	-0.122 (0.419)	-0.127 (0.419)
Above	0.242 (0.135)	0.238 (0.135)	0.235 (0.135)	0.235 (0.135)	0.292 (0.146)	0.292 (0.146)
Industry dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
R-square	0.09	0.09	0.09	0.09	0.09	0.09
Numb. of obs.	1051	1051	1051	1051	1051	1051

Dependent variables are valuations calculated by Ebitda comparables. *VCTotal* is the number of distinct VCs that provide capital before the IPO date. We drop single VC backed IPOs from the sample. *RoundVCSize* is the mean number of distinct VCs that provide capital per round. *VCDivIndex* is an index which is total number of (i) different VC types within the syndicate (e.g. private, investment bank or corporate VC), (ii) different industry preferences of syndicating VCs, (iii) different nationalities of participating VCs and (iv) age brackets of VC firms. *VCSizeLarge* is one if the mean VC syndicate size per round is greater than or equal to the median of the sample. *VCDivHigh* is one if the diversity index of the syndicate is larger than 8.3, the median of the sample. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Above* takes value one if the IPO is priced above the original filing price range and zero otherwise. Standard errors are reported in brackets and significance levels at 1% and 5% levels are represented by *** and ** respectively