Innovation Incentives Meet Organizational Reality:

Comparing Investment Practices by Corporate and Independent Venture Capitalists

Gary Dushnitsky
The Wharton School
University of Pennsylvania
2031 Steinberg Hall – Dietrich Hall
Philadelphia, PA 19104
gdushnit@wharton.upenn.edu

Zur B. Shapira
Stern School of Business
New York University
44 West 4th St.
New York City, NY 10012
zshapira@stern.nyu.edu

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ABSTRACT

This paper examines corporate investment practices, specifically, corporate venture capital investments (i.e., minority equity investment in entrepreneurial ventures by established firms). This setting offers a unique opportunity to compare corporate practices to those of investment experts, the independent VCs. We observe differences in the number of participants in venture capital syndicates that involve a Corporate Venture Capital (CVC) investor, and those that consist solely of Independent VCs (IVC). The differences persist after controlling for numerous factors including ventures' stage and industry, IVC risk-preferences and CVC objectives. However, the magnitude of the differences decreases substantially when we consider a subset of CVC programs that compensate their employees using IVC-like long-term pay-for-performance (e.g., carry interest). We conjecture the deviation from IVCs' 'best practice' is due mainly to idiosyncratic corporate incentive scheme. In doing so, we highlight the factors facilitating ineffective corporate investment strategy, in the tradition of Jensen (1993).

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"Syndicates that can help or hurt your career"[1]

A firm's competitive advantage is largely related to its ability to make decisions under uncertainty. Enhanced innovativeness and growth opportunities await those firms that can effectively invest in novel, and highly uncertain, technologies. The reality in which corporate R&D investment is undertaken, however, often hinders these efforts. Along these lines, Jensen (1993) notes the total annual disbursements from the venture industry have never exceeded the R&D spending of either IBM or General Motors, yet the economic successes of venture-backed firms have been profound. He ascribes this to unfavorable incentives within corporate research facilities. In doing so, Jensen highlights the need to understand the effects of corporate compensation schemes on investment decisions, and ultimately on firms' ability to innovate and grow.

We follow the call and study the impact of corporate compensation on one such corporate activity, namely corporate venture capital (CVC). Corporate venture capital is the practice of minority equity investment by established firms in independent entrepreneurial ventures, i.e., technology-based companies that are seeking capital to continue operation (Gompers and Lerner, 1998).

This paper focuses on one investment practice in particular, the syndication of investment which plays an important role in managing investment uncertainty (Gompers and Lerner, 2001). Syndication occurs when two or more investors participate in the

[1] A session at the Corporate Venturing & Strategic Partnering conference (Rancho Mirage, CA; Feb. 2004).

financing of a given venture. Syndicate membership may consist of corporate venture capitalists as well as independent venture capitalists (IVC). The paper explores the number of participants in an investment syndicate (i.e., syndicate size) across two different syndicate types: (a) those involving only independent venture capital funds (denoted *all-IVC*), and (b) those where a corporate investor is a syndicate member, along with IVCs (denoted *CVC/IVC*). We examine whether there are persistent differences in syndicate size and are those differences sensitive to the nature of CVC personnel compensation scheme.

Our analysis of syndicate size builds on three pillars. First, following the agency literature, we note that individuals may pass up profitable yet risky projects. These studies suggest various pay-for-performance schemes can be put in place to incentivize individual to undertake profitable and risky projects. Second, the compensation schemes of independent venture capitalists and CVC personnel differ. Not only do the former share in the financial up-side of their portfolio while CVC personnel often do not, but also IVCs are more tolerant of portfolio company's failure. Third, syndication of venture capital investment is a way for investors to share risks, as well as profits, with co-investors. Taken together, these factors suggest that independent venture capitalists pursue moderate syndication resulting in riskier and potentially more profitable investment strategy. Corporate personnel, however, may seek a larger syndicate size that mitigates their exposure to risky investments, even though it comes at the cost of decreasing the probability of a windfall profit.

We construct a unique sample of all investment syndicates that funded U.S.-based ventures during the time period 1990-1999. The sample consists of 15,191 syndicates, of

which 1,266 involve a corporate investor. We find that syndicates involving only independent venture capital funds are persistently smaller in size (that is, fewer participants are involved) than those where a corporate investor is a syndicate member along with the IVCs. These results are robust to various alternative explanations such as temporal or industry effects, venture's stage or heterogeneity in ventures' quality. Most importantly, we find the nature of corporate venture capitalists' compensations explains the magnitude of these differences. When CVC personnel are privy to long-term pay-for-performance compensation, the syndicate size differential shrinks significantly.

This paper makes several contributions. First, a unique setting is utilized to objectively diagnose the efficacy of corporate compensation schemes. Most empirical studies compare firms to their peers, thus exploiting only a narrow range of variance in compensation schemes and performance outcomes. To the extent that independent venture capitalists are expert investors (e.g., Jensen 1993; Gompers & Lerner, 2001; Kaplan & Stromberg, 2003), they serve as an 'informed benchmark' and allows us to capture the full range of actions and outcomes. Second, we continue the tradition of Jensen (1993) and provide further evidence regarding the advantages of IVC-like compensation. Third, we address an important lacuna in the compensation literature. While numerous studies explores the impact of CEO and other top executives compensations on risky investment, we know little about non-executive employees, in general, and R&D personnel, in particular.

The reminder of the paper is organized as follows. Section 2 briefly reviews the agency framework and its implications to risky investment choice as they pertain to a generic investor. The practice of investment syndication, as well as similarities and

differences between corporate investors and independent VC funds and their implications for the size of the syndicate, are addressed in section 3. The empirical methodology and results are presented in section 4 and 5, respectively. Section 6 discusses investment and syndication decisions. Section 7 concludes.

THEORETICAL BACKGROUND

The agency framework advances our understanding of compensation schemes impact on risk-taking behavior. The key argument is that option-like compensation can induce risk-averse employees to invest into profitable yet risky projects, which may otherwise be foregone as too risky, thus enhancing firm innovativeness and ultimately increasing its value. We briefly highlight a few key predictions below.

The framework notes that risk-neutral shareholders would like employees to maximize firm value by undertaking all positive net present value projects regardless of their riskiness (hereafter we use risk and variance interchangeably). Risk-averse employees, however, would opt for low variance projects and may pass up some positive but risky NPV projects that shareholders would like undertaken. By offering certain pay-for-performance compensation schemes, shareholders can still induce employees to maximize firm value.

Simple stock allocation, however, may prove ineffective. Stockholding offers a linear association between pay and performance and as such also results in risk-averse employees rejecting profitable yet risky projects. Introducing convexity into employees' compensation – for example by awarding stock options – may resolve the problem. A number of formal models show that stock options stimulate employees to select riskier projects as those amplifies firm's variance, and subsequently increases the value of

employees' options (see Lambert, 1986; Smith and Stulz, 1985; Hirshfleifer and Suh, 1992). Similarly, convex compensation schemes may be optimal when employees' effort choice affects project riskiness (Hemmer, Kim and Verrecchia, 1999).

Empirical evidence often present mixed results (Core, Guay and Larcker, 2002, offer an excellent review). Work on the relationship between employees' stock options and the choice of risky investment is scare. Nonetheless, a number of recent studies find support to the theoretical predictions. Datta, Iskandar-Datta and Raman (2001) investigate M&A activity and find managers with substantial equity-based compensations are inclined to engage in riskier takeover projects. Rajgopal and Shevlin (2002) study oil and gas companies and find the variance on future cash-flow of exploration activities is positively associated to the sensitivity of employees' stock options to stock volatility.

While the impact on firm performance received greater consideration, the results are mixed as well. Abowd (1990) reports a positive association between firm's stock returns and the sensitivity of executive's compensation to firm value in the previous year. In contrast, Aboody (1996) finds share prices are negatively associated with the value of all outstanding employee stock options. Shifting from financial to operational measures, Balkin, Markman, and Gomez-Mejia (2000) show long-term equity-based CEO compensation is related to greater R&D investment and patent output, and Conyon and Freeman (2004) observe greater firm productivity in the presence of stock-option plans. These findings prevail in the context of non-executive compensation as well. Divisional innovativeness (e.g., ratio of division's patent to sales) is related to the salience of long-term compensation for division's head (Holthausen, Larcker, and Sloan, 1995). Lower than predicted option grants to technical employees are associated with lower subsequent return

on assets (Ittner, Lambert, and Larcker, 2003). Relatedly, Lerner and Wulf (2006) show the production of valuable patents (i.e., highly cited patents) is positively associated with more long-term incentives for heads of centralized corporate R&D units.

In sum, the agency theory and empirical evidence suggest convex pay-for-performance compensation schemes (e.g., stock options) may incentivize risk-averse individuals to invest in high-variance high-return projects, thus maximizing firm's value. The next section builds on these insights to motivate our hypotheses.

VENTURE CAPITAL INVESTMENT PRACTICES:

The goal of this paper is to understand how established firms invest in new technologies of uncertain prospects. The venture capital market provides a unique context for this study. Investment in entrepreneurial ventures is tantamount to making a risky investment due to high level of uncertainty regarding technological feasibility, market prospects, intensity of competition, management quality and financing environment (Kaplan and Stromberg, 2004; MacMillan, Zemann and SubbaNarasimha, 1987; Sapienza, 1992). Moreover, investors' investment practices – including monitoring, investment syndication and staging of funding – are clearly mapped (e.g., Gompers and Lerner, 2001), and often observable by the independent researcher.

The first sub-section expands on one investment practice in particular: the syndication of venture capital investments. The following sub-section reviews the characteristics of corporate and independent venture capitalists. The last sub-section builds on the differences between the groups and hypothesizes about syndicate size when a CVC investor is, or is not, involved in a particular financing round.

Investment Syndicates

Scholars observe that syndication is a common practice in the venture capital markets (Bygrave, 1987; Lerner, 1994; Sorenson and Stuart, 2001; Brander, Amit and Antweiler, 2002; Hellmann, Lindsey, Puri, 2004), much like staging of funding and monitoring. Investment syndicates occur when two or more investors participate in the financing of a given venture. These syndicates may play a role in managing investment uncertainty (Gompers and Lerner, 2001). We discuss four reasons for forming investment syndication as identified in the literature: risk sharing, selection, referral, and value-added.

Risk Sharing. An investment syndicate may be seen as a form of risk-sharing, where a group of investors make a common investment decision in which the ensuing payoff is to be shared jointly (Wilson, 1968). The theory of syndicates predicts that in the face of uncertain payoffs investors who do not want to under-perform their peers may choose to diversify their holdings. When an investor cannot adequately diversify her portfolio by investing in multiple ventures she may opt to syndicate her investment. This is likely to occur under two scenarios: when venture's future payoffs are characterized by high variance, or when the investment amount constitutes a substantial proportion of the investor's assets. Consistent with the risk-sharing explanation, Brander, Amit and Antweiler (2002) find that Canadian investors are more likely to syndicate an investment in a venture of high variance payoff. They also report that some ventures require funds well beyond half of the capital under management by some venture capitalists.

Selection. The practice of syndicated investments may also improve the ability to select attractive investment opportunities. Bygrave (1987) and Lerner (1994) argue that

syndicate members serve as a source of a 'second opinion'. For example, Lerner (1994) finds that experienced venture capitalists syndicate investments in early stage ventures with other experienced VCs who can provide expert opinion. According to the selection reasoning, an approval process involving multiple syndicate members may reduce the likelihood of accepting a bad project (Sah and Stiglitz, 1986).

Referral. Syndication may be instrumental in securing access to quality ventures.[2] At times, an investor may choose to syndicate an investment to which she has proprietary access even when the target venture is known to have favorable prospects and capital constraints are not binding. In those cases, the decision to include additional investors is motivated by the anticipation of reciprocity (Sorenson and Stuart, 2001).[3, 4]

Value added. Syndication can also be an important strategy to enhance a venture's prospects. This argument is founded on the observation that in addition to capital infusion, investors provide substantial value-added services (Sapienza, 1992; Hellmann and Puri, 2002). Brander et al. (2002) suggest venture capitalists choose to syndicate their investment to increase the pool of available value-added services. They report syndicated investments in Canadian ventures are associated with higher returns.

In sum, a number of rationales have been proposed to explain the syndication phenomenon in venture capital markets. It is likely that all of them play a role in

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[2] The referral explanation views syndication as a vehicle to enhance the deal flow (i.e., broaden the pool of accessible investment targets), whereas the selection explanation assumes that for a given deal flow (i.e., a given pool of targets) syndication may increase the likelihood of selecting high-quality ventures.

[3] For example, investor A includes investor B in a lucrative investment in anticipation that investor B, when recognizing a quality venture in the future, will syndicate it with investor A.

[4] Reciprocal investment may enhance investors' performance, but may also serve as a way to 'window dress' investors' track record with no significant increase in performance. Investors may invite each other to join, at a high valuation, an investment in a soon-to-IPO venture (Lerner, 1994; Lakonishok, Shleifer, Thaler, and Vishny, 1991). It gives an opportunity to present an accomplished track record, yet does not contribute to actual performance.

determining the optimal syndicate size, though some may be more important during early stage rounds (e.g., referral and selection; Lerner, 1994), while others may carry more weight during later stage funding (e.g., value added services, Brander et al., 2002). Our hypotheses draws mainly on the risk-sharing rationale. Nonetheless, the emergent syndicate size is likely affected by all four rationales, as each investor considers the various benefits and costs before joining the syndicate. The discussion section expands on this point and reconciles our predications with all four syndication rationales.

Venture Capital Investors

Independent venture capital funds. Independent VC funds (IVC) are limited partnerships that invest in early and late stage growth-oriented business endeavors. The venture capitalists manage all aspects of the investment, starting with the initial identification of attractive investment opportunities through the due-diligence process and post-investment monitoring. They also offer a variety of value-added services to their portfolio companies (Sapienza, 1992; Timmons, 1994).[5] Venture capital funds seek capital appreciation through lucrative exits, usually via an IPO or an acquisition (Gompers and Lerner, 2001).

The compensation of funds' personnel has two main components (Sahlman, 1990; Lerner, 1994; Gompers and Lerner, 1999). The first is a fixed amount which the IVC draws each year as management fees, about 1.5%-3% of funds' assets. The second component is contingent on fund performance. It is often referred to as 'carried interest' and usually runs about 20% of the funds' profits.

[5] These include assistance in formulating venture's strategy, administrative support, attracting personnel and top mangers (Gorman and Sahlman, 1989; Hellmann and Puri, 2002) as well as assisting entrepreneurs in networking with the right professional firms, investors, and potential acquirers (MacMillan, Kulow and Khoylian, 1989).

Corporate venture capital. Established firms are important players in the venture capital markets (Prowse, 1998; Timmons, 1994). The objectives of corporate venture capitalists vary and while some focus on achieving financial gains, most CVC programs seek a window on novel technologies (Siegel et al, 1988; Block and MacMillan, 1993; Chesbrough, 2002). Corporate backing can contribute significantly to a venture, as follows: (a) by offering value-added services that are similar in quality to those provided by quality VC funds (Block and MacMillan, 1993), (b) by leveraging corporate resources (Acs, Morck, Shaver and Yeung, 1997; Maula and Murray, 2001; Teece, 1986), or (c) by providing an endorsement effect for third parties and/or capital markets (Stuart, Hoang and Hybels, 1999).

Nowadays, more then before, CVC personnel participate in their portfolio's up-side either through carried interest in CVC portfolio companies, or – more frequently – through annual bonus based on financial and/or strategic performance. Nonetheless, straight salary remains the most common compensation scheme among CVC personnel (Birkinshaw, van Basten-Batenburg and Murray, 2002; McNally, 1997). Moreover, failure of a few portfolio ventures, while unavoidable, may have detrimental effect on the career of the CVC personnel associated with it. We expand on this issue below.

Hypotheses Formation

We explore the impact of corporate compensation on corporate investment behavior by way of comparison. Independent venture capitalists (IVCs), the predominant investor type in venture capital markets, constitute an important benchmark against which we compare firms' investment practices. IVCs differ from corporate venture capital (CVC) programs on a number of dimensions yet both investor groups commonly

participate in investment syndicates. Guided by the agency framework, we conjecture differential compensation schemes may be associated with persistent differences in IVC and CVC syndicate sizes. To that end, we review the incentives of corporate personnel in general, and that of CVC personnel, in particular and identify two attributes: (a) lack of positive pay-for-performance compensation schemes, and (b) intolerance towards failure.

The lack of rewards for positive performance has long been recognized in the corporate setting. Detailed studies find that established firms offer an extremely flat compensation schemes to their R&D personnel (e.g., Neumeyer, 1971). More recently, Zenger (1994) reports that large corporations substantially lag behind small companies in terms of rewarding research and development employees.

Moreover, managers often complain that life in a corporation is marked by the overweighting of failure over success (Shapira, 1995). Scholars observe that decision makers who operate within a corporate context assign excessive negative weights to potential failures. As Kahneman and Lovallo (1993:22) argue:

> "Loss aversion is not mitigated when decisions are made in an organizational context. On the contrary, the asymmetry between credit and blame may enhance the asymmetry between gains and losses in the decision marker's utilities. The evidence indicates that the pressures of accountability and personal responsibility increase the status quo bias and other manifestations of loss aversion."

Similarly, Viscusi, Magat and Huber (1987) who report that decision makers are extremely reluctant to accept responsibility for even a small increase in the probability of disaster. Swalm (1966) finds that managers of an industrial company forego beneficial projects with a potential down-side, acknowledging that their own choices were not in the best interest of the company, but were aligned with their own interest as aspiring executives. Based on interviews with practicing managers, Shapira (1995) reports that

penalties associated with failure in organizational contexts are often perceived as 'terminal' (i.e., being fired) even if such attitudes and beliefs are not grounded in facts.

Consequently, corporate employees are sensitive to the variance of a prospective investment. A high variance project is associated with greater probability of good and bad outcomes. Such project is likely to be shunned because an employee is worried about being held responsible in case of poor performance, and at the same time, he or she does not partake in case of superior performance.[6] As a result, corporate investment choices are often aimed at diminishing investment variance without recognizing the implications in terms of lost opportunities. Consistently, the move away from centralized R&D centers is explained by 'risk minimization' behavior on the part of US corporations (National Science Board, 1992).

These issues resonate with the experience of CVC personnel. Corporate venture capitalists' participation in portfolio's up-side is limited compared to IVC personnel.[7] This is not to say that CVC personnel do not share in the up-side – some do. However, only a small number of CVC programs offer their staff IVC-like compensation in the form of carried interest. The vast majority of programs provide either a capped annual bonus or straight salary (Birkinshaw *et al.*, 2002; McNally, 1997). Below are examples of successful CVC programs that did not receive any high-powered incentives.

> "The head of German software-maker SAP AG's venture capital unit in Silicon Valley racked up a 6,000% return on his employer's first $25 million fund…

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[6] Accountability for foregoing profitable projects is not a source of concern as (a) those are often not attributable to a specific individual, and (b) unlikely to surface until significant time has passed.

[7] Pay-for-performance is uncommon for a number of reasons (Block & Ornati,1987; Siegel, et al,1988; Sykes,1992; Birkinshaw et al, 2002). First, firms often maintain pay-equality to avoid resentment by other employees. Second, inability to establish performance metrics and manage complex compensation inhibits participation in financial success. Third, a pay-for-performance component may encounter problems when employees transfer to and from CVC program. Finally, by disassociating CVC compensation from venture success the firm seek to align programs' goal with corporate interests.

> Yet he still earned a straight salary just as SAP's 22,000 other employees did." (Daily Deal, 12/2000)
>
> "Late in December [1999], Intel Corp. hired an outside team to structure a compensation package for its venture group that would mimic those of firms outside the corporate umbrella, including a co-investment option and a carried interest reward. After corporate management rejected the plan, citing concerns over internal equity within the organization, the venture group's top officer jumped ship for a spot at a private venture firm." (Private Equity Week, 9/2000)

Not only does CVC personnel exposure to portfolio's up-side pale in comparison to IVCs, but also they operate in an environment that is less tolerable of potential failures. Recent testimonies illustrate the impact of a single investment failure on one's career:

> "'The reality of the venture model is that 20% to 30% of these investments are successful,' says Chris Aidun, partner and head of the VC practice at Weil, Gotshal & Manges LLP. 'As a corporation, can I tolerate that kind of success rate?'" *(Venture Capital Journal; Dec., 2001)*
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> "Richard Shaffer, president of the New York City-based VC firm Technologic Partners, says that to succeed as a venture capitalist you must be continuously willing to bet your career. The same holds true, Shaffer says, for CIOs attempting to play that role within their companies. The recent wave of corporate venturing has already claimed victims. Former Fireman's Fund CIO Deems Davis left in February 2000 after a couple of ventures he championed for the Novato, Calif.-based insurance company failed.
>
> The fact of the matter is that while opportunity abounds, there is an even greater amount of risk. Investments fail, and startups rarely succeed. 'It's like turtle eggs,' says Technologic's Shaffer. 'A turtle swims ashore, lays thousands of eggs and most of them die. But the few that survive are enough to propagate the species.'… The problem for the aspiring CIO venture capitalist, says Bell-Mason's Mason, is that laying tons of eggs and hoping some of them hatch is fundamentally at odds with the way most corporations work." *(CIO Magazine; May, 2001)*

These concerns increase as the scope of the CVC program becomes a substantial proportion of corporate operations. Harry Laswell, a former Intel Capital managing director, notes "When the scale of your program grows, its ability to affect your earnings can become an additional challenge." (*Venture Capital Journal*; Dec., 2001).

On average, the compensation of independent (corporate) venture capitalists exhibits (lacks) a substantial pay-for-performance component. In comparison to IVCs,

corporate investors are therefore likely to pursue a portfolio of lower variance, which can be achieved through larger syndicates.[8]

> ***Hypothesis 1:*** *All else being equal, syndicates in which a corporate investor is a member would be larger than syndicates in which membership consists solely of independent VC funds.*

To the extent agency framework explains individual behavior, one would expect difference in investment practices to disappear when both corporate and independent VCs are privy to similar compensation schemes. Put differently, in comparison to the average CVC program, a CVC program that rewards long-term equity-based compensation (e.g., carry interest) to its employees would pursue a portfolio of higher variance.

> ***Hypothesis 2:*** *All else being equal, the use of long-term compensation by a CVC program would decrease the degree to which syndicates in which it is a member are larger than syndicates in which membership consists solely of independent VC funds.*

THE EMPIRICAL STUDY

We compare the syndicate size of two syndication types, those involving only independent venture capital funds and those where a corporate investor is a syndicate member, along with the IVCs.

Data

We utilize the Venture Economics database to construct our syndication dataset. Venture Economics (VE) collects data through multiple sources including the investment banking community, surveys of general partners and their portfolio companies,

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[8] Formally, let σ^2 denote the variance of an investor's portfolio. A given an investor has *N* portfolio companies, indexed *i*=1,…, *N*. Let s_i denote the fraction of an investor's assets that are committed to venture *i*, such that $\Sigma^N_{i=1}(s_i)=1$. The variance of investor's portfolio is equal to $\sigma^2\Sigma^N_{i=1}(s_i)^2$. Thus, higher *N* results in overall lower portfolio variance.

government filings and industry associations. These data have been used in previous academic studies (Gompers 1995; Sorenson and Stuart, 2001). VE identifies each particular investment made by a specific investor during a given round as a unique record.[9] As such, the data contain the full history of investments in each venture.

Syndicate size is the number of unique investors who participate in a given round in a specific venture. At times, Venture Economics recorded investment disbursements that are part of a single round as separate investment rounds (Lerner, 1994). This may lead to an under-estimation of rounds' syndicate size. We address this problem by aggregating two or more consecutive rounds listed within a 90-day period as a single round. Consistent with Guler (2003), we choose 90 days as a cutoff point because most term sheets specify a maximum 90-day closing date window during which investors can schedule their cash infusions to the portfolio company.[10]

The dataset consists of all investments relationships from January 1990 to December 1999. We focus on investment relationships involving U.S. ventures in the Hi-tech industries (i.e., semiconductors, hardware, software, and telecommunication). Venture Economics records 50,041 investment disbursements representing 16,155 investment rounds in 7,299 distinct ventures throughout the U.S. Table 1 presents the number of ventures by state and industry. Venture Economics contains information on the geographical location of these ventures. As expected, California has the highest number of ventures, with Massachusetts, Texas and New York being a far second, third

[9] For example, venture Z received two rounds of funding; the first from investors A, B and C, and the second from investors A, B and D. Venture Economics will log six unique records: (Z, Round 1, A), (Z, Round 1, B), (Z, Round 1, C), (Z, Round 2, A), (Z, Round 2, B), (Z, Round 1, D).

[10] Because venture capitalists need to call upon their limited partners to provide the necessary funds for a specific investment, most funding agreements (i.e., the 'term sheet') state that capital infusion may be deferred up to 90 days (Lerner, 1994). Typically, if there are more than 90 days between two capital infusions, the second infusion is considered a "new" round and is subject to new terms.

and fourth, respectively. The highest number of ventures is within the Computer Programming and Data Processing industry (2-digits SIC code = 73). The other industries, by decreasing number of ventures, are Communications (2-digits SIC code = 48), Semiconductors and Electronics (2-digits SIC code = 36), Computer Equipment (2-digits SIC code = 35) and other retail and wholesale.

Insert Table 1 about here

There are 2,397 different investors in the sample. These include 2,094 independent venture capital firms.[11] There are also 303 corporate venture capital investors, which constitute 12.6% of all sample investors. We initially use the VE's categorization to identify corporate venture capital investors. Given our focus, we excluded those investors that are purely financial institutions which are likely to be savvy financial investors. To that end, we conducted an extensive Lexis-Nexis search for each CVC investor and dropped financial corporations that pursue venture capital investments as means of diversifying their portfolio (e.g., the insurance company SunAmerica). The remaining corporate venture capitalists participated in 1,662 (or 10.3%) investment rounds. In 1,266 rounds the syndicate involved a sole corporate investor along with IVCs; while 290 and 57 rounds included 2 and 3 corporate investors, respectively. Some rounds involve even larger numbers of CVCs, e.g., a later-stage investment round in *Liberate Technologies* included twelve syndicate members, of which ten were CVCs.

[11] On average, a venture capital firm manages 1.95 funds, with some firms managing as many as 16 different VC funds during the 1990s. For example, the prestigious venture capital firm Kleiner Perkins Caufield & Byers (KPCB) has managed numerous VC funds. In our sample alone, KPCB is listed as managing 16 different funds: KPCB I, KPCB II, KPCB III, KPCB IV, KPCB V, KPCB VI, L.P., KPCB VII, LP, KPCB VIII, KPCB IX-A , L.P, KPCB Zaibutsu Fund I, KPCB Life Sciences Zaibatsu Fund II, KPCB Information Sciences Zaibatsu Fund II, KPCB Java Fund, and KPCB VIII Founders Fund.

Finally, we use data derived from a unique survey of CVC programs to discern the compensation schemes of program personnel (BBM, 2002). The information was obtained through a mail survey of CVC executives during 2002. Target programs were identified using Venture Economics and the Corporate Venturing Directory & Yearbook. A response rate of 30% yields rich information regarding the organization and compensation of just less than a hundred CVC programs.

Because CVC executives are typically disinclined to provide "hard" data on their remuneration, we have limited information regarding the dollar value of compensation. Rather, the survey utilizes Likert-type multi-item scales and asks CVC executives as to the salience of (a) straight salary, (b) bonuses based on short term performance, and (c) long term pay-for-performance mechanisms (e.g., CVC executive report carried interest is employed to incentivize program staff). While the lack of detailed information regarding compensation magnitudes is unfortunate, the available information is less susceptible to certain biases: answers simply document the 'compensation rules' and are less liable to calculation errors, as well as conscious over- or under-statement.

Variables

The dependent variable, *Syndicate Size*, is a count of the number of syndicate members that participate in a focal investment round. That is, the variable is at the venture-round level. Each unique investor, as recorded by Venture Economics, is counted as one additional syndicate member, irrespectively of whether the investor is an independent venture capitalist or a CVC investor. For example, the *Syndicate Size* is equal to four in the following two cases: (a) Vermeer Technologies which received funding in December 1995 from four different independent venture capital funds Atlas

Venture Fund II, Matrix Partners, Menlo Ventures VI, and Sigma Partners III, and (b) NetBoost which received funding in August 1997 from TI Ventures (Texas Instrument CVC program) as well as three venture capital funds J.P. Morgan, Bay Partners and Crosspoint Venture Partners. See Figure 1 for other examples of the dependent variable.

The main independent variable, *CVC/IVC*, is assigned the value zero if the focal investment round is an *all-IVC* syndicate, or one if it is a mixed CVC, IVC syndicate. For example, the variable is equal to zero for Vermeer's round of financing in December 1995, and is equal to one for NetBoost's round of financing in August 1997. In the context of Figure 1, the variable is equal to zero for either Oberon (Panel A) or Times Ten Performance (Panel B) rounds, and is equal to one for Venturecom.

Insert Figure 1 about here

We also construct measures of CVC compensation structure. A number of issues have to be considered before the additional independent variables can be defined. First, these variables are available to a subset of CVC programs that are covered by the BBM survey. Second, the survey describes the nature of programs' compensation scheme rather than the dollar amount. Consequently, two dichotomous indicators of CVC compensation structure are constructed: *Short-Term* and *Long-Term*. The former (latter) is equal to one if short-term bonuses (long-term carried interest) are the most salient component of a focal program, zero else. The two variables are mutually exclusive (i.e., for a given CVC both cannot equal to one).[12]

[12] Given the issues above and the anecdotal evidence regarding the lack of pay-for-performance in most CVC programs, we do not employ a 'straight salary' indicator. We explain the decision, and the interpretation of these two variables in the methods section.

We also employ a set of control variables. *Round Valuation* is the post-round valuation (in thousands of dollars). We include *Year Dummies*, a vector of dichotomous variables denoting the year of the focal round (1990-1999). *Venture Industry Dummies*, a vector of dichotomous variables denoting the 2-digits VEIC code of the venture. Venture Economics assigns an industry classification along its proprietary Venture Economics Industry Classification (VEIC). There are 24 unique 2-digits-VEIC codes in our sample. Finally, *Investment Stage* denotes the stage of development of the funded venture at the time of the investment round. Building on the Venture Economics, we identify four major stages: Startup, Early, Expansion and Later.

Methods

The dependent variable, syndicate size, is a 'count' variable and takes only non-negative integer values. The assumptions of homoskedasticity and normally distributed errors which underlie the Ordinary Least Squares regression technique are therefore violated. Thus, we employ the Negaive binomial regression approach (Hausman, Hall, Griliches, 1984), and specify the following regression equation: $P_{it} = exp\ (X_{it}\beta_1 + C_{it}\beta_2)$, where P_{it} is the number of syndicate members that participate in a focal investment round in venture i in year t (i.e., *Syndicate Size*), X_{it} is vector of independent variables capturing the presence of a CVC investor (i.e., *CVC/IVC*) and its compensation structure (i.e, *Short-Term, Long-Term*), C_{it} is a vector of control variables affecting P_{it}, and β_1, β_2 are the corresponding vectors of coefficient estimates.

The interpretation of the independent variables merits an explanation. By construction, the compensation indicators only receive the value of one when *CVC/IVC* equals to one. Therefore, in specifications that include *Short-Term* and *Long-Term*, the

coefficient on *CVC/IVC* implicitly represents the omitted category – CVC programs that lack any pay-for-performance component.[13] Consequently, the coefficient $\beta_1^{Short\text{-}Term}$ captures the difference between syndicate size involving a CVC with short-term compensation and those where personnel is compensated solely through straight salary. To discern whether the syndicate size of 'short term' CVC programs differs from that of all-IVC syndicates, the sum of the coefficients $\beta_1^{CVC/IVC} + \beta_1^{Short\text{-}Term}$ has to be considered. Finally, in some of the early specification that exclude *Short-Term* and *Long-Term,* the coefficient on *CVC/IVC* represents the average effect of CVC presence.

RESULTS

Univariate Analysis

This section compares the syndicate size of two syndication types, those involving only independent venture capital funds and those where a CVC investor is a syndicate member, and tests whether size differences are statistically significant. The effect of CVC compensation is studies in the next section, as part of the multivariate analysis.

Figure 2 presents the distribution of syndicate sizes for each group. Table 2 reports average syndicate size for each syndication type. The mean syndicate size for rounds involving only independent venture capital funds is 2.85, while syndications involving a single corporate investor along with a number of IVCs are of an average size of 4.91. That is, rounds in which only IVCs participate (i.e., *all-IVC*) have, on average,

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[13] CVC programs that are not covered by the BBM survey are assumed to compensate their staff through straight salary. This assumption seems reasonable given (a) the widespread use of straight salary within the subset of BBM respondents, and (b) the anecdotal evidence regarding the lack of pay-for-performance in most CVC programs.
Note, the assumption represents a conservative interpretation of the results. If uncoded programs employ long-term compensation rather than straight salary, we are less likely to find a significant coefficient on $\beta_1^{Short\text{-}Term}$.

2.85 unique investors. Rounds involving a single corporate investor along with IVCs (i.e., *CVC/IVC*), exhibit higher participation: on average there are 4.91 different investors. The average size of *all-IVC* syndicates is consistent with other syndication studies in Canada (Brander et al., 2002), U.K. (Wright and Lockett, 2003) and U.S. (Guler, 2003). The average size of investment syndicates that involve a corporate investor is not available elsewhere, to the best of our knowledge.

Using the Mann-Whitney nonparametric test, we test the hypothesis that *all-IVC* syndicates are smaller in size compared to syndicates involving a corporate investor. We opt for the Mann-Whitney test because it does not require an assumption of normality regarding the data. The difference is highly significant (z-statistics = 25.09, $p < .001$). To test the robustness of our results, a set of alternative explanations is identified and tested. Table 10 presents a summary of alternative explanations, corresponding tests and results.

Insert Figure 2 and Table 2 about here

First, differing propensity to invest alone may drive our findings. As is evident in Figure 2, a round that consists of a single investor is more common for IVCs (33% of the cases) than it is for CVCs (only 13% of the cases). This has an immediate downwards effect on the average *all-IVC* syndicate size. To account for this effect, we repeat our analysis for a sub-sample of syndicated investments (i.e., excluding all single investor rounds). We find that syndicated investments that involve a corporate venture capitalist exhibit significantly larger syndicate sizes in comparison to *all-IVC* syndicates (Table 2, Panel B). Thus, our findings are not a mere artifact of IVCs' propensity to invest alone.

Second, we recognize that differences in syndicate size may be a result of differential target stage, rather than CVC inclination to mitigate investment risk. If CVC investors have greater propensity to participate in later-stage rounds we may expected them to partake in larger syndicate size: a later-stage round usually requires a larger investment amount and may result in a larger syndicate size. Consequently, we analyze syndicate size for each investment stage. Table 2 (Panel C) demonstrates that differences in syndicate size persist within each stage. In other words, irrespective of round stage, syndicated rounds that involve corporate venture capitalists are statistically larger than similar stage rounds where syndicate members are all independent venture capitalists. Thus, the data is inconsistent with the assertion that dissimilar distribution across investment stages is driving differential syndication size.

Third, whether or not a venture's receives funding for the first time may also affect syndicate size, in addition to the venture's stage of development at the time of financing.[14] For example, it may be that CVC only participate in follow-up funding of attractive ventures. Because existing IVCs may seek participation to avoid dilution, syndicate size during follow-up rounds may be larger as it includes existing IVCs as well as the new syndicate member – the CVC investor. We limit our sample to initial rounds of investment, and find that syndicates that involve CVC are statistically larger than initial rounds of investment consisting solely of independent venture capitalists (Table 2, Panel D). Therefore, the result is inconsistent with the assertion that syndicate sizes differ due to excessive CVC participation in follow-up rounds.

[14] The initial round of financing need not be associated with a particular stage of the company: of the initial investment by *all-IVC*, 23%, 32%, 26% and 5% were in entrepreneurial ventures at the startup, early, expansion and later stage, respectively. For *CVC/IVC* investment syndicates, the occurrence of an initial investment is 24%, 43%, 26% and 3%, respectively.

Fourth, syndicate size may be driven by temporal changes. Particularly, it can be that most *CVC/IVC* investments occurred during a period that was characterized by greater syndicate memberships. To address this alternative explanation, we compare syndicate sizes year-by-year and find significant differences for each and every year (Table 2, Panel E). In other words, the results are inconsistent with the view that temporal differences in investment activity are driving differential syndication size.

Fifth, syndicate size may differ across industries, either due to varying level of effort that goes into the due-diligence process, dissimilar requirements for value-added services (e.g., due to greater specialization in some industries compared to others), or differential capital needs. If CVC investment are predominantly channeled towards ventures in such industries, we may observe them participating, on average, in larger syndicates. To address this confounding effect, we split the sample by venture's industry (based on the 2-digits VEIC code). Table 3 presents the results within the top ten 2-digits-VEIC industries, which account for 90% of the rounds in our sample. We find that differences in syndicate size persist within each and every one of the top ten industries. Investment rounds that involve corporate venture capitalists exhibit significantly larger syndicate sizes, which is inconsistent with the view that differential syndication size is solely an artifact of inherent differences in target-industry of investment.

Sixth, another way in which target industry may affect syndicate size has to do with investment as a mean of promoting standards. If an entrepreneurial venture is built around a product or service that employs a new standard, greater participation in the investment syndicate may reflect firms' commitment to promoting the standard. We take three steps to test for this alternative explanation. First, our sample is limited to

syndicates that include one CVC investor or less. Because promotion of a standard is likely to be undertaken by corporate investors, the exclusion of multiple-CVC syndicates decreases the likelihood that standard development is associated with larger pools. Second, standards do not play an equally important role in the various industries in our sample. Even if we believe that IVC are equally likely to join a CVC in a syndicate as means of promoting a standard, we would expect *CVC/IVC* investment to concentrate in those industries that are susceptible to standards. However, we could not find support to the claim that *CVC/IVC* investment patterns across industries differ significantly from *all-IVC* (results are not reported, but are available from the authors). Finally, if indeed standards are important in some industries and not others, one may expect significant differences in syndicate sizes only in those industries but not others (where standards are less important). However, Table 3 suggests that CVC/IVC syndicate size is larger within each and every one of the top ten industries.

Seventh, co-investors' prior experience may affect syndicate size. We know that the likelihood of participating in a syndicated investment increases in VC's experience and centrality (Sorenson and Stuart, 2001). Dissimilarity in *all-IVC* and *CVC/IVC* syndicate size may arise if CVC investors' opportunity to co-invest along with experienced venture capitalists differs from that of independent VCs. To that end, we study syndicate size as a function of investors' past experience. The experience measure is a count of the number of investor's portfolio companies that went public prior to the focal year.[15] Using this measure, we identify the most experienced investors (those

[15] For each year, we count the number of investor's portfolio companies that went public between 1990 and year t-1. The count is conducted at the general partner level, such that the measure of experience for Kleiner Perkins Caufield & Byers experience in the year 1998 consists of all the ventures across their various KPCB funds, which IPO-ed between 1990 and 1997.

ranking at the top 25% or 10%) and investigate the size of the syndicates in which they participate.[16] Table 4 reports that 47% of all investment rounds in 1998 included at least one highly experienced investor – as defined by being at the top 10% in terms of prior IPO experience – with greater involvement in *CVC/IVC* syndicates (59%) vs. *all-IVC* syndicates (46%). Similar pattern holds for 1999 financing rounds: 46%, 57% and 44%, respectively. If differential access to experienced co-investor is driving syndicate size than we should not find significant differences between *all-IVC* and *CVC/IVC* syndicates within the sub-sample of investment rounds that involve solely highly-experienced investors. Nonetheless, we find *CVC/IVC* syndicates are larger than *all-IVC* rounds, and the difference is statistically significant. In sum, controlling for the presence of experienced co-investors, we find that larger membership remains a key characteristic of *CVC/IVC* syndicates.

Eighth, the variation in syndicate size may be explained by sorting on the part of the IVCs. The key observation is that an IVC makes two choices: first, whether or not to co-invest along with a CVC investor, and second its preferred syndicate size. It is possible therefore that our observations are an artifact of some unobserved IVCs' attributes (*e.g.*, inherent capabilities, risk preference) such that certain IVCs seek CVC participation as well as larger syndicate membership while others seek smaller syndicates and no corporate participation. To address this concern, we hold the IVC constant, thus controlling for unobserved IVC attributes. Specifically, we focus on those IVCs that have ever syndicated with a CVC investor, comparing the size of the syndicates in which they

[16] With respect to 1998 financing rounds, we consider investors that had 2 (5) or more portfolio companies IPO between 1990 and 1997 in the top 25% (10%). With respect to 1999 financing rounds, we consider investors that had 3 (6) or more IPO between 1990 and 1998 in the top 25% (10%).

invest along with other IVCs to those in which they co-invest with a corporation.[17] Table 5 presents the results while holding IVC fund (Panel A), or IVC firm (Panel B) constant. We find that differences in syndicate size persist for the sub-sample of IVCs who are known to co-invest with corporations. Syndicates that involve a corporate venture capitalist exhibit significantly larger size, which is inconsistent with the view that differential syndication size is a result of inherent heterogeneity in IVC attributes.

Ninth, heterogeneity in ventures' quality may explain differences in syndicate size. It is possible that CVC-backed and IVC-backed ventures differ in their quality such that CVC investors face greater likelihood to fund ventures of higher quality. This, for example, may be the result of high-quality entrepreneurs actively choosing CVC-backing in hope of gaining access to corporate complementary assets, industry knowledge, customers, etc. Because higher-quality ventures are likely to command higher valuation and consequently necessitate greater syndicate membership, we may observe *CVC/IVC* syndicate that are systematically larger but not for the reason we hypothesized. Indeed, the average valuation of an IVC-backed venture is $6.6M in comparison to $13.2M for CVC-backed ventures. To address this concern, we stratify our sample into deciles based on ventures' post-round valuation (Table 6). We then establish that within each stratum the ventures are of homogeneous quality.[18] Next, we compare syndicate sizes within

[17] We spot all IVCs who participated in an *CVC/IVC* investment round. Next, we identify every subsequent *all-IVC* investments round in which these IVCs participated. We find that 1,676 unique IVC funds out of a total of 4,488 in our sample, have ever co-invested with a CVC investor. Recognizing that the same venture capital firm may have multiple funds, we repeat the exercise for firms and find that 944 unique IVC firms out of a total of 2,397 ever syndicated with a CVC investor.

[18] To establish that heterogeneity does not persist within each stratum, we test whether the valuation for *all-IVC* and *CVC/IVC* ventures are from populations with the same distribution. We find that they are. In other words, while the valuation of CVC-backed and IVC-backed venture differ in the overall sample (indicating quality heterogeneity), we establish that within each stratum the distribution of ventures' valuation does not differ between the two groups (suggesting ventures are of homogeneous quality).

each stratum and find that within nine of the ten deciles *CVC/IVC* syndicates are significantly larger than their *all-IVC* counterparts. Therefore, investment rounds that involve corporate venture capitalists exhibit predominantly larger syndicate sizes even after controlling for ventures' valuation (and potentially quality), which is inconsistent with the view that heterogeneity in ventures' quality is driving our results.

Insert Table 4, 5 & 6 about here

Multivariate Analysis

Table 7 presents the results of a Negative Binomial regression of syndicate size on a number of variables, including the presence of a CVC investor. Model 7-1 finds a positive and significant coefficient on *CVC/IVC*, which is consistent with Hypothesis 1, rounds that involve a corporate venture capitalist are associated with larger syndicate size in comparison to rounds where syndicate members are all independent venture capitalists. In Models 7-2 through 7-4 we introduce controls for other factors that may affect syndicate size: Model 7-2 includes a vector of dichotomous variables denoting venture's stage at the time of investment, Model 7-3 adds a vector of dichotomous variables denoting the year of investment, and a vector of dichotomous variables denoting venture's industry affiliation is included in Model 7-4. For parsimony, we do not report the coefficients on each and every dichotomous variable; rather we report likelihood-ratio tests which suggest that each model constitute an improvement in regression specification compared to the previous one. Most importantly, the estimates for *CVC/IVC* remain positive and highly significant, consistent with our hypothesis.

The next two models control for possible heterogeneity in ventures' quality. To that end, we either control for the decile in which focal venture's valuation falls (Model 7-5), or the dollar valuation of the focal venture (Model 7-6). The likelihood ratio test indicates that both models offer a significantly better specification compared to a model that includes no information on venture's quality. Importantly, the coefficients for *CVC/IVC* are again positive and highly significant.

As robustness check, we re-estimate the models for a few sub-samples (Table 8). In Model 8-1 we replicate Model 7-6 while excluding investments by a single investor (irrespectively of investor type). Thus, we analyze only syndicated investments while controlling for all of the confounding factors we discussed above. Consistent with Hypothesis 1, we find that the coefficient for *CVC/IVC* is positive and highly significant. In Model 8-2 we limit the sample to initial rounds of investment and include all control variables. Again we find *CVC/IVC* is positive and highly significant, consistent with our predictions. Models 8-3 repeats the analysis for a sub-sample of IVC funds that currently, or previously, syndicated with CVC investors and Models 8-4 does the same holding IVC firms constant (i.e., including all IVC firm that currently, or previously, co-invested along CVCs). Consistent with our predictions, the coefficient for *CVC/IVC* is positive and highly significant across the various samples and specifications.

As a test of Hypothesis 2, we investigate the effect of CVC compensation structure by including the variables *Short-Term* and *Long-Term* (Table 9). In Model 9-2 we estimate the specification of Model 7-4 (re-reported as Model 9-1) and include the two additional independent variables. The coefficient on *Short-Term* is negative but insignificantly different from zero. Interestingly, the coefficient on *Long-Term* is negative

and statistically significantly. We find similar results in Model 9-4, which replicates Model 7-6 (re-reported as Model 9-3) and incorporate *Short-Term* and *Long-Term*. In both Models 9-2 and 9-4, a Likelihood-ratio test indicates the inclusion of information regarding CVC compensations improves model's specification. In other words, the compensation scheme of corporate employees explains variance in investment practices.

What is the impact of short and long term compensation? The insignificant coefficient on *Short-Term* suggests syndicates in which 'straight salaried' CVCs and 'short-term' CVCs participate, exhibit no difference in size. moreover, the sum of *CVC/IVC* and *Short-term* coefficients is consistent with the hypothesis that rounds that involve a CVC investor are associated with substantially larger syndicate size in comparison to rounds where syndicate members are all IVCs. In contrast, long-term compensation schemes are associated with distinct CVC investment practices: the negative coefficient on *Long-Term* suggests these programs participate in smaller syndicates compared to 'straight salaried' CVCs. The sum of the coefficients on *CVC/IVC* and *Long-term* is positive and significant suggesting even 'long term' CVCs are associated with larger syndicates than that of an all-IVCs syndicate. Nonetheless, it is important to note the magnitude of the difference changed in the hypothesized direction: consistent with Hypothesis 2, CVC programs using long-term pay-for-performance employ investment practices that are more common with IVCs than other CVCs.

DISCUSSION

Our findings indicate that syndicates involving only independent venture capital funds are smaller than those where a corporate investor is a syndicate member along with the IVCs. These results are robust to various alternative explanations such as temporal or

industry effects, venture's stage, and heterogeneity in ventures' quality (see Table 10). We focus in the discussion on a few aspects of the syndication decision.

First, we note that syndication is a voluntary structure. As such, it emerges if and only if all syndicate members agree to do so, each weighing the costs and benefits associated with a particular syndicate size (i.e., each investors likely considers the four syndication rationales: risk-sharing, selection, referral, and value-added). This immediately raises a question – while CVCs may seek larger syndicate, why would fellow IVCs agree to a syndicate size that may reduce their payoff? The answer has to do with the observation that corporate investors often improves venture selection and enhance ventures' ultimate valuations, consequently raising the overall expected payoff. A larger *CVC/IVC* syndicate ensues if two conditions are met: (a) the corporate investor increases venture's expected payoff thereby winning IVCs consent to a larger syndicate size (a necessary condition), and (b) CVC personnel pushes towards larger syndicate membership in an attempt to mitigate investment risk (a sufficient condition). If one of the conditions is not satisfied, the reported differences in syndicate size could not have been observed. Put differently, if we were to abstract from risk-sharing considerations and focus solely on selection and value-added as syndication drivers, we might expect *CVC/IVC* syndicates to be smaller than *all-IVC* syndicates because the CVC brings superior selection and value-added capabilities that exceed the contribution of any one IVC. [19] Thus, only the risk-sharing rationale is consistent with our findings of larger *CVC/IVC* syndicates.

[19] To the extent that a CVC investor possesses superior selection and value-added capabilities, it may 'dominate' others as a syndicate member. Thus, a syndicate that consists of 3 IVCs and one CVC (i.e., 4 members altogether) may be as effective as an investment syndicate that consists of 5 IVCs.

Second, we stipulate that discrepancies in syndicate sizes reflect inherent differences in the structure of corporate and IVC incentives. Differences in (a) risk aversion, or (b) disposition to cognitive biases are unlikely to drive our results. We do not assume that risk profiles are exogenous; rather we explain that different risk tendencies can be tracked back to incentives which are a function of organizational membership (IVC vs. CVC). Specifically, our analysis emphasizes that even if individuals working for either an IVC or a CVC are equally risk-averse, the way incentives are set leads to CVC personnel to behave in a more risk-averse manner.

Cognitive biases can explain the differences in syndicate size only to the extent that corporate investors are uniquely predisposed to certain biases. For example, one may argue that greater escalation of commitment on the part of CVC can prompt it to fund an increasing number of ventures. As a result, CVC may have to 'stretch their dollars thin' by participating in a greater number of syndicates and contributing less funds to each syndicate, which may necessitate larger syndicate size. However, there is reason to believe that cognitive biases are common with IVCs as well (Guler, 2003). Moreover, because *CVC/IVC* syndicates include IVCs along with the corporate investor, we may expect that CVC's biases will be 'smoothed-out' by its fellow IVC syndicate members and thus should not affect the resulting syndicate size.

Finally, we do not assert that the size of investment syndicates that involve a corporate investor is sub-optimal. Nonetheless, we recognize that independent venture capitalists are investment professionals who are known to maximize their expected payoffs (Gompers and Lerner, 2001). Thus, the average size of an *all-IVCs* syndicate constitutes a valuable benchmark and any deviations from IVC practices are therefore

noteworthy and merit investigation. This paper attempts to present a potential explanation of this phenomenon.

CONCLUSIONS

This paper explores firms' ability to effectively invest in novel and highly uncertain technologies. We study investment syndicates, an investment practice that plays an important role in managing investment uncertainty (Gompers and Lerner, 2001). Based on an analysis of 15,191 investment syndicates in technology-based ventures during the 1990s, we find that syndicates involving a corporate investor are persistently larger in size than those where all syndicate members are independent venture capital funds. However, when firms employ long-term pay-for-performance to compensate their CVC personnel, the syndicate size differential shrinks significantly.

The history of corporate R&D management is a history of experimentation to find the right set of incentives (Merges, 1999). Following Jensen (1993), our analysis suggests that corporations exhibit risk-averse behavior, likely due to ineffective compensation schemes. We believe these insights may be instrumental in enhancing established firms ability to innovate and grow.

REFERENCES

Aboody, D. 1996. Recognition versus disclosure in the oil and gas industry. *Journal of Accounting Research*, 34, 21– 44.

Abowd, J., 1990. Does performance-based managerial compensation affect corporate performance? *Industrial and Labor Relations Review,* 43, 52-S–73-S.

Acs Z.J., R. Morck, J.M. Shaver and B. Yeung. 1997. The internationalization of small and medium-sized enterprises: a policy perspective. *Small Business Economics*, 9

Balkin, D., Markman, G., Gomez-Mejia, L., 2000. Is CEO pay in high technology firms related to innovation? *Academy of Management Journal,* 23, 1118–1129.

Birkinshaw, J., Murray, G. and van Basten-Batenburg, R. 2002. Corporate venturing: The state of the art and the prospects for the future. London: LBS.

Brander, J. A., R. Amit and W. Antweiler. 2002. Venture capital syndication: Improved venture selection versus the value-added hypothesis. *Journal of Economics and Management Strategy,* 11(3): 423-452

Block, Z., I. MacMillan. 1993. Corporate venturing: Creating new business within the firm. Harvard Business School Press: Boston, MA.

Block, Z. and O.A. Ornati. 1987. Compensating corporate venture managers, *Journal of Business Venturing*, 2

Bygrave, W.D. 1989. The entrepreneurship paradigm (II): Chaos and catastrophes among quantum jumps? *Entrepreneurship: Theory and Practice*, 14(2): 7-30

Chesbrough, H.W. 2002. Making sense of corporate venture capital. Harvard Business Review, *March*

Chesbrough, H.W. 2002. Graceful exits and foregone opportunities: Xerox's management of its technology spinoff organizations. *Business History Review*, 76(4): 803-838

Conyon, M.J., R.B. Freeman. 2004. Shared modes of compensation and firm performance: UK evidence", in Richard Blundell, David Card and Richard Freeman, eds., Seeking a Premier League Economy, University of Chicago Press, chapter 3, 109-146.

Datta, S., Iskandar-Datta, M., & Raman, K. 2001. Executive compensation and corporate a acquisition decisions. *Journal of Finance*, 61, 2299– 2336.

Gompers, P. 1995. Optimal investment, monitoring and the staging of venture capital, *Journal of Finance*, 50

Gompers, P. and J. Lerner. 1998. The determinants of corporate venture capital success: organizational structure, incentives and complementarities. NBER #6725: Cambridge, MA.

Gompers P. and J. Lerner. 1999. An analysis of compensation in the US venture capital partnership. *Journal. of Financial Economics* 51, 3-44.

Gompers, P. and J. Lerner. 2001. The Venture Capital Revolution. *Journal of Economic Perspectives*,15(2)

Guler, I. 2003. A study of decision making, capabilities, and performance in the venture capital industry. dissertation, University of Pennsylvania.

Hausman J., Hall B. Griliches Z. 1984. Econometric models for count data with application to patents- R&D Relationship. *Econometrica*, 52: 909-938.

Hellmann, T. and M. Puri. 2002. The Interaction between product market and financing decisions: The role of venture capital. *Review of Economics Studies,* 13 (4),959-984.

Hellmann, T., L. Lindsey, and M. Puri. 2004. Building relationships early: Banks in venture capital. BER WP #10535.

Hemmer, T., Kim, O., & Verrecchia, R. E. 1999. Introducing convexity into optimal compensation contracts. *Journal of Accounting and Economics*, 28, 307– 327.

Hirshleifer, D., & Suh, R. 1992. Risk, managerial effort, and project choice. *Journal of Financial Intermediation*, 2, 308– 345.

Holthausen, R., Larcker, D., & Sloan, R. 1995. Business unit innovation and the structure of executive compensation. *Journal Accounting and Economics*, 19, 279– 313.

Ittner, C. D., R. A. Lambert, and D. F. Larcker. 2003. The structure and performance consequences of equity grants to employees of new economy firms. *Journal of Accounting and Economics*, 34, 89-127.

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

Kahneman, D. and D. Lovallo. 1993. Timid choices and bold forecasts: A cognitive perspective on risk taking. *Management Science*, 39: 17-31

Kaplan. S. and P. Stromberg. 2004. Characteristics, contracts and actions: Evidence from venture capital analysis. Journal of Finance, 59(5)

Lambert, R. 1986. Executive effort and the selection of risky projects. *Rand Journal of Economics*, 17, 77– 88.

Lerner, J. 1994. The syndication of venture capital investments. *Financial Management,* 23:16-27

Lerner, J. and J. Wulf. 2006. Innovation and incentives: Evidence from corporate R&D. *working paper.*

MacMillan, I.C., Siegel, R. & SubbaNarasimha, P.N. 1985. Criteria used by venture capitalists to evaluate new venture proposals. *Journal of Business venturing*, 1(1)

MacMillan, I.C., Zemann, L. & SubbaNarasimha, P.N. 1987. Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *Journal of Business Venturing*, 2: 123–37.

Maula, M., Murray G. 2001. Corporate Venture Capital and the Creation of US Public Companies. In Creating value: Winners in the new business environment. Hitt, Amit, Lucier, Nixon (eds). Blackwell

McNally, K. 1997. Corporate venture capital: Bridging the equity gap in the small business sector. London: Routledge.

Merges, R.P. 1999. The law and economics of employee inventions. *Harvard Journal of Law and Technology,* 13, 1-61.

National Science Board, Committee on Industrial Support of R&D, 1992, The Competitive Strength of U.S. Industrial Science and Technology: Strategic Issues, Washington, DC: National Science Foundation.

Neumeyer, Fredrik, 1971, *The Employed Inventor in the United States: R&D Policies, Law and Practice*, Cambridge, MA: MIT Press.

Peterson, W., Birdsall, T. & Fox, W. 1954. The theory of signal detectability. Institute of Radio Engineers Transactions, PGIT-4, 171-212.

Prowse D. 1998. The economics of the private equity market. *Federal Reserve Bank of Dallas, 3rd quarter*

Rajgopal, S., & Shevlin, T. 2002. Empirical evidence on the relation between stock option compensation and risk taking. *Journal of Accounting and Economics*, 33, 145–171.

Sah R.K. and J.E. Stiglitz. 1986. The architecture of economic systems: Hierarchies or Polyarchies. *American Economic Review* (September): 716-727

Sahlman, W. 1990. The structure and governance of venture capital organizations. *Journal of Financial Economics*.

Sapienza, H. 1992. When do venture capitalists add value? *Journal of Business Venturing*, 7: 9-27

Shapira, Z. 1995. Risk taking: A managerial perspective. Russell Sage Foundation, New York.

Sorenson, O. and T.E. Stuart. 2001. Syndication networks and the spatial distribution of venture capital investments, *American Journal of Sociology*, 6: 1546-1588

Stuart, T., Hoang , Hybels 1999. Interorganizational endorsements and the performance of entrepreneurial ventures, *Administrative Science Quarterly,* 44: 315-349

Smith, C. W., Stulz, R. 1985. The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis*, 4, 391– 405.

Swalm, R.O.. 1966. Utility theory: Insights into risk taking. *Harvard Business Review*, 44

Sykes, H (1992) Incentive compensation for corporate venture personnel, *Journal of Business Venturing*, 7: 253-265

Teece, D. 1986. Profiting from technological innovation: Implication for integration, collaboration, licensing and public policy. *Research Policy*, 15: 285-305

Timmons, J.A. 1994. New Venture Creation. 4th Ed. Homewood, IL: Richard D. Irwin.

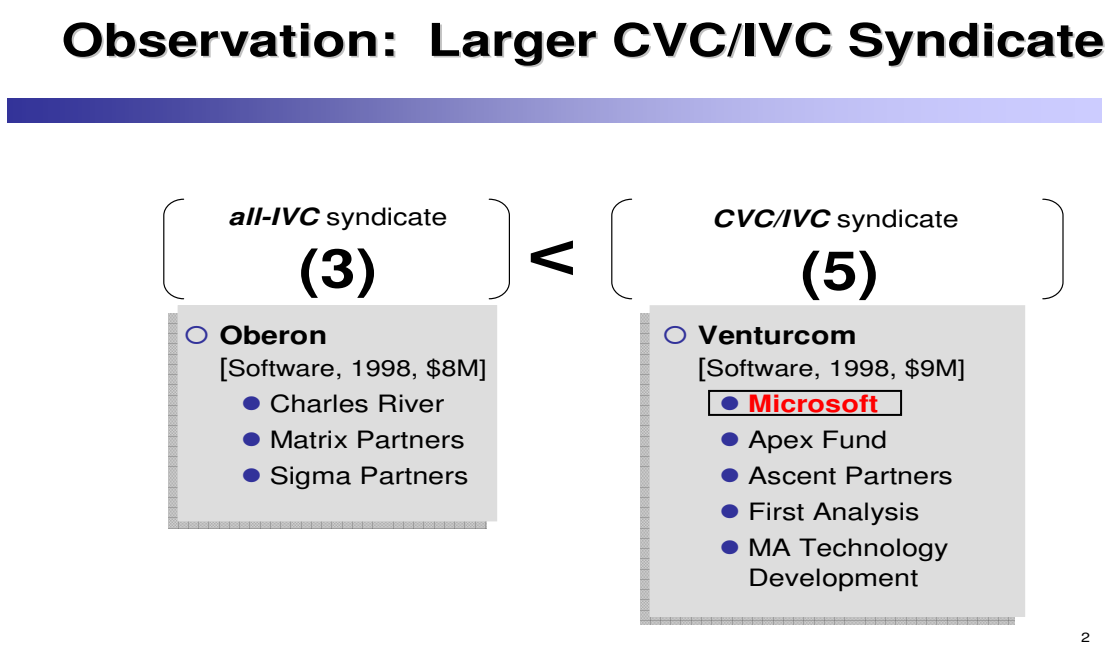
Viscusi, K., W. Magat and J. Huber. 1987. An investigation of the rationality of consumer valuations of multiple health risks. *Rand Journal of Economics*, 18

Wilson, R. 1968. The theory of syndicates. *Econometrica* 36(1): 119-132

Wright, M., Lockett, A., 2003. The structure and management of alliances: Syndication in the venture capital industry. *Journal of Management Studies* 40: 2073-2102

Figure 1: The Dependent Variable: A Count of the Number of Syndicate Members

Panel A



Panel B

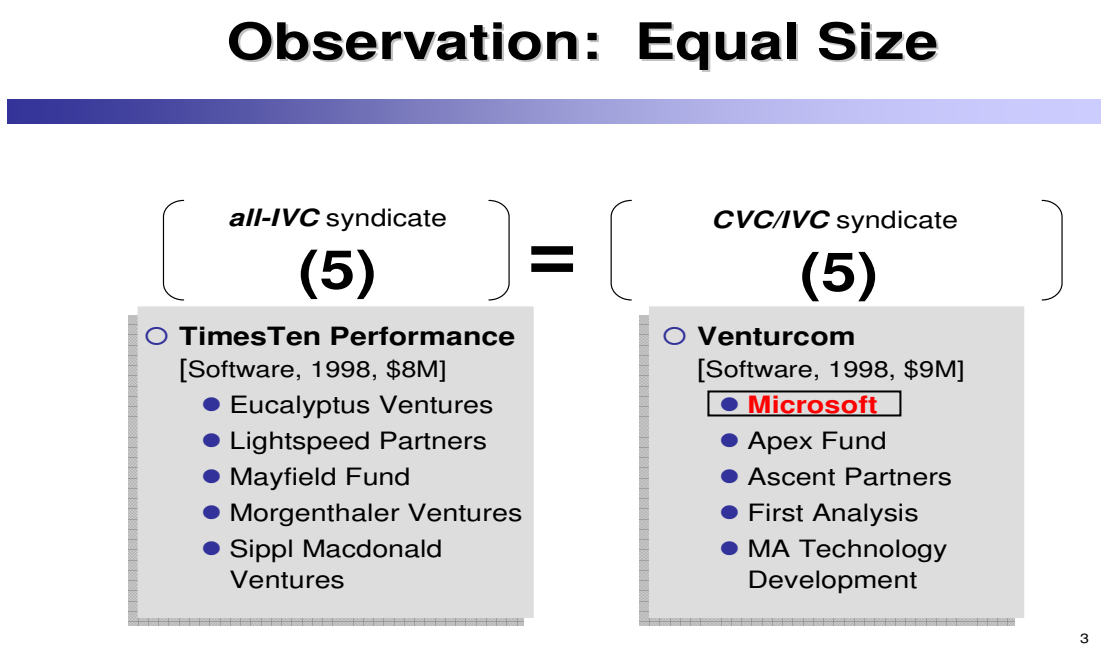


Figure 2: Distribution of Syndicate Sizes

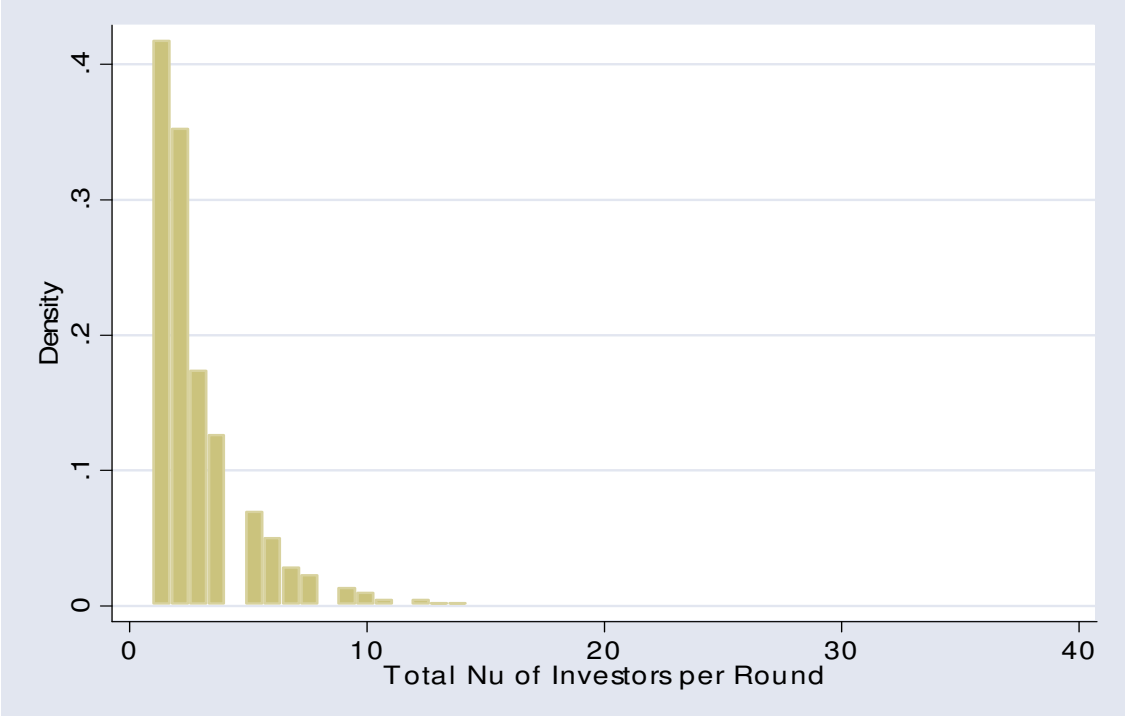


Figure 2a: Histogram of Syndicate Size where investment syndicates includes only independent venture capital funds

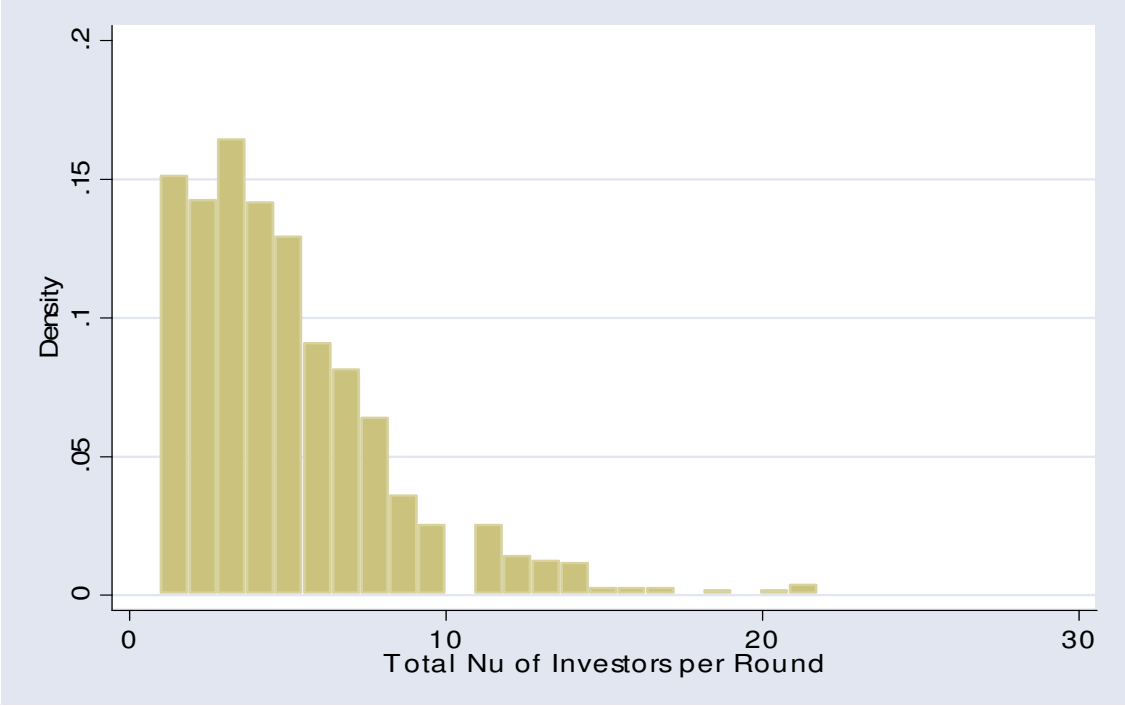


Figure 2b: Histogram of Syndicate Size where investment syndicate includes one corporate venture capital investor

Table 1: US Venture Companies by State and Industry

State	Software & Data Process.	Communications	Semiconductors & Electronics	Computer Equipment	Other[20]	Total
AK	1	2				3
AL	4	7	2	1	10	24
AR		3			3	6
AZ	32	7	7		19	65
CA	1,288	109	338	87	1,069	2,891
CO	104	29	13	6	83	235
CT	44	21	13	3	43	124
DC	3	9			11	23
DE	1	2		1	2	6
FL	60	40	9	3	50	162
GA	81	30	8		83	202
HI	3	1			1	5
IA	8	2	1		7	18
ID			3		2	5
IL	66	19	8	2	61	156
IN	7	1	1		3	12
KS	4	6			6	16
KY	4	5			5	14
LA	3	10			3	16
MA	368	35	53	26	284	766
MD	48	13	12	2	50	125
ME	6	2	1		8	17
MI	26	15	4	1	22	68
MN	42	7	5	3	63	120
MO	8	15	2		20	45
MS		8			3	11
MT	3	2			1	6
NC	51	11	9	1	51	123
ND	3	1			-	4
NE	4	1	1		2	8
NH	26	4	6	4	18	58
NJ	64	23	8	5	59	159
NM	2		1		2	5
NV	2	2	2	1	5	12
NY	153	58	16	6	184	417
OH	27	15	2	2	27	73
OK	4	5			4	13
OR	34	3	9	3	32	81
PA	92	24	4	5	86	211
RI	6	2			1	9
SC	4	8			6	18
SD					2	2
TN	12	5			12	29
TX	155	55	36	8	127	381
UT	24	6	1	3	15	49
VA	104	27	9	2	80	222
VT	3				1	4
WA	110	22	7	5	86	230
WI	8	3	2	1	7	21
WV	1	1			1	3
WY				1		1
Total	**3,113**	**683**	**595**	**184**	**2,724**	**7,299**

[20] Not affiliated with the previous four industries, or not coded.

Table 2: Mean and Median Syndicate Size

Panel	Mean		Median		Mann-Whitney
	***all*-IVC**	**CVC/IVC**	***all*-IVC**	**CVC/IVC**	***z*- statistics**
[A] All Rounds	2.85 [13,925]	4.91 [1,266]	2.0 [13,925]	4.0 [1266]	25.09 ***
[B] Only Syndicates	3.74 [9,391]	5.54 [1,093]	3.0 [9,391]	5.0 [1,093]	21.69 ***
[C] By Venture Stage					
Startup Rounds	2.60 [1,970]	3.5 [139]	2.0 [1,970]	3.0 [139]	5.35 ***
Early Rounds	2.69 [3,242]	3.73 [317]	2.0 [3,242]	3.0 [317]	8.09 ***
Expansion Rounds	3.08 [4,741]	5.35 [557]	2.0 [4,741]	5.0 [557]	17.02 ***
Later Rounds	3.62 [1,466]	6.43 [198]	2.0 [1,466]	6.0 [198]	11.16 ***
[D] Initial Investment	2.41 [6,069]	3.3 [392]	1.9 [6,069]	2.4 [392]	9.22 ***
[E] By Round Year					
1990	2.83 [833]	5.48 [29]	2.0 [833]	5.0 [29]	5.50 ***
1991	2.81 [688]	5.27 [26]	2.0 [688]	5.0 [26]	4.88 ***
1992	3.15 [868]	6.48 [31]	2.0 [868]	5.0 [31]	6.14 ***
1993	2.57 [699]	6.6 [20]	2.0 [699]	6.5 [20]	5.69 ***
1994	2.97 [771]	7.0 [31]	2.0 [771]	7.0 [31]	6.56 ***
1995	2.38 [1,018]	4.37 [59]	2.0 [1,018]	3.0 [59]	6.07 ***
1996	2.07 [1,588]	3.93 [102]	2.0 [1,588]	3.0 [102]	4.53 ***
1997	2.72 [1,882]	4.18 [164]	2.0 [1,882]	4.0 [164]	8.43 ***
1998	2.92 [2,302]	4.72 [212]	2.0 [2,302]	4.0 [212]	9.81***
1999	3.01 [3,276]	5.12 [592]	2.0 [3,276]	4.0 [592]	14.31 ***

Table reports average and median syndicate size for all-IVC and CVC/IVC rounds.
Numbers in square brackets represents number of rounds. * $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$

Table 3: Mean Syndicate Size by Ventures' Industry Affiliation

Ventures' Industry Affiliation	***all*-IVC**	**CVC/IVC**	**Mann-Whitney *z*-statistics**
Computer Software **(VEIC=27)**	2.8 [4,985]	4.7 [397]	-14.98 ***
Internet / Online Related **(VEIC=28)**	3.0 [1,941]	4.8 [331]	-9.92 ***
Data Communication **(VEIC=15)**	3.3 [1,892]	5.2 [251]	-8.61 ***
Commercial Communication **(VEIC=11)**	1.9 [782]	7.6 [20]	-6.73 ***
Electronic Components **(VEIC=31)**	3.1 [689]	5.1 [56]	-5.42 ***
Wireless Communication **(VEIC=13)**	3.3 [537]	5.8 [40]	-4.53 ***
Digital Imaging **(VEIC=22)**	2.9 [499]	5.1 [43]	-6.90 ***
Wired Communication **(VEIC=12)**	2.7 [416]	4.8 [25]	-2.96 **
Computer Peripherals **(VEIC=25)**	3.0 [390]	4.6 [25]	-2.48 *
Computer Services **(VEIC=26)**	2.5 [326]	3.6 [20]	-2.49 *

Table reports average syndicate size for all-IVC and CVC/IVC rounds in the ten industries that received most investment, using 2-digits Venture Economics Industry Classification (VEIC) scheme. Numbers in square brackets represents number of rounds.
* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$

Table 4: Mean Syndicate Size by IVC Prior Experience

All Rounds	% of Top-Experienced	Top-Experienced Rounds (a) ALL	*(b)* *all*-IVC	(c) CVC/IVC	Mann-Whitney *z*-statistics (b) vs. (c)
Panel A: 1998 Financing Rounds					
3.1 [2,514]	25%	3.6 [1,654] (66%)	3.4 [1,478] (64%)	5.3 [173] (82%)	-9.06 ***
3.1 [2,514]	10%	3.9 [1,193] (47%)	3.7 [1,068] (46%)	6.0 [125] (59%)	-9.11 ***
Panel B: 1999 Financing Rounds					
3.4 [3,868]	25%	4.2 [2,232] (58%)	3.7 [1,822] (56%)	6.2 [410] (69%)	-14.09 ***
3.4 [3,868]	10%	3.9 [1,783] (46%)	4.0 [1,445] (44%)	6.6 [338] (57%)	-13.13 ***

Table reports average syndicate size for 1998 and 1999 financing rounds, as well as for sub-sample of rounds involving top-experienced investors (all, all-IVC, or CVC/IVC). We consider investors that had 2 (5) or more portfolio companies IPO between 1990 and 1997 in the top 25% (10%). For the period, 1990 to 1998, we consider investors with 3 (6) or more IPOs in the top 25% (10%).[21]
Numbers represent [number of rounds] or (% of similar rounds that year).[22]
* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$

[21] For each year, we count the number of investor's portfolio companies that went public between 1990 and year t-1. The count is conducted at the general partner level, such that the measure of experience for Kleiner Perkins Caufield & Byers experience in the year 1998 consists of all the ventures across their various KPCB funds, which IPO-ed between 1990 and 1997.

[22] The 173 CVC/IVC rounds in the 25% top-experienced rounds for year 1998, constitute 82% of the 212 CVC/IVC rounds that year (see also Table 2, Panel D).

Table 5: Mean Syndicate Size Holding IVC constant

Holding IVC Constant	***all*-IVC**	**CVC/IVC**	**Mann-Whitney *z*-statistics**
Panel A: IVC Fund Constant			
At least one IVC previously syndicated with a CVC investor	3.5 [9,498]	4.9 [1,266]	-15.86 ***
All IVCs previously syndicated with a CVC investor	2.2 [4,115]	4.9 [1,266]	-30.23 ***
Panel B: IVC Firm Constant			
At least one IVC previously syndicated with a CVC investor	3.3 [10,858]	4.9 [1,266]	-18.85 ***
All IVCs previously syndicated with a CVC investor	2.5 [6,933]	4.9 [1,266]	-27.54 ***

Table reports average syndicate size for all-IVC and CVC/IVC rounds while holding IVC constant (i.e., for a sub-sample of IVCs that currently, or previously, co-invested along with CVC investor).
Panel A holds IVC fund constant (e.g., Kleiner Perkins Fund I). It requires that *all-IVC* syndicates include at least one IVC previously syndicated with a CVC investor (9,498 rounds meet this threshold), or be fully comprised of IVCs previously syndicated with a CVC investor (4,115 rounds meet this stricter threshold). Panel B holds IVC firm constant (e.g., all Kleiner Perkins investments, irrespectively of which specific KPCB fund). It requires that *all-IVC* syndicates include at least one IVC (10,858 rounds meet threshold), or all IVCs (6,933 rounds meet threshold) previously syndicated with a CVC.
Numbers in square brackets represents number of rounds. * $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$

Table 6: Mean Syndicate Size by Round Valuation

Stratum	Stratum Round Valuation	*all*-IVC	CVC/IVC	Mann-Whitney z-statistics
1	***$0 - $200*** †	1.5 [1,448]	3.5 [12]	-1.97 *
2	***$201 - $561*** †	1.9 [1,337]	2.1 [27]	-0.38
3	***$562 - $1,050*** †	2.2 [1,366]	3.2 [56]	-3.70 ***
4	***$1,051 - $2,000*** †	2.4 [1,728]	3.5 [102]	-5.44 ***
5	***$2,001 - $3,000*** †	2.8 [1,339]	3.4 [74]	-2.19 *
6	***$3,001 - $4,000*** †	3.1 [947]	4.0 [91]	-3.41 ***
7	***$4,001 - $5,700*** †	3.8 [1,230]	4.2 [141]	-4.70 ***
8	***$5,701 - $8,500*** †	3.9 [1,260]	4.6 [190]	-4.90 ***
9	***$8,501 - $15,000*** †	4.1 [1,213]	5.1 [230]	-6.07 ***
10	***$15,001 -*** †	4.6 [1,050]	7.6 [279]	-11.33 ***

Table reports average syndicate size for all-IVC and CVC/IVC rounds.
To establish the relevance of each stratum, we test whether the two independent samples (i.e., valuation for all-IVC and CVC/IVC rounds) are from populations with the same distribution: † denotes the two are from populations with the same distribution, at $z < 0.05$.
Numbers in square brackets represents number of rounds. * $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$

Table 7: Multivariate Analysis of Syndicate Size

The dependent variable is a count of the number of syndicate members (IVC or CVC investors) that participate in a focal investment round. The main independent variable, *CVC/IVC*, gets the value zero if the focal investment round is all-IVC syndicate, or one if it is a mixed CVC, IVC syndicate. *Venture Stage Dummies,* a vector of dichotomous variables denoting whether the focal round is startup, early, expansion or later. *Year Dummies*, a vector of dichotomous variables denoting the year of the focal round (1990-1999). *Venture Industry Dummies*, a vector of dichotomous variables denoting the 2-digits VEIC code of the venture. *Round Valuation Dummies*, a vector of dichotomous variables denoting the stratum affiliation given focal round valuation. *Round Valuation,* post-round valuation (in thousands). For continuous variables, the table reports parameter coefficient estimates, robust (White) standard errors are in brackets (* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$). For dichotomous variables, the table reports inclusion of a vector of variables and a log-likelihood test vis-à-vis a preceding model. Models 7-1 through 7-4 are based on the full sample (#, due to missing industry info, the number of observations drops in Models 7-5 and 7-6).

	(7-1) Full	**(7-2) Full**	**(7-3) Full**	**(7-4) Full**	**(7-5) Full#**	**(7-6) Full#**
CVC / IVC	0.545*** [.02]	0.526*** [.02]	0.480*** [.02]	0.464*** [.02]	0.294*** [.02]	0.452*** [.02]
Venture Stage Dummies	–	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Year Dummies	–	–	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	–	–	–	*Incl.*	*Incl.*	*Incl.*
Round Valuation Dummies	–	–	–	–	*Incl.*	–
Round Valuation	–	–	–	–	–	0.000*** [.00]
Constant	1.048*** [.01]	1.050*** [.03]	0.875*** [.04]	0.907*** [.11]	.0435*** [.11]	0.872*** [.11]
N	15,191	15,191	15,191	15,191	14,120	14,120
Pearson chi²	653***	775***	1216***	1553***	4931***	1601***
LR-Test		(1)→(2) 240***	(2)→(3) 817***	(3)→(4) 493***	(4)→(5) 8904***	(4)→(6) 4559***

Table 8: Multivariate Analysis of Syndicate Size

The dependent variable is a count of the number of syndicate members (IVC or CVC investors) that participate in a focal investment round. The main independent variable, *CVC/IVC*, gets the value zero if the focal investment round is all-IVC syndicate, or one if it is a mixed CVC, IVC syndicate. Model 8-1 through 8-4 replicate Model 7-6 for a variety of sub-samples. Model 8-1 is based on a sub-sample of syndicated investments, i.e., excluding rounds in which there was a single investor (either IVC or CVC). Model 8-2 is based on a sub-sample of initial round of investment, irrespectively of the venture stage at the time of financing. Models 8-3 replicates Models 7-6, holding IVC fund constant (i.e., it requires that all-IVC syndicates be fully comprised of IVC funds -- e.g., Kleiner Perkins Fund I -- previously syndicated with a CVC investor). Similarly, Model 8-4 holds IVC firm constant (i.e., all investments by the firm Kleiner Perkins, irrespectively of the specific KPCB fund). For description of control variables see Table 7. For continuous variables, the table reports parameter coefficient estimates, robust (White) standard errors are in brackets (* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$). For dichotomous variables, the table reports inclusion of a vector of variables and a log-likelihood test vis-à-vis a preceding model. Models 8-1 and 8-4 are based on the complete sub-sample and due to missing industry information, the number of observations drops in the other models.

	(8-1) Syndicated Investment	**(8-2) Initial Investment**	**(8-3) Holding IVC Fund**	**(8-4) Holding IVC Firm**
CVC / IVC	0.337*** [.04]	0.307*** [.04]	0.697*** [.02]	0.558*** [.02]
Venture Stage Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Round Valuation	0.000** [.00]	0.000*** [.00]	0.000***	0.000***
Constant	1.382*** [.11]	0.529*** [.13]	0.505*** [.18]	.237 [.15]
N	9,892	5,982	5,012	7,652
Pearson chi^2	1189***	318***	5208***	1566***

Table 9: Multivariate Analysis of Syndicate Size and CVC Compensation Structure

The dependent variable is a count of the number of syndicate members (IVC or CVC investors) that participate in a focal investment round. The independent variable, *CVC/IVC*, gets the value zero if the focal investment round is all-IVC syndicate, or one if it is a mixed CVC, IVC syndicate. *Short-Term* is equal to one if CVC personnel are compensate by short-term bonus, zero lese. Similarly, *Long-Term* is equal to one if long-term compensation are employ by the CVC program, zero lese. Models 9-1 and 9-3 reiterate Models 7-4 and 7-6, respectively. Models 9-2 (9-3) replicate Models 9-1 (9-3) and includes the measures of CVC compensation structure. For description of control variables see Table 7. For continuous variables, the table reports parameter coefficient estimates, robust (White) standard errors are in brackets (* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$). For dichotomous variables, the table reports inclusion of a vector of variables and a log-likelihood test vis-à-vis a preceding model. Models 8-1 and 8-4 are based on the complete sub-sample and due to missing industry information, the number of observations drops in the other models.

	(9-1) Full	**(9-2) Full**	**(9-3) Full#**	**(9-4) Full#**
CVC / IVC	0.464*** [.02]	0.483 *** [.00]	0.452 *** [.02]	0.469 *** [.00]
Short-Term	–	–0.061 [.22]	–	–0.050 [.17]
Long-Term	–	–0.431*** [.01]	– [.02]	–0.450*** [.01]
Venture Stage Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Round Valuation	–	–	0.000*** [.00]	0.000*** [.00]
Constant	0.907 *** [.01]	0.907 *** [.03]	.872 *** [.11]	0.871*** [.11]
N	15,191	15,191	14,120	14,120
Pearson chi²	1553 ***	1580 ***	1601 ***	1634 ***
LR-Test		(1)→(2) 21.2 ***		(4)→(6) 20.6 ***

Table 10: Summary and Critique of Alternative Explanations

Alternative explanation	Test	Result
Single vs. Syndicated Investment More all-IVC rounds consist of a single investor (33%) compared to CVC rounds (12%), thus driving the average syndicate size downwards.	Compare syndicate size for a sub-sample the excludes single investors [Table 2, Panel B]	*Not supported* Differences hold for the *sub-sample.*
Venture Stage All-IVC and CVC/IVC invest in different stages, such that differences in syndicate size reflect different stage need.	Compare syndicate size *within* each venture stage. [Table 2, Panel C]	*Not supported* Differences persist *within* each stage.
Initial vs. Follow-up Rounds CVC likely participate in follow-up rounds in attractive ventures, such that differences in syndicate size reflect the fact that follow-up rounds involve new investors in addition to existing ones.	Compare syndicate size for a sub-sample of *initial investments* [Table 2, Panel D]	*Not supported* Differences hold for the *sub-sample*.
Year of Investment All-IVC and CVC/IVC invested during different time periods, such that differences in syndicate size reflect temporal differences.	Compare syndicate size *year-by-year.* [Table 2, Panel E]	*Not supported* Differences persist *each year.*
Venture Industry All-IVC and CVC/IVC invest in different industries, such that differences in syndicate size reflect differences in industry structure and requirements.	Compare syndicate size *within* each industry. [Table 3]	*Not supported* Differences persist *within* each industry
Promoting Standards CVCs, as opposed to all-IVC, may invest to promote a standard. As such, large syndicate size reflects commitment to the proposed standard.	• Consider only syndicates with a single CVC. • Compare syndicate size *within* each industry. [Table 3]	*Not supported* Differences persist *within* each industry.
IVC Prior Experience CVC may face different opportunity to co-invest with experienced investor, such that differences in syndicate size reflect syndicate under/over-experience.	Compare syndicate size for a sub-sample of *experienced co-investors.* [Table 4]	*Not supported* Differences hold for the *sub-sample*.
Heterogeneity in IVCs' preferences IVCs that choose to co-invest with CVC have deferential preferences than IVCs that choose not to, such that differences in syndicate size may reflect IVC inherent attributes.	Compare syndicate size for a sub-sample of IVCs that *previously co-invested with CVCs.* [Table 5]	*Not supported* Differences hold for the *sub-sample*.
Heterogeneity in Ventures' Quality All-IVC and CVC/IVC invest in ventures of different quality. Higher-quality venture are likely to command higher valuations such that syndicates which fund those ventures are likely to be bigger.	Control for ventures' quality by comparing syndicate size *within* ten valuation stratum. [Table 6]	*Not supported* Differences persist *within* each stratum.