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Complementary or conflictory?: the effects of the composition of the syndicate on venture capital-backed IPOs in the US stock market

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Abstract This study investigates how syndicated investment among financial and strategic investors, such as independent venture capitalists (IVCs) and corporate venture capitalists (CVCs), affects the performance of the investee firms. While these different types of investors provide different but complementary non-financial value-added to the investee firms, their inherent differences in motives and objectives of the investment can also lead to conflict about the operational controls of the investee firms. Using a sample of VC-backed IPOs in the US stock market, we analyze how the composition of the investment syndicate influences the investee's exit through IPO. Empirical results indicate that IVCs and CVCs could face increasing conflicts when they syndicate their investment with a balanced distribution of ownership. As a result, investees backed by these syndicates can incur delays to their IPO exit. By addressing the syndicate investment among different types of investors and its impact on the performance of the investee, this study complements the literature on entrepreneurial finance and IPOs.

Keywords IPO exit · Venture capital · Financial investor · Strategic investor · Syndicate investment · Complementarity · Conflicts

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1 Introduction

Venture capital (VC) positively affects many economic and managerial phenomena such as the foundation of public companies, technological innovations and economic growth (Kortum and Lerner 2000). In a fast changing market and technology environment, the role of VCs in supporting high agility startups has been enormously strengthened. Further, VCs have a beneficial effect on the investee's exit through IPO, which is considered as an important factor related to a startup's performance early in its life (Ritter and Welch 2002; Sutton and Benedetto 1988). VCs provide financial and non-financial support to their investees (Large and Muegge 2008), and play a certification role in IPOs (Megginson and Weiss 1991). Further, VC-backed firms are more efficient and have more effective corporate governance and independent boards, which leads to a higher possibility of successful exit through IPO (Baker and Gompers 2003; Campbell Ii and Frye 2009; Chemmanur et al. 2011; Suchard 2009). Though previous research has investigated the significant roles of VCs and their critical success factors (Baum and Silverman 2004; Sapienza 1992), the basic assumption has been that VCs are homogeneous. In practice, however, VCs are heterogeneous in their experiences, resources, capabilities and objectives (Elango et al. 1995). VCs exhibit strong variation in the quality and effectiveness of their financial investment and non-financial value-added. Hence, the objective of this paper is to investigate the effects of the VC type on the performance of VC-backed startups.

Prior research has classified VCs into financial investors, such as independent venture capitalists (IVCs), and strategic investors, such as corporate venture capitalists (CVCs), and identified their characteristics and differences (Alvarez-Garrido and Dushnitsky 2016; Arping and Falconieri 2010; Chemmanur et al. 2014; Hellmann 2002; Maula et al. 2005; McNally 1997). Although previous studies have investigated the characteristics and different effects of IVCs and CVCs, they put less attention on the syndicate investments among IVCs and CVCs. In this paper, we analyze syndicate investments among IVCs and CVCs and their influence on the IPO of the investee firms. When IVCs and CVCs engage in syndication, the resource-based view provides a foundation for explaining the complementary relationship between them, as both hold different but complementary resources and capabilities (Alvarez-Garrido and Dushnitsky 2016; Teece 1986; Penrose 1959). On the other hand, the agency theory perspective suggests that syndicate investment among IVCs and CVCs, who have different objectives and time horizon, may face conflicts of interest (Eisenhardt 1989; Jensen and Meckling 1976; Masulis and Nahata 2009; Wright and Lockett 2003). Hence, we discuss and test the two conflicting hypotheses of either a complementary or conflictory relationship in syndicate investment among IVCs and CVCs and the resulting effect on the IPO of the investee firms.

The data sample used in our study is composed of 188 VC-backed US firms which attracted their first VC investment from 2001 to 2010 and achieved IPO exit. To investigate the effects of the syndicate investment on the startups'

performance, this paper conducts survival analysis and treats 'time to IPO' as the dependent variable that measures the months between the first VC investment and IPO exit.[1] The results indicate that syndicate investments among IVCs and CVCs delay the IPO exit due to agency costs and conflicts among syndicate partners.

Overall, this study makes a number of contributions. First, it analyzes the syndicate investments among different types of investors such as IVCs and CVCs, and their impact on the investee's exit through IPO which for the most part has not been a focus of previous literature. We believe this research provides a valuable theoretical and empirical extension of the existing literature on entrepreneurial finance and IPOs. Second, this paper uses various theoretical lenses such as the resource-based view, agency theory, and the relational view to shed light on the relational characteristics among syndicate partners.

2 Theoretical background and hypotheses

In the VC industry, a large proportion of the investments take place in syndicates (Lerner 1994a). VC firms syndicate their investments for various reasons such as risk sharing, portfolio diversification, access to the future deal flow, improved venture selection, monitoring skill, value-added, and sharing of knowledge (Manigart et al. 2006). Accordingly, syndicate investments not only result in higher returns to VCs (Brander et al. 2002), but also increase the product and financial market value of their investee firms (Wright and Lockett 2003). However, a limited number of literature points out that the syndicate partners could get both gains and pains from their syndicate investments. While VCs benefit from improved venture selection, monitoring skills, value-added, and the sharing of knowledge (Brander et al. 2002; Manigart et al. 2006), syndicate investments also incur costs due to the uncertainty about partners' expertise or principal–principal conflicts from misaligned goals (Casamatta and Haritchabalet 2007; Meuleman et al. 2010; Wright and Lockett 2003). Similarly, syndicate investments among IVCs and CVCs can be expected to result in both complementary and conflictory relationships (Keil et al. 2010; Masulis and Nahata 2009).

[1] Considering the strategic objectives of CVC, which might not see the investee firms' IPO as a priority objective, one could question the validity and applicability of analysis on CVC investments with IPO exit. However, prior research address mixed results in the choice of an exit route of CVC investments. Searching for acquisition candidates is a well-known objective or motive of CVC investments, and has been recognized by several survey based and theoretical studies (Siegel et al. 1988; Sykes 1990), as well as empirically supported by a study using a European dataset, that showed that CVC-backed startups are more likely to exit through an acquisition than IVC-backed startups (Cumming 2008). However, another line of research has shown that CVC-backed startups exit more frequently through IPO than IVC-backed startups (Gompers and Lerner 2000). Moreover, Maula and Murray (2000) found that only 5.8 percent of the startups which received CVC financing are acquired by the parent company of the CVC fund. Therefore, measures based on IPO exit activities are a viable approach when researching phenomena related to CVC investment.

2.1 Complementarity in value-added contributions

The resource-based view explains that firms build a sustainable competitive advantage depending on the resources and capabilities they possess (Penrose 1959; Wernerfelt 1984). The complementary resources and capabilities possessed or accessed by the firm also play a key role in benefiting from technological innovations and competitive advantages (Teece 1986). Hence, firms are endeavoring to acquire complementary resources and capabilities through strategic alliances and M&As (Rothaermel 2001). Although startups have positive traits such as entrepreneurship, flexibility, and rapid response, which stimulate innovation, they often struggle with development, commercialization, innovation or even survival due to a lack of resources and capabilities (Baum et al. 2000). Thus, startups utilize external cooperative relationships to complement their internal deficiencies or attract VC investments to not only benefit from financial supports but also non-financial value-added contributions (Baum et al. 2000; Gorman and Sahlman 1989). For startups, value-added from VCs could be another way to access complementary resources. In addition to financial investments, VCs provide startups with value-added contributions like development and operations, personnel management, financial participation, and management selection which are complementary to startups' capabilities (Hellmann 2000; Sapienza 1992). Accordingly, VC-backed startups are more likely to bring their products to the market faster (Hellmann and Puri 2000) and reach a successful exit (Gompers and Lerner 2000). However, these value-added contributions to startups are different depending on the characteristics of the VCs. VCs can be characterized by not only their fund size, investment experiences, and industries in which they specialize, but also their objectives and source of capital. IVCs and CVCs, which have different sources of capital, have clearly different characteristics, and thus provide distinct value-added contributions.

Due to the differences in knowledge, resources, capabilities, and social capital they possess, CVCs provide startups with value-added different from IVCs (Alvarez-Garrido and Dushnitsky 2016; Keil et al. 2010; Maula et al. 2005). CVCs can access and utilize key resources held by their parent corporations, such as R&D facilities, distribution channels, knowledge and experiences, and social capital on related technologies and markets (Chemmanur et al. 2014; Maula et al. 2005). Further, CVCs provide startups with certification benefits, which can provide endorsement to the startup and decrease the liability of newness (Stuart et al. 1999). However, CVCs have several shortcomings in value-added contributions, such as a sparse network with the financial sector that make it difficult to attract additional investments, the lack of deal making experiences, a limited recruiting pool of employees within the corporation (Maula et al. 2005), and weak incentives for value-added activities of CVCs due to the limited compensation schemes (Cumming and Johan 2010; Gompers and Lerner 2000). Hence, relying solely on CVC to invest in a startup results in the lack of certain value-added contributions to the investee.

On the other hand, IVCs' characteristics and value-added contributions differ from those of CVCs (Gorman and Sahlman 1989; Maula et al. 2005). Based on their numerous deal making experiences with other venture companies, IVCs can play the

role of a coach, giving advice about managerial decisions and growth strategies suitable for startups (Hellmann 2000). The IVCs' strong and close relationships with the financial sector and venture communities also may facilitate the raising of additional capital and help to recruit potential key employees (Maula et al. 2005; Sapienza 1992). However, the lack of deep industrial and technological understanding could limit their value-added to managerial consulting. Board members with no operating experience, such as pure financial investors, may be valued lower in terms of their managerial advice (Rosenstein et al. 1993).

Taken together, CVC and IVC respectively provide startups with complementary value-added that helps startups to build competitive advantage. Notably, CVC and IVC provide non-overlapping and "different but strongly complement" value-added contributions (Maula et al. 2005). That is, IVC provides "enterprise nurturing" value-added which is needed during the early growth of a startup, while CVC provides "commerce building" value-added which is needed for product development, manufacturing, and sales (Maula et al. 2005). One of the strong motives for syndication in the venture capital investment is the improved value-added (Brander et al. 2002). Hence, startups that have received investments from both CVCs and IVCs can access a balanced and complete set of value-added that leads to the development of a competitive advantage and a successful exit (Teece 1986). CVCs provide unique benefits to startups that make them attractive as a syndication partner for IVCs (Keil et al. 2010). Therefore, the following hypothesis can be posed:

H1a. A balanced share of CVC and IVC in the syndicate positively influences the investee's performance. In other words, there will be an inverted U-shaped relationship between CVCs' share of the total amount of investment within the syndicate and the investee's performance.

2.2 Conflicts in operational control

Inter-organizational collaborations have been recognized as an efficient way to access each other's resources and capabilities and build up competitive advantage (Gulati 1995a), but they also involve risks of not achieving desired outcomes or even losing competitive advantages (Lavie 2007). Behaviors that pursue self-interest with deceit to achieve gains at the expense of the others cause partner opportunism in alliances (Das and Rahman 2010). That is, agency costs are incurred in inter-organizational cooperation along with conflicts of interest among collaboration partners (Eisenhardt 1989).

VC syndication can be considered as a kind of collaboration between firms, which is similar to equity joint ventures (Wright and Lockett 2003). While VC syndication has benefits in improved selection, value-added, risk sharing, deal flow, and project size (Brander et al. 2002; Lerner 1994a), it also imposes agency costs which stem from conflicts and opportunism among syndicate partners who have different objectives (Wright and Lockett 2003). Syndicate partners only can arrive at a decision through a process of renegotiation and reaching of collective agreements whenever they make an investment, provide managerial advices, or take

action with respect to investee firms (Wright and Lockett 2003). Undergoing a difficult and time-consuming renegotiation process, not only do syndicate partners suffer from complications and delays in decision-making but also the investees are negatively affected. In this situation of complications and conflict, shared ownership may bring about coordination problems among syndicate partners, while an imbalance in ownership may ease the complications and make decision-making less time consuming (Geringer and Hebert 1989).

CVCs and IVCs invest considering their own often distinctive objectives. Financial returns are a fundamental objective of the investment and are used as an important performance index for IVCs. IVCs are seeking the grandstand such as faster growth of their investee firms and higher fund returns to demonstrate their ability to their potential limited partner investors (Gompers 1996). On the other hand, CVCs, besides financial returns, also put emphasis on strategic objectives (McNally 1997). With their strategic objectives, CVCs may be less preoccupied with the investee firm's success, and even in some cases, CVCs put pressure on the investee firms to pursue a technology agenda that is favorable to the parent corporation but would result in suboptimal financial returns (Katila et al. 2008).

The differences in the structure of CVC and IVC investments also manifest themselves in different investment, fund operation, time horizon, and exit strategies. Due to their structure in which a management company manages funds from partners for a pre-determined time period, an IVC fund has to conclude its investment activities, for example by exiting through an IPO, within a given timeframe (Bertoni et al. 2013). Hence, IVCs have higher discount rates than institutions and corporations, and design their optimal investment structure, time horizon, and exit strategy based on returns (Bayar and Chemmanur 2011). On the other hand, CVCs are venture investment arms of established corporations in which fundraising activities may not be needed. CVCs are unconstrained by the fixed lifetime of a fund, thus having lower discount rates and longer investment time horizons (Guo et al. 2015; Large and Muegge 2008). Moreover, the accumulated experiences of the parent corporation in production and innovation make the CVCs more tolerant to failure that result in a long-term investment perspective (Tian and Wang 2014). Consequently, CVCs and IVCs have somewhat different properties with respect to funding operations and the time horizon, which may lead to conflicts related to investment and exit decisions. CVCs' strategic objectives could affect their syndication with IVCs and the allocation of control rights between them due to the possible conflicts of interest with both the entrepreneurs and other VCs (Masulis and Nahata 2009).

In summary, while IVCs and CVCs collaborate as syndication partners, they may engage in the management of the investee firm guided by their own objectives and time plans. Hence, there is a possibility of conflicts among the syndicate partners that leads to delayed decision-making and increasing coordination costs (Das and Rahman 2010). The conflicts may get worse with shared equity ownership among syndicate partners rather than with imbalanced syndicates (Gaur et al. 2015; Geringer and Hebert 1989). In that conflict situation, investees could have difficulties in obtaining the appropriate support and advice in time, and may not be

able to deal with rapidly changing market environments. Therefore we can draw the following hypothesis:

H1b. Abalanced share of CVC and IVC in the syndicate negatively influences the investee's performance. In other words, there will be a U-shaped relationship between CVCs' share of the total amount of investment within the syndicate and the investee's performance.

2.3 Trust relationship between syndicate partners

The trust between inter-organizational collaboration partners has been described and analyzed as a significant determinant of collaboration (Dyer and Singh 1998). Trust not only reduces the possibility of opportunistic behavior (Ganesan 1994; Hill 1990), but also builds up cooperative relationships between partners that enhance the transfer of resources and know-how across the exchange interface (Kale et al. 2000; Zaheer et al. 1998). Trust can be built through repeated relationships between partners, which create an initial base of inter-partner trust. Accordingly, prior relationships enable partners to "have greater understanding of each other's needs and capabilities" and reduce "the hazards associated with future transaction" (Gulati 1995a).

In VC investment, where syndication frequently occurs, the social capital among VCs plays a significant role from the deal sourcing to the fund performance. Accordingly, VCs seek to syndicate with other investors who have good reputation, competence, or trust that have been built up through prior relationships (Sorenson and Stuart 2008; Wright and Lockett 2003). Trust among syndicate investors has an effect on both cooperative activities and opportunistic behavior. Due to mutual trust which has been built up through repeated interactions (Gulati 1995a), participants form cooperative relationships, actively integrating their resources and capabilities and refraining from opportunistic behaviors (Kale et al. 2000). Hence, by combining and delivering complementary resources and capabilities, syndicate investment provides a better value-added contribution to startups. Further, with reduced information asymmetries and behavioral uncertainty (Casciaro 2003), syndicate partners will focus on the collective interest and not the individual strategic interest, in turn contributing to a better performance of the investee firms. Consequently, the prior co-investment experiences among syndicate partners, including IVC and CVC, will strengthen their complementarities while reducing conflicts. Therefore we postulate that:

H2. Prior co-investment experiences among syndicate partners positively moderate the relationship between the share of each type of investment and the performance of the investee.

3 Methods

3.1 Data and sample

The data used in this paper have been extracted from the PE/VC module of the Thomson Reuters Thomson One database. The database provided the dates of startup foundation, the dates of IPO, details of financing history, the VC types, co-investment experiences and industrial classifications. We constructed a sample of VC-backed US firms which attracted their first VC investment from 2001 to 2010 and achieved IPO exit until 2014. The observation period was chosen to start with the end of the dot-com bubble, when the VC industry had shrunk back to about half of its peak after enjoying a sudden surge in the late 1990s. This was done since investments made during the late-1990s have raised questions about the rationality of the participating investors and less sophisticated contracts (Valliere and Peterson 2004). While trade sales are another major exit route for VCs and VC-backed firms, IPO and trade sale to another company have differences in their characteristics, such as the motive of the entrepreneur, the maintenance of ownership, and subsequent exit strategies and contract terms (Cumming and Johan 2008; Giot and Schwienbacher 2007). Considering the complexity of the research that takes all these circumstances into account, this study focused on the exit through IPOs. As the focus of this study is placed on syndicates among financial investors and strategic investors such as IVCs and CVCs, we classified investor types such as Bank Affiliated, Insurance Firm Affiliated, Investment Management Firm, Private Equity Firm, and Private Equity Advisor as financial investors (Hellmann et al. 2008; Secrieru and Vigneault 2004), and the investor type of Corporate PE/Venture as strategic investors or CVCs. While bank affiliates or insurance firm affiliates are classified into captive VCs, their priority lies in building up financial relationships, and providing value-adding support is not their main concern (Hellmann et al. 2008). Investor types such as University Program, Government Affiliated Program, Angel Group, Individual, Endowment Foundation or Pension Fund, Incubator/Development Program, Service Provider, and Others were not considered in the analysis for their different nature and structure of investments (Sorenson and Stuart 2008). The final sample consists of 188 VC-backed IPOs and 1963 VCs who invested into these startups. Among these VCs, 237 are CVCs.

3.2 Variables

This study adopts the IPO as an early-stage measure for the performance of startups backed by syndicate investment. Since the conventional measures for firm performance such as revenue, growth, or profitability are not suitable to measure the performance of startups, existing research has often used the IPO event as a measure for performance in the early stage of startups (Stuart et al. 1999; Deeds et al. 1997; Chang 2004). Through the IPO, startups can become known to the market, utilize multiple financing opportunities, gain legitimacy, raise capital, expand their businesses, and become publicly traded enterprises, therefore, the IPO

event is considered as an important factor related to a startup's performance early in its life. By selling equity to the public, startups often generate much-needed capital as well as provide an opportunity to equity holders to exchange stock for cash. Venture capital firms typically wish to take startups public as soon as possible to realize their profits and invest the proceeds in other startups. Since a longer time to exit raises the opportunity costs for startups (Jovanovic and Rousseau 2001; Cumming and Johan 2010), both startups and VCs routinely wish to undertake IPO quickly. Therefore, the firm-level performance outcome that we examine here is the speed at which startups undertake an IPO. To investigate the effects of the syndicate investment on startups' performance, we used the *time to IPO* as the dependent variable, as measured by the months between the first VC investment and IPO exit.

Two independent variables are used in this study. The first independent variable, *CVC share*, is the CVCs' share of the total amount of investment within the syndicate. The syndicate, in a narrow sense, is defined as a co-investment within the same investment round, but in a broader sense, is defined as a co-investment to a company indifferent to the time of investment (Brander et al. 2002). Following the broader definition, the ratio of the amount of total CVC investment to the total amount of investment within the syndication was measured as the CVC share variable. For example, a value of one means that the syndicate is composed entirely of CVCs. To figure out the relational characteristics among syndicate partners, we developed a second independent variable that measures the prior co-investment experiences (Gulati 1995a). We defined the *co-investment experience* variable of each syndicate investment as the average number of deals that two VC firms out of the syndicate partners co-invested in the same company in the same year during the last five years.

We included control variables that could affect the IPO of the startup into our model. For the investment-level controls, we included a measure of each investments' characteristics, such as total amount raised, number of rounds, syndicate size, and CVC lead investor dummy. The variable *total amount raised* measures the total amount (in million USD) raised from VCs until the IPO. This variable was log transformed. We expect that the more capital a startup raises, the greater is the possibility that it will go public (Deeds et al. 1997). We also control for *number of rounds* of financing that the investee obtained, and for *syndicate size*, measured as the number of VC firms engaged in the focal investments.

Further, we captured the signaling effect of venture capital investment with two measures, syndicate partners' reputation and status (Jensen and Roy 2008). The two terms, reputation and status, have been often used interchangeably to proxy the perceived quality of the firm, but developed in different fields and connote different aspects. Dimov and Milanov (2010) distinguished two concepts as follow: "While reputation is an economic concept that is closely coupled with the firm's past actions and track record, status is a sociological concept that captures a firm's social rank based on its external affiliations". Following and modifying the method used in Dimov and Milanov (2010), we measured the syndicate partners' reputation and status. We measured the *syndicate partners' reputation* relevant for its activity in year (t) as a composite of the syndicate partner's age in year (t), the total number of investments involved in during the last 5 years (t−5 to t−1), and the total number of

companies exit through IPO which were backed by the syndicate partner during the last 5 years (t−5 to t−1). The composite reputation scores were based on standardized values for each components for each year, and we normalized the scores for each year across VC firms so that the lowest value in each year as the normalized value of zero and the highest one as the normalized value of one. Then, we averaged the normalized scores for all participating syndicate partners in a deal. To measure *syndicate partners' status*, we constructed a matrix of relationships between all VC firms in the Thomson One database for each year. For a matrix constructed for year (t), each element (R_{ij}) represented the number of times firms (i) and (j) had co-invested in the same company over the last 5 years (t−5 to t−1). Using Bonacich's (1987) centrality measure, we measured a VC firm's network status in year (t), and calculated a centrality score for each VC firm and each year and normalized the score (Dimov and Milanov 2010; Podolny 2001; Sorenson and Stuart 2001). We averaged the status for all participating syndicate partners in a deal.

We also considered the general environment of the IPO market since these are taken into account by both entrepreneurs and VCs. The IPO market conditions are proxied using Ritter's (1984) index of hot issue market as a time-varying covariate (*market environment*). Ritter measured the degree of hot issue market as the difference between the offer price and the closing price on the first day of trading. Since our time-varying covariate was updated quarterly, we took the 3-month weighted average of the IPO first-day returns.

For the investee-level controls, we included the *industry dummy* as control variables. Follow the classification given in the Thomson One database, industries are classified as either biotechnology, communications and media, computer related, medical/health/life science, semiconductors/other electronics, and non-high technology industries. Finally, for use in the hazard model, we control the months between the official establishment of the company and the first VC investment (*time to investment*).

3.3 Analysis

In this study, we used the time to IPO as a measure for investees' performance. Survival analysis allows the efficient modelling of the time that it takes till the first event occurs. Following Stuart et al. (1999), Chang (2004), and Yang et al. (2011), the Cox proportional hazard model was used in this study (Cox and Oakes 1984). The Cox proportional hazard model is a semi-parametric model that assumes a baseline hazard function without specifying its distribution, and estimates the effects of explanatory variables on the hazard of the event focusing only on time-ordering of observed events. The hazard rate that we can estimate from the Cox model is the conditional probability that the event occurs at a particular point in time and, in this study, is defined as the likelihood that a firm will go to IPO in each period. Thus from the model, we can estimate the influences of explanatory variables on the likelihood that a firm will go public in each period. A positive regression coefficient for an explanatory variable means that a higher positive value on that variable is linked to higher hazard rate of IPO events and thus a lower

expected duration of time to IPO. Hence, in this study, positive coefficients imply shorter time to IPO that is, higher performance of the investee firms.

4 Results

Table 1 shows the descriptive statistics and correlation matrix of variables analyzed in this study. Of the investments, the mean value of CVC share is 0.081, with a maximum value of 0.520. Stand-alone investment of CVCs has not been observed in the sample of this research. It has been discussed in previous literature that CVCs usually invest in syndication with IVCs (Keil et al. 2010). Table 1 also shows the absence of strong correlation among the different variables.

Table 2 shows the results from the Cox proportional hazard model. Model 1 is the baseline model which includes the control variables. Among these control variables, total funded amount and market environment have a significant positive effect on the hazard rate of IPO events. The coefficient estimate implies that each $1million in additional venture funding multiplies the baseline rate by a factor of 1.32 (Exp(0.276)). These results are consistent with prior research which suggested that startups experience more successful IPO exit when they raised bigger capital or underwent IPO in a hot market environment (Deeds et al. 1997; Giot and Schwienbacher 2007).

Models 2 and 3 examine Hypothesis 1. The variable, CVC share, and its square are independent variables in these models. The results of Model 3 show that the coefficient of CVC share is negative and significant ($\beta = -4.954$, p value < 0.05). That is, the larger the CVC share, the lower the hazard rate which implies a longer time to IPO. The coefficient of the square term is positive and significant ($\beta = 13.612$, p-value < 0.05), showing the U-shaped relationship between the CVC share and the hazard rate of IPO event. The estimated turning point is at 18.2 % of the CVC share. The estimation implies that when a startup A was funded by a syndicate with a CVC share of 20 % and startup B was funded by a syndicate with no CVC participation, the hazard rate of IPO for startup B is 1.56 times higher than that for startup A. Thus, Hypothesis 1a is not supported, while Hypothesis 1b, which predicted that a balanced syndication between CVCs and IVCs will increase the startup's time to IPO exit, is supported.

In Models 4 through 6, we test Hypothesis 2 which focuses on the moderation effect of co-investment experience between VCs on the main effect of Hypothesis 1. However, all the coefficients of the direct effect and moderation effects of the variable co-investment experience are insignificant. These results imply that the co-investment experience among syndicate partners neither has an impact on the duration before the IPO nor moderates the delaying effect caused by the presence of different types of VC in the syndicate investment. Consequently, the results do not support Hypothesis 2 which predicted that the co-investment experience between VCs reduces the conflict described in Hypothesis 1b.

Finally, the full model provides consistent results in which Hypothesis 1b is supported but Hypothesis 2 is not. In the full model, the estimated turning point is at 19.4 %, showing a similar result as the one from Model 3. Both estimated turning points lie well within the range of the sample (Haans et al. 2015).

Table 1 Descriptive statistics and correlation matrix

#	Variables	Mean	S.D.	Max	Min	1	2	3	4	5	6
1	CVC share	0.081	0.104	0.520	0.000						
2	Co-investment experience	1.536	1.965	0.000	0.000	−0.088					
3	Time to investment	22.734	25.078	136.000	0.000	0.020	−0.240				
4	No. of rounds	8.126	3.309	21.000	1.000	−0.072	0.086	0.050			
5	Syndicate size	10.676	4.189	24.000	3.000	0.149	0.003	−0.072	0.403		
6	Market environment	1.107	0.879	4.699	−0.066	−0.004	0.009	0.002	−0.001	0.010	
7	Total amount raised	11.646	0.744	14.740	8.949	−0.035	0.190	−0.096	0.475	0.486	−0.029
8	Syndicate partners' reputation	0.171	0.115	1.000	0.016	−0.068	0.349	−0.220	−0.093	−0.090	−0.011
9	Syndicate partners' status	0.118	0.079	0.470	0.000	−0.068	−0.136	0.478	−0.235	−0.177	−0.197
10	Communications and media	0.097	0.296	1.000	0.000	−0.007	0.015	0.009	−0.095	0.005	0.000
11	Computer related	0.265	0.441	1.000	0.000	−0.147	0.178	0.003	−0.031	−0.201	−0.021
12	Medical/health/life science	0.189	0.392	1.000	0.000	0.023	−0.071	−0.001	−0.055	−0.105	0.022
13	Semiconductors/other electronics	0.029	0.167	1.000	0.000	0.234	−0.065	−0.084	−0.022	0.124	0.005
14	Non-high technology	0.015	0.123	1.000	0.000	0.032	−0.080	0.008	−0.042	−0.101	−0.016

#	Variables	7	8	9	10	11	12	13
1	CVC share							
2	Co-investment experience							
3	Time to investment							
4	No. of rounds							
5	Syndicate size							
6	Market environment							
7	Total amount raised							
8	Syndicate partners' reputation	0.208						
9	Syndicate partners' status	0.091	0.695					

Table 1 continued

#	Variables	7	8	9	10	11	12	13
10	Communications and media	−0.031	0.009	0.073				
11	Computer related	0.022	0.172	0.281	−0.196			
12	Medical/health/life science	−0.113	−0.046	−0.057	−0.159	−0.286		
13	Semiconductors/other electronics	−0.044	0.066	0.033	−0.057	−0.103	−0.083	
14	Non-high technology	0.008	−0.107	−0.092	−0.041	−0.075	−0.060	−0.022

The table depicts the descriptive statistics for all variables. For the full sample there are 188 observations

Table 2 Maximum likelihood estimation of time-to-IPO

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Independent variables							
CVC share		−0.696 (0.839)	−4.954*** (1.867)	−5.325*** (1.897)	−5.944*** (2.111)	−5.599*** (1.979)	−6.471*** (2.395)
(CVC share)^2			13.612*** (5.041)	14.631*** (5.109)	15.261*** (5.264)	14.633*** (5.196)	16.671*** (6.003)
Co-investment experience				−0.047 (0.045)	−0.058 (0.048)	−0.053 (0.047)	−0.064 (0.051)
(CVC share) × (co-investment experience)					0.275 (0.397)		0.885 (1.373)
(CVC share)^2 × (co-investment experience)						0.617 (1.183)	−1.910 (4.162)
Control variables							
Time to investment	−0.000 (0.003)	−0.000 (0.003)	−0.001 (0.003)	−0.001 (0.003)	−0.001 (0.003)	−0.001 (0.003)	−0.001 (0.003)
Number of rounds	−0.117*** (0.031)	−0.119*** (0.031)	−0.122*** (0.031)	−0.119*** (0.031)	−0.123*** (0.031)	−0.121*** (0.031)	−0.126*** (0.032)
Syndicate size	−0.013 (0.024)	−0.010 (0.025)	−0.007 (0.025)	−0.007 (0.025)	−0.008 (0.025)	−0.007 (0.025)	−0.008 (0.025)
Total amount raised	0.276** (0.140)	0.272* (0.140)	0.297** (0.142)	0.309** (0.141)	0.310*** (0.142)	0.309*** (0.142)	0.312*** (0.142)
Syndicate partners' reputation	−1.512 (1.095)	−1.514 (1.090)	−1.520 (1.092)	−1.557 (1.075)	−1.630 (1.084)	−1.603 (1.083)	−1.653 (1.081)
Syndicate partners' status	2.046 (1.434)	2.044 (1.431)	2.029 (1.428)	2.659* (1.537)	2.660* (1.534)	2.645* (1.538)	2.712* (1.531)
Market environment	0.006*** (0.001)	0.007*** (0.001)	0.006*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)
Communications and media	−0.102 (0.281)	−0.107 (0.282)	−0.144 (0.283)	−0.139 (0.283)	−0.132 (0.284)	−0.134 (0.284)	−0.132 (0.284)
Computer related	0.129 (0.210)	0.114 (0.211)	0.081 (0.212)	0.083 (0.212)	0.066 (0.213)	0.076 (0.212)	0.051 (0.216)
Medica/health/life science	0.116 (0.217)	0.128 (0.218)	0.087 (0.220)	0.072 (0.220)	0.056 (0.221)	0.067 (0.220)	0.036 (0.226)

Table 2 continued

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Semiconductors/other electronics	0.175 (0.476)	0.272 (0.489)	0.047 (0.505)	0.010 (0.508)	0.018 (0.508)	0.010 (0.509)	0.036 (0.509)
Non-high technology	0.550 (0.543)	0.621 (0.549)	0.704 (0.548)	0.642 (0.551)	0.683 (0.553)	0.669 (0.553)	0.691 (0.553)
Log likelihood	−749.487	−749.133	−746.018	−745.450	−745.222	−745.322	−745.114

Standard errors are in parentheses. Total of 4828 spells and 188 events (IPOs)

*, **, *** denotes significance at the 10, 5 or 1 % level, respectively

To grasp the overall picture relating to IPO and compare it with other studies, we additionally performed an analysis using another performance measure, the pre-money valuation of investees at IPO.[2] The pre-money value of an investee at IPO was measured as:

$$\mathrm{V} = p_{offer}\left(q_{total} - q_{offer}\right),$$

where p_{offer} is the IPO offer price, q_{total} is the total number of shares outstanding, and q_{offer} is the number of shares offered in the IPO (Stuart et al. 1999). The variable was log transformed. In unreported models with another valuation measure, based on the first-day closing price and the total number of shares outstanding, we observed results similar to those presented here. We used OLS to estimate the valuation models, and control for possible selection bias by using Lee's (1983) generalization of Heckman's (1979) two-stage estimator by generating a sample correction variable lambda and including it in the OLS models. Table 3 presents the results from the OLS estimation of the log of market value of investees at IPO. The results of the full model show that the coefficient of CVC share is negative and significant ($\beta = -3.415$, p-value < 0.05), and that the coefficient of the square term is positive and significant ($\beta = 9.286$, p-value < 0.01). These results imply that CVC share has a U-shaped relationship with the market capitalization of the investees at IPO. The estimated turning point is at 18.4 % of the CVC share, which is similar to the results presented in Table 2. However, the difference value between the minimum point and the zero CVC share point is quite small.

Overall, balanced syndication between CVCs and IVCs has a discouraging effect on investees' IPO exit, i.e., it delays the IPO exit and decrease market capitalization at the investees' IPO exit.

5 Discussion and conclusion

The objective of this study was to investigate the effects of CVC and IVC syndicate investments with varying compositions on the investee firms. The syndicate investment among different types of VCs, who have not only different objectives and time horizons, but also different resources and capabilities which, depending on the point of view, makes the relationships between them either complementary or conflicting. By analyzing 188 VC-backed IPOs, we were able to empirically verify the following effects.

[2] Prevalent measures of IPO performance are based on the amount of money obtained by a firm at the IPO (Higgins et al. 2011; Useche 2014), the pre-money valuation of the firm (Higgins and Gulati 2003; LiPuma 2012; Stuart et al. 1999), the age of the venture at IPO (Chang 2004; Stuart et al. 1999; Yang et al. 2011), the valuation multiples (Ritter and Welch 2002), or Tobin's Q (Bonardo et al. 2011; Useche 2014). Among these, our dependent variable is the pre-money valuation of the firm at IPO. This is the firm's market valuation less the proceeds to the firm as a result of the IPO. Therefore, the pre-money valuation at IPO is the market valuation of the firm just preceding the first day of trading. Pre-money valuation is independent of the amount invested in the venture during the current IPO financing round, and is a more appropriate measure than post-money valuation (Lerner 1994b).

Table 3 OLS estimates of the log of market value of investees at IPO

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Independent variables							
CVC share		0.484 (0.534)	−2.013 (1.350)	−1.879 (1.348)	−2.874* (1.507)	−2.3107 (1.400)	−3.415** (1.698)
(CVC share)^2			7.114** (3.539)	6.702* (3.536)	7.788** (3.602)	6.671* (3.533)	9.286*** (5.026)
Co-investment experience				0.050 (0.033)	0.030 (0.036)	0.040 (0.034)	0.022 (0.038)
(CVC share) × (co-investment experience)					0.425 (0.292)		0.990 (0.863)
(CVC share)^2 × (co-investment experience)						0.982 (0.866)	−1.776 (2.556)
Control variables							
Total amount raised	0.811*** (0.093)	0.814*** (0.093)	0.828*** (0.093)	0.824*** (0.092)	0.830*** (0.092)	0.828*** (0.092)	0.832*** (0.092)
Number of rounds	−0.038* (0.021)	−0.035* (0.021)	−0.040* (0.021)	−0.045** (0.021)	−0.049** (0.021)	−0.046** (0.021)	−0.051** (0.022)
Syndicate size	−0.022 (0.016)	−0.024 (0.017)	−0.019 (0.017)	−0.021 (0.017)	−0.020 (0.017)	−0.020 (0.017)	−0.020 (0.017)
Syndicate partners' reputation	0.639 (0.656)	0.589 (0.659)	0.604 (0.653)	0.634 (0.651)	0.510 (0.654)	0.576 (0.653)	0.451 (0.661)
Syndicate partners' status	−0.666 (1.011)	−0.551 (1.020)	−0.641 (1.012)	−1.202 (1.074)	−1.265 (1.071)	−1.311 (1.077)	−1.152 (1.085)
Market environment	0.050 (0.046)	0.049 (0.046)	0.051 (0.045)	0.043 (0.046)	0.047 (0.045)	0.046 (0.046)	0.047 (0.046)
Investee age	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Communications and media	0.846*** (0.206)	0.854*** (0.206)	0.849*** (0.205)	0.848*** (0.204)	0.876*** (0.204)	0.869*** (0.205)	0.876*** (0.205)

Table 3 continued

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Computer related	1.394*** (0.144)	1.405*** (0.144)	1.411*** (0.143)	1.394*** (0.143)	1.386*** (0.142)	1.397*** (0.143)	1.369*** (0.145)
Medica/health/life science	−0.029 (0.148)	−0.029 (0.148)	−0.045 (0.147)	−0.041 (0.147)	−0.048 (0.146)	−0.039 (0.146)	−−0.061 (0.148)
Semiconductors/ other electronics	1.164*** (0.343)	1.106*** (0.349)	1.069*** (0.347)	1.089*** (0.345)	1.092*** (0.344)	1.086*** (0.345)	1.102*** (0.345)
Non-high technology	0.588 (0.382)	0.586 (0.383)	0.623* (0.380)	0.678* (0.380)	0.686* (0.379)	0.686* (0.380)	0.682 (0.379)
Lambda	−1.103 (1.006)	−1.060 (1.007)	−0.896 (1.002)	−1.001 (1.001)	−0.981 (0.997)	−0.996 (1.000)	−0.964 (0.999)
Constant	9.936*** (0.978)	9.873*** (0.981)	9.742*** (0.975)	9.807*** (0.972)	9.826*** (0.969)	9.816*** (0.972)	9.836*** (0.971)
R-squared	0.591	0.593	0.603	0.608	0.613	0.611	0.614

Standard errors are in parentheses; 188 IPOs

*, **, *** denotes significance at the 10, 5 or 1 % level, respectively

First, the CVCs' participation in the syndicate investment delays the investees' IPO exit. As seen in Model 3 of Table 2, which tests the effect of the CVC share and its squared variables, the CVC share of investment in the syndicate exhibits a curvilinear relationship with the hazard rate of an IPO event of the investee firm. In other words, a more balanced equity ownership between IVCs and CVCs delays the investees' IPO, whereas an imbalanced equity ownership may provide a faster IPO exit for investees. This result shows that the syndicate investments among CVCs and IVCs are affected more by conflicts originating from their different motives rather than by positive effects from the complementary value-added contributions. This finding differs from those found in Cumming and Johan (2010), but corresponds well with the recent results found in the theoretical and empirical study of Guo et al. (2015). In prior studies on syndicate investments among CVCs and IVCs, it was revealed that CVC participation in a syndicate has a positive effect on the performance of the startup as measured by its valuation at the time of IPO (Ivanov and Xie 2010; Maula and Murray 2002). However, these studies differ from our approach in the definition of performance, which we define as the time to IPO, and in general have not clarified the conflict between syndicate partners and resulting delays to the IPO exit. A more recent study by Colombo and Murtinu (2016) found evidence that in terms of impact on total factor productivity (TFP), conflicts in mixed IVC-CVC syndicates hamper portfolio companies compared to IVC-only or CVC-only investments. In addition, Colombo and Murtinu (2016) found evidence on the dynamics of the TFP impact of CVC-only investments which supports the view that CVC investors are more patient investors than IVCs. Meanwhile, our results also indicate that investees with an imbalanced composition of investors could gain more market capitalization. This result is consistent with research findings of previous research (Stuart et al. 1999). Delays to IPO exit would only increase the opportunity costs for both the startups and VCs (Jovanovic and Rousseau 2001).

Second, the trust relationship between syndicate partners has no influence on reducing the conflicts occurring within the syndicate and improving the performance of the investees. The relational characteristics between the syndicate partners neither have a direct positive effect on the hazard rate of IPO event (Model 4 in Table 2), nor do they moderate the relationship between the share of each type of investment and the hazard rate of the IPO event (Models 5 and 6 in Table 2). These results imply that the trust built up through prior co-investment experiences between syndicate partners does not affect the likelihood of opportunistic behavior and conflicts among them. However, these results are inconsistent with previous studies that have consolidated the role of trust in inter-organizational relationship (Dyer and Singh 1998; Hill 1990; Zaheer et al. 1998). Prior literature has shown that trust can constrain the opportunistic behaviors of the collaboration partners (Ganesan 1994), and trust-based relationships facilitate the transfer and integration of knowledge and information across boundaries (Kale et al. 2000). There are a few explanations that can account for these inconsistence. First, while prior relationships between partners create an initial base of inter-partner trust, there is also a downside of repeated interactions. Interactions between partners beyond the first few might provide diminishing amounts of information to the partners (Gulati 1995b). Further, repeated ties with the same

partners could lead to an inadequate monitoring and the adoption of suboptimal routines developed during prior relationships (Khanna 2007). In light of these concern, we additionally extend and test the model with the co-investment experience variable and its squared term (these results are not reported in this paper). However, we could not find any significant relationships between prior interactions among syndicate partners and the hazard rate of the IPO event. Prior literature on IPOs, on the other hand, could provide another explanation for the inconsistent finding (Baker and Gompers 2003; Campbell Ii and Frye 2009; Chemmanur et al. 2011; Suchard 2009). Prior studies have shown that firms with effective corporate governance and independent boards have a higher probability of successful exit through IPO (Baker and Gompers 2003; Campbell Ii and Frye 2009). In that sense, a trust-based relationship among insiders including syndicate VC partners could raise concerns about an inadequate monitoring and possible moral hazard (Arthurs et al. 2008; Khanna 2007; Tomkins 2001). The trade-off between trustworthy relationship among insider VCs and board independence needs to be further considered with respect to the impact on the exit through IPO (Arthurs et al. 2008). Meanwhile, partner's reputation or social status may suggest a possibility of an alternative way of measuring trust. Partner's reputation or social status, which are built over time, are used to judge the quality of the partner (Jensen and Roy 2008), and are providing a foundation of trust (Glückler and Armbrüster 2003; Michell et al. 1998; Rousseau et al. 1998). Considering a high degree of network connectivity within the VC industry due to the frequent nature of syndicate investments, VCs having good reputation or taking important network positions are to be considered trustworthy (Glückler and Armbrüster 2003; Meuleman et al. 2010; Sorenson and Stuart 2008). However, the quality of the investors, judged by their reputation or social status, also provides a signal of quality of the investee to the market, which influences the exit through IPO (Krishnan et al. 2011; Nahata 2008). Hence, using the reputation or status as a trust measure might result in a misleading interpretation. Further discussions are needed to determine an appropriate measure for trust among syndicate partners and to overcome the issue of interplay between trust among insiders and concerns by outsiders.

The results of this study provide managerial implications to both entrepreneurs and VCs. First, this study points out to entrepreneurs that when accepting VC funding, syndicate composition must be considered in view of the startups' planned exit. The participation of different types of investors, especially in a balanced composition, results in conflicts and was shown by our study to increase the investees' time to IPO exit. At the same time, it is known to also affect the valuation at exit. It is vital for entrepreneurs to understand the differences between the VC types, especially their motivations and possible contributions to a startup's performance either in exit size or timing. Second, IVC and CVC investors also must understand each partner's characteristics related to their plans and exit strategies in order to assemble a syndicate as objectives need to be aligned and exit strategies must be discussed ahead of time. Although the different types of partners such as CVCs or IVCs who have unique, different and complementary resources are perceived as attractive partners (Keil et al. 2010), the syndication among them provides sources of conflicts. For VCs, some insights from this study can provide a

guideline for predictions about the exit strategies and their post-investment activities (Gerasymenko and Arthurs 2014).

We believe the contributions of this paper to be as follows: First, this study contributes to the increasing literature on entrepreneurial finance. Prior research on VCs classified the types of VCs and mainly focused on the characteristics and the differences of financial and strategic investors (Alvarez-Garrido and Dushnitsky 2016; Gompers and Lerner 2000; Hellmann 2002; Ivanov and Xie, 2010; Maula et al. 2005). However, prior studies did not pay much attention to syndicate investment among different types of investors such as IVCs or CVCs. By analyzing the syndicate investment of IVCs and CVCs and its impact on the performance of the investee, this study complements and addresses an existing gap in the literature on entrepreneurial finance and IPO. Second, this study contributes to explaining the VC investment phenomenon thorough diverse theoretical lenses. Complementing prior studies that mainly focused on financial perspectives such as investment and return (Gompers 1996), this study deals with various theoretical perspectives on strategy, including the resource-based view, agency theory, and the relational view, in explaining the nature and influences of syndicate investment among IVCs and CVCs. Through a comprehensive approach, the study sheds light on principal–principal conflicts among syndicate partners and contributes to the research on partner conflict and its consequences in the context of entrepreneurial finance.

While making a number of contributions to the field of VC research, we at the same time acknowledge some limitations of our approach and provide directions for further research. First, samples of VC syndicate investment with CVC participation may be biased. This is because it is rare for CVCs to invest independently or take part as a major investor. In this study, the maximum value of the CVC share variable was 0.553. Therefore, there is a limit to analyzing curvilinear relationships such as the relationship between CVC share and time to IPO. Second, due to limitations of data, this study determined VC syndicates based on the broad definition of Brander et al. (2002). Therefore, the syndicate composition in each round and the order of VC investment participation were ignored. A more detailed investment data set would potentially reveal more interesting effects and relationships. Third, this study did not look into potential differences between exit types such as IPO and trade sale and has used a dataset of VC-backed startups that exited through IPO. This poses limitations to generalize its findings. Besides IPOs, trade sales are another major successful exit route for VCs and VC-backed firms. However, going public and trade sale to another company have differences in their characteristics, such as the motive of the entrepreneur, the maintenance of ownership, the continuity of business operations, and the market environment. Thus, depending on their exit route, startups and their investors adopt different exit strategies and contract terms (Cumming and Johan 2008; Giot and Schwienbacher 2007). Further, the resulting return on investment shows significant differences between IPO and trade sale, where IPO is generally more profitable than trade sale (Black and Gilson 1999; Nadeau 2011). Hence, factors influencing the exit through IPOs could affect the exit through trade sales in different ways (Giot and Schwienbacher 2007). Moreover, when CVC is included as an investor and the investee is trying to exit through a trade sale to another company, it might be

required to avert potential conflict between the CVC investor and the potential acquirer (Masulis and Nahata 2011). Yet, in order to obtain a full picture of VC investment and startup development, also other exit types and their effects on performance should be included and compared in future research. Fourth, this paper focuses on the composition of the syndicate and the time to IPO as key concerns for both startups and venture capitals. However, this is just one of many interesting facets of the IPO, a critical time for firms. Future research could look into other factors surrounding the IPO such as valuation at IPO, underpricing, lock up periods, long-term performance, or other factors. Further research is also required in the areas of influence and characteristics of the relationship between lead-follower investors and on the topic of agency problems and conflicts between investors and investees (Katila et al. 2008).

Overall, our findings imply that syndicate investments of different types of VCs have inherent conflicts arising from differences in objective and characteristics, which undermine the performance of their investee. Managing this inherent conflict is crucial to achieve a high performance for both of VCs and entrepreneurs.

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