Entrepreneurial Finance Meet Corporate Reality: Comparing Investment Practices by Corporate and Independent Venture Capitalists

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This version: August 19, 2007

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ABSTRACT

This paper investigates the relationship between the compensation of corporate personnel and their investment in new technologies. To that end, we focus on a specific corporate activity, namely Corporate Venture Capital (CVC, describing minority equity investment by established firms in entrepreneurial ventures). The setting offers an opportunity to compare corporate practices to those of investment experts, the independent VCs. We observe disparity between the number of participants in venture capital syndicates that involve a corporate investor, and those that consist solely of independent VCs. The differences persist after controlling for numerous factors including CVC's objectives. The disparity shrinks substantially, however, for a subset of CVC programs that compensate their personnel using performance-pay (e.g. carried interest). We find a parallel pattern when analyzing the relationship between compensation and another investment practice, staging of investment. These empirical patterns provide direct evidence that compensation schemes critically shape the risk preferences of corporate personnel and hence affect the investment practices they undertake. We conjecture that the deviation from VCs' 'best practice' is due mainly to idiosyncratic corporate compensation schemes.

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> "The fact of the matter is that while opportunity abounds, there is an even greater amount of risk. Investments fail, and startups rarely succeed… The problem for the aspiring CIO venture capitalist… is that laying tons of eggs and hoping some of them hatch is fundamentally at odds with the way most corporations work." (*Chief Information Officer Magazine*; May, 2001)

Corporate personnel are often required to pursue investment in innovative yet risky projects. The reality in which corporate R&D investment is undertaken, however, often hinders these efforts. In his presidential address to the American Finance Association, Jensen (1993) notes that the total annual disbursements from the venture-capital 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 underscores the need to understand the effects of corporate compensation schemes on corporate investment decisions.

We heed the call and study the impact of corporate incentives 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., innovative companies that seek capital to continue operation. CVC investment opens a window onto new markets and novel technologies, thus offering established firms an opportunity to advance their innovation efforts ("[Nokia Ventures] *will help to fuel future growth and to boost new product and long-term business development, Nokia hopes.*", Dow Jones; April, 1998).

We study the compensation—investment relationship using a sample of 13,096 investment rounds in U.S.-based ventures during the time period 1990-1999. We focus on two investment practices; staging (Gompers, 1995) and syndication (Lerner, 1994). They play an important role in managing investment uncertainty, and are commonly used by corporate and independent venture capitalists alike (Gompers and Lerner, 2001). Staging implies that a venture

is not fully financed upfront. Rather, investment rounds take place at distinct stages of venture's development. Syndication occurs when two or more investors participate in a given round. A syndicate may consist of both corporate investors and independent venture capitalists (IVC).

Our approach is to compare investment practices across two different round types: (a) those involving only independent venture capital funds (denoted *all-IVC*), and (b) those where a corporate investor co-invests with IVCs (denoted *CVC/IVC*). Analysis of investment stage indicates that in comparison to *all-IVC* rounds, those in which a CVC participates target ventures at later stages of development. That is, the investment practices of CVCs and IVCs differ. Interestingly, the magnitude of the difference is affected by the nature of corporate venture capitalists' compensation. It is large when CVC personnel receive little or no performance-pay, yet shrinks significantly when they are privy to performance-pay. Analysis of investment syndicates yields similar results. *All-IVC* syndicates are persistently smaller in size (that is, fewer participants are involved) than those where a corporate investor is a syndicate member. The syndicate size disparity shrinks substantially if a CVC program awards performance-pay. Results are robust to various alternative explanations such as temporal or industry effects, or heterogeneity in ventures' quality. Our findings are not sensitive to CVC objectives; they hold for strategically-oriented programs as well as for CVCs that seek financial returns. Furthermore, results are robust to a Treatment-Effect model (Heckman, 1979; Maddala, 1983) which addresses the possibility that compensation and behavior of CVC personnel are endogenously determined.

The purpose of this paper is twofold. First, it sheds light on the little studied behavior of corporate investors. Our findings suggest that performance-pay shapes the risk preferences of CVC personnel and hence affect their investment practices. Second, it informs the broader literature on compensation and R&D investments (e.g., Hoskisson, Hitt and Hill, 1993). Extant work reports an

association between compensation and overall-firm-performance, and assumes it is due to the motivating impact the former has on managerial behavior. We substantiate the conjecture by (a) observing the investment practices managers actually undertake, and (b) documenting their sensitivity to performance-pay. Moreover, our research approach affords intuitive interpretation of CVC behavior; to the extent that independent venture capitalists are expert investors, their investment practices serve as a benchmark against which CVC practices can be assessed.

A couple of clarifications are warranted. First, we takes investor's rather then venture's perspective. Actions that are good for the latter usually benefit the former, though not always so. For example, a bigger syndicate can enhance a venture's valuation (as each syndicate member provides unique support), yet it might hurt a focal investor's performance (because 'spoils' are split among a larger group). Hence, studies comparing ventures' performance under CVC- vs. IVC-backing (Gompers and Lerner, 1998; Maula and Murray, 2000) provide indicative but not conclusive evidence regarding the performance of the CVC investors. Second, due to strict data limitation we study the impact of compensation on investment-practices yet abstract from investor's subsequent performance.[1]

The remainder of the paper is organized as follows. Section 2 reviews related work. Section 3 delineates our research design and hypothesizes as to CVCs and IVCs staging and syndication behavior. Methods and results are presented in Sections 4 and 5, respectively. Section 6 covers alternative explanations and syndication decisions. Section 7 concludes.

[1] The confidentiality policy of our data source explicitly state "*Data concerning individual fund performance, cash flows, commitments, takedowns, distributions, investors, etc. is embargoed without time limit*." (http://www.ventureeconomics.com/vec/methodology.html#36). In the only large-scale empirical study to date, Kaplan and Schoar (2005) faced strict restrictions and note "*We do not know the identities of the particular [venture capitalist]*..."(p.1794). These restrictions render impossible a comparison of CVC and IVC outcomes.

THEORETICAL BACKGROUND

The principal-agent framework analyzes the relationship between incentives and risk-taking behavior. A key upshot is that compensation schemes may be used to guide a manager toward performance-maximizing choices by affecting his or her risk preferences. Fueled by data availability for public firms, this insight stimulated a stream of work which empirically explores the relationship between the compensation of the CEO, or other top executives, and overall firm performance. Due to data scarcity, there is less evidence regarding the compensation–performance association for managers outside the executive-suite. Furthermore, few studies directly explore the impact of executives' compensation on actual managerial actions (as opposed to overall firm performance).

Theoretically, an agency relationship is said to exist between a firm's shareholders (i.e., principal) and its managers (i.e., agents). Principal-agent models assume shareholders are risk-neutral as they can hold a diversified portfolio while managers are risk-averse because their job security and income are tied to one firm. From the manager's perspective, fixed salary is the efficient risk-sharing arrangement. The risk-averse manager receives a guaranteed pay while risk-neutral shareholders takes on the risk associated with uncertain future outcomes (Holmstrom, 1979; Shavell, 1979). From the shareholders' perspective, managers should maximize firm value by undertaking all positive net present value projects regardless of their riskiness (hereafter we use risk and variance interchangeably; c.f., Mansfield, 1981). Risk-averse managers, however, would opt for low variance projects and may pass up some positive but risky NPV projects that shareholders would like to pursue. Absent an ability to constantly monitor managerial action, shareholders have to motivate managers. They can do so by offering performance-pay. Having a manager bear some of the uncertainty regarding future performance will induce her to invest in profitable yet risky projects, which may otherwise be foregone as too risky (Holmstrom, 1979). In sum, a key

characteristic of compensation schemes is the tradeoff between risk-sharing (managerial perspective) and motivation (principle perspective) (Levinthal, 1988; Eisenhardt, 1989).

Empirically, the indirect impact of compensation on firm performance is well studied. Abowd (1990) reports a positive association between a firm's stock returns and the sensitivity of executives' compensation to firm value in the previous year. Rajagopalan (1996) documents performance increases in dynamic-oriented firms following the adoption of stock-based incentive plans. Shifting from financial to operational measures, Conyon and Freeman (2004) observe greater firm productivity in the presence of stock-option plans. Performance-pay is said to enhance innovativeness in Japanese firms (Quinn and Rivoli, 1993), and increase R&D expenditure by US firms (Hoskisson, Hitt and Hill, 1993). Balkin, Markman, and Gomez-Mejia (2000) show that equity-based CEO compensation is related to greater R&D investment and patent output.

A similar pattern emerges in the context of non-executive compensation. A small stream of work explores the compensation of divisional and mid-level managers. These managers are often the ones making investment decisions (Chandler, 1991; Hoskisson and Hitt, 1988). Divisional innovativeness (ratio of division's patents to sales) is associated with performance-pay to the division's head (Hoskisson *et al.*, 1993; 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). Lerner and Wulf (2006) find that the production of highly cited patents is associated with high-incentives awarded to R&D unit heads. These studies assume compensation affects performance by inducing managers to invest in high-risk high-return projects.

The direct relationship between managerial compensation and project selection is the focus of a third stream of research. Formal models predict that stock options stimulate managers to select riskier projects as those amplify a firm's variance, and subsequently increase the value of managers'

options (Lambert, 1986; Smith and Stulz, 1985; Hirshfleifer and Suh, 1992; Hemmer, Kim and Verrecchia, 1999). Evidence, however, is scarce because of measurement challenges. Nonetheless, several studies record the impact of managers' compensation on their choice of risky investments. Datta, Iskandar-Datta and Raman (2001) study M&A activity and find that managers with substantial equity compensation engage in riskier takeovers. Rajgopal and Shevlin (2002) analyze oil and gas companies. They find that variance on future cash-flow of exploration projects is positively associated with the sensitivity of managers' options to stock volatility.

To conclude, the principal-agent framework suggests that the sensitivity of managerial compensation to outcomes affects managers' choice of risky projects and may consequently maximize the firm's value. Empirical evidence is mainly supportive of the positive compensation-performance relationship, though only limited evidence exists regarding the direct effect of compensation schemes on subsequent managerial choices.

THE VENTURE CAPITAL MARKET

The venture capital context is uniquely fit for studying the way in which compensation affects behavior. Funding entrepreneurial ventures is tantamount to investment in risky projects due to high level of uncertainty regarding technological feasibility, future demand, etc. (Kaplan and Stromberg, 2004; Scherer, Harhoff and Kukies, 2000). The first sub-section reviews the characteristics of corporate and independent venture capitalists. Per our research question, the discussion centers on differences in compensation schemes of investment personnel. Next, we note that investors employ various practices to manage the level of risk they face (Gompers and Lerner, 2001). The second sub-section details two practices; investment-stage and investment-syndicate. These practices are well documented, and most importantly, universally employed by

CVCs and IVCs alike. Combining these observations, the last sub-section hypothesizes how compensation schemes affect investors' staging and syndication choices.

Venture Capital Investors

Independent venture capital funds. Independent VC funds are limited partnerships that pool and manage money from entities such as pension funds and wealthy individuals. IVCs seek high financial returns. To that end, they invest in growth-oriented business ventures from which they then exit, usually via an IPO or an acquisition (Gompers and Lerner, 2001). IVCs manage all aspects of the investment, from opportunity identification through due-diligence process and post-investment monitoring. They also offer a variety of value-added services to their portfolio companies (Sapienza, 1992; Sapienza and Manigart, 1996; Timmons, 1994).

The compensation of IVCs consists of two elements (Sahlman, 1990; Lerner, 1994; Gompers and Lerner, 1999). The first is a fixed management fee which the IVC draws annually; about 1.5%-3% of funds' assets. The second element is contingent on performance. It is referred to as 'carried interest' and usually runs about 20% of the funds' profits. Note that IVC funds are run by a handful of partners (e.g., average fund consists of 8 to 9 professionals, Venture Economics), thus the individuals making investment decisions are also those receiving management fees and carried interest.

Corporate venture capital. Established firms are important players in the venture capital market (Prowse, 1998; Timmons, 1994). They too invest in growth-oriented ventures. Their objectives vary, though: some focus on achieving financial gains, while most CVC programs seek a window on novel technologies (Siegel et al., 1988; Chesbrough, 2002; Dushnitsky and Lenox, 2005a, b; Benson and Ziedonis, 2005; Keil, 2002, 2004). Corporate investors assist portfolio companies by (a) providing value-added services similar to IVC funds (Block and

MacMillan, 1993), (b) leveraging corporate resources; e.g. corporate laboratories, firm's network of suppliers and customers (Maula and Murray, 2001; Dushnitsky and Lenox, 2005b), and (c) endorsing the venture vis-à-vis third parties (Stuart, Hoang and Hybels, 1999).

As for compensation, fixed salary remains the most common scheme among managers in CVC programs (Block and Ornati, 1987; McNally, 1997). In recent years, however, one sees greater heterogeneity in CVC compensation schemes (Birkinshaw, Murray and van Basten-Batenburg, 2002). A small minority of programs give CVC personnel high-powered incentives in the form of 'carried interest.' A larger minority compensate managers through annual bonuses based on financial or strategic metrics. Overall, the majority of CVC managers receive fixed salary, and only a smaller number of programs award managers for success. We emphasize that compensation schemes are exogenous to the program's objective. Prior work and discussions with CVC mangers support this observation. The 'Hypotheses Development' section expands on the issue, and the 'Results' section empirically addresses endogeniety concerns.

Venture Capital Practices

Investment Stage. Investors rarely provide all the capital that a venture needs upfront. Instead, they invest in companies at distinct stages of their development (Sahlman, 1990; Gompers and Lerner, 2001). Rationing of capital gives investors the right to abandon a venture with unfavorable prospects. It thus stimulates entrepreneurs to put an effort toward meeting milestones and securing subsequent rounds (Gompers, 1995). Kaplan and Stromberg (2004) report that the option to abandon is important under high level of external risks, which they define as uncertainties that neither investors nor entrepreneurs control (e.g., magnitude of future demand, intensity of competition, etc.).

The prospect of young ventures with ongoing development efforts but no commercial operations (i.e., Seed-stage) is construed as highly uncertain. The level of uncertainty declines but remains high, as a venture matures. This is partially reflected in the discount rates applied by investors; rates may be as high as 70% for Seed-stage investments and as low as 30% for Later-stage (Sahlman, 1990). Not surprisingly, capital rationing is common in earlier stages (Gompers, 1995), and is less prevalent as the level of external risks declines (Kaplan and Stromberg, 2004).

In sum, investors can manage their exposure to risk by targeting ventures at specific stages of development. Young Seed-stage ventures are associated with high uncertainties across multiple facets of operation. Later-stage ventures with complete products and paying customers are construed as less risky.

Investment Syndicates. Investment syndicates come about when two or more investors participate in the financing of a given venture (Bygrave, 1987; Lerner, 1994; Sorenson and Stuart, 2001; Brander, Amit and Antweiler, 2002). Following Wilson (1968), syndication has been seen as a form of risk-sharing. The theory of syndicates predicts that in the face of uncertain payoffs investors may choose to diversify their holdings. When an investor cannot adequately diversify by investing in multiple ventures she may opt to syndicate her investment. Is likely to occur when a venture's future payoffs are characterized by high variance, or when the investment amount constitutes a substantial proportion of the investor's assets. Brander et al. (2002) find consistent findings for a sample of Canadian investors; e.g., syndicates are more likely to take place in ventures that have high variance payoffs.

Extant work proposes additional rationales. The selection rationale advances that by soliciting a 'second opinion' from co-investors, syndicates improve the ability to select attractive investment targets (Bygrave, 1987; Lerner, 1994). The referral rationale views syndication as a

strategy for building quality future deal-flow; an invitation to co-invest is motivated by anticipation of reciprocity (Sorenson and Stuart, 2001). Finally, syndicates enhance a venture's prospects by leveraging value-added services from multiple co-investors (Brander et al., 2002).

In sum, our hypotheses focus on syndication as a risk-sharing mechanism. Nevertheless, we recognize that each of the above explanations may affect syndicate size. The 'Discussion' section tackles this issue and reconciles our predications with all four rationales. It also explains that the predictions hold irrespective of the identity of syndicate's lead investor.

Hypotheses Development

We explore the impact of corporate compensation on corporate investment behavior by way of comparison. Our approach is to utilize IVCs as a benchmark against which CVC investment-practices can be compared. In particular, we exploit the fact that entrepreneurial ventures are funded by individuals operating in two different settings (i.e., within a CVC or an IVC). These settings differ on the dimension of interest – compensation scheme – yet both regularly practice staging and syndication.

Note that our approach follows a distinctive research design. Extant work compares firms to their peers and reports 'relative' findings. For example, managers in firms that employ performance-pay pursue riskier projects than managers in firms that do not (Datta, et al., 2001; Rajgopal and Shevlin, 2002). Such findings offer important support to the principle-agent framework. Yet, it remains difficult to gauge whether the behavior is ideal. To the extent that IVCs are expert investors (Jensen, 1993; Gompers and Lerner, 2001; Kaplan and Stromberg, 2004), they constitute an informed-benchmark. We can hence compare the behavior of CVC personnel to that of investment professionals. The advantages are twofold (see 'Discussion' section for additional details). First, we can potentially observe a broader range of compensation

schemes and associated behaviors. Second, by using IVC-behavior as a yardstick, we may go beyond 'relative' or subjective insights and derive comprehensive interpretation of the results.

In a corporate setting, the lack of rewards for positive performance has long been the rule rather than the exception. Neumeyer (1971) notes that established firms offer extremely flat compensation schemes to R&D personnel. Zenger (1994) reports that large firms lag in rewarding R&D workers. Beatty and Zajac (1994) advance that performance-pay is less common since it imposes excessive risk on employees. Others attribute the lack of performance-pay to measurement costs (Holmstrom, 1979), influence activities (Milgrom and Roberts, 1988), or envy between co-workers (Argyres and Liebeskind, 1998; Nickerson and Zenger, 2006).

The experience of CVC personnel echoes these observations. As we reviewed above, only a small number of CVC programs offer IVC-like compensation to their staff. The majority of the programs provide fixed salary (Birkinshaw *et al.*, 2002; McNally, 1997). Studies of CVC programs identify various reasons for the lack of incentive-pay. Interestingly, most have little to do with CVC objectives (Block and Ornati, 1987; Siegel et al.,1988; Sykes,1992; Birkinshaw et al., 2002). For example, many firms avoid a performance-pay component simply because it generates administrative and accounting problems when employees transfer to and from the CVC program. Inability to agree-on and establish performance metrics is another explanation for the lack of performance-pay. Also, firms often maintain pay-equality to avoid resentment by employees in other business units. To conclude, not only is it likely that compensation schemes are exogenous to a program's objective, but also they often consist solely of fixed-salary. In fact, managers in many leading CVC programs did not receive any performance-pay:

> "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… Yet he still earned a straight salary just as SAP's 22,000 other employees did." (*Daily Deal;* Dec., 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." (*PE Week;* Sep., 2000)

Drawing on the principal-agent framework, high variance investments are likely to be shunned by corporate personnel who are not exposed to performance-pay. Furthermore, corporate investment practices will, on average, aim at diminishing investment variance. In comparison to IVCs, corporate investors will seek less risky investments. This can be achieved by (a) funding ventures at later stages of development, or (b) participating in larger syndicates. The former suggests that rounds where only IVCs participate (*all-IVC*) would take place at earlier stages than those where a corporation is involved (*CVC/IVC*). The latter implies that, irrespective of venture's stage, syndicates involving only IVCs would have fewer members than those where a CVC is a syndicate member along with the IVCs.

> ***Hypothesis 1a:*** *Other things being equal, a round in which a corporate investor participates* (CVC/IVC) *would occur at a later stage of development than a round financed solely by independent VC funds* (all-IVC).
>
> ***Hypothesis 1b:*** *Other things being equal, a syndicate in which a corporate investor participates* (CVC/IVC) *would have more members than a syndicate in which membership consists solely of independent VC funds* (all-IVC).

For a sub-group of programs, CVC personnel are remunerated with carried-interest or other forms of performance-pay (Birkinshaw *et al.,* 2002; McNally, 1997). To the extent that compensation shape venture-capitalists' risk preferences and ultimately drive their investment practices, this sub-group of programs is likely to exhibit more aggressive practices than those of the average CVC program. Moreover, when both CVC and IVC personnel are privy to performance-pay, one might expect differences in investment practices to diminish. Hence, a CVC privy to performance-pay is likely to target ventures at the same stages as IVCs do, which is earlier in comparison to that of the average CVC program. This CVC is also likely to

participate in syndicates that are closer in size to those involving only IVCs, and smaller in comparison to that of the average CVC program.

> ***Hypothesis 2a:*** *Other things being equal, the use of performance-pay by a corporate investor decreases the likelihood that it targets later stage rounds. Moreover, a round in which such a corporate investor participates* (CVC/IVC) *would occur at a similar stage of development as a round financed solely by independent VC funds* (all-IVC).
>
> ***Hypothesis 2b:*** *Other things being equal, the use of performance-pay by a corporate investor decreases the likelihood that it participates in large syndicates. Moreover, a syndicate in which such a corporate investor participates* (CVC/IVC) *would have similar number of members as a syndicate consisting solely of independent VC funds* (all-IVC).

DATA AND METHODS

Data. We construct a dataset of venture capital investments using Venture Economics database. Venture Economics (VE) collects data through multiple sources including surveys of general partners and their portfolio companies, government filings, etc. VE data have been used in previous studies (Gompers 1995; Dushnitsky and Lenox, 2005a,b). We focus on the following investments: (a) venture capital rounds (i.e., excluding buyouts), (b) in U.S. ventures, (c) operating in the Hi-Tech industries, (d) between January 1990 and December 1999. Venture Economics records more than fourteen thousand rounds in about six thousands unique ventures that match these criteria. As expected, California has the highest number of ventures, with Massachusetts, Texas and New York being a far 2nd, 3rd and 4th, respectively. The highest number of ventures is in the Programming and Data Processing industry, and – by decreasing number of ventures – in Communications, Semiconductors, and Computer Equipment.

At times, Venture Economics recorded investment disbursements that are part of a single round as separate investment rounds (Lerner, 1994). This can affect our analysis; e.g., for a given round we may under-count the number of participations in a syndicate. To address this issue, we

aggregate two or more consecutive rounds listed within a 90-day period as a single round. The 90 days cutoff is chosen because most term sheets specify a maximum 90-day closing date window during which investors can schedule cash infusions to the portfolio company.[2]

There are approximately sixteen hundred investors in the sample, including hundreds of corporate venture capitalists.[3] We use VE's categorization to identify CVC investors, and further confirmed their identities using an extensive Lexis–Nexis search (Dushnitsky & Lenox, 2005). There are 1,197 rounds that involve a single corporate investor (i.e., a round may, or may not, include IVCs along with the CVC). We compare them to 11,899 rounds involving only IVCs. Thus, the sample includes 13,096 rounds: 1,197 *CVC/IVC*, and 11,899 *all-IVC*.

To discern compensation schemes of program personnel we use data from a proprietary survey of CVC programs (for details, see Birkinshaw *et al.*, 2002). Data 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 ninety-five CVC programs.

Variables. The dependent variable, *Investment Stage*, denotes the venture's stage of development at the time of the investment round. It depicts the venture-round level. Building on Venture Economics definitions, we identify four major stages – Seed, Early, Expansion and Later – and set the value of *Investment Stage* to 1, 2, 3, and 4, respectively. Seed-stage ventures engage in research and product development and usually have no established commercial

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[2] Because venture capitalists need to call upon their limited partners to provide the necessary funds for a given round, most funding agreements (i.e., 'term sheets') state that capital infusion may be deferred up to 90 days (Lerner, 1994; Guler, 2003). Typically, if there are more than 90 days between two capital infusions, the second infusion is considered a "new" round and is subjected to new terms.

[3] On average, a venture capital firm manages 1.95 funds, with some VC firms managing as many as 16 different funds. For example, the prestigious venture capital firm Kleiner Perkins Caufield & Byers (KPCB) has managed numerous funds. In our sample, KPCB is listed as managing 16 funds: KPCB I through KPCB IX, as well as KPCB Zaibutsu Fund I, KPCB Life Sciences Zaibatsu Fund II, KPCB Information Sciences Zaibatsu Fund II, KPCB Java Fund, and KPCB VIII Founders Fund.

operations. Early-stage ventures are at a stage were their product is in development or available commercially. Expansion-stage ventures already ship products though profits may be negative. Finally, Later-stage ventures exhibit increasing sales volume and may be breaking-even or profitable. Because the level of uncertainty declines as a venture matures, higher values of *Investment Stage* are associated with less risky investment.

The other dependent variable, *Syndicate Size*, is a count of the number of syndicate members that participate in a focal investment round. It is also at the venture-round level. Each unique investor, as recorded by Venture Economics, is counted as one additional syndicate member, irrespective of whether the investor is an IVC or a CVC. For example, *Syndicate Size* is equal to 4 in the following cases: (a) Vermeer Technologies received funding in December 1995 from four different IVC funds; Atlas Venture Fund II, Matrix Partners, Menlo Ventures VI, and Sigma Partners III, and (b) NetBoost received funding in August 1997 from TI Ventures (Texas Instrument CVC program) as well as three IVCs; Bay Partners, JP Morgan, and Crosspoint Venture Partners. Figure 1 presents additional examples.

The independent variable, *CVC/IVC*, is assigned the value one if the focal round involves a corporate investor (e.g, a mixed CVC, IVC syndicate), and zero if consists solely of IVCs (e.g., an *all-IVC* syndicate). Continuing the above example, the variable is equal to zero for Vermeer's round in December 1995, and is equal to one for NetBoost's round in August 1997. As for Figure 1, *CVC/IVC* is equal to zero for either Oberon (Panel A) or Times Ten (Panel B), and is equal to one for Venturecom.

***** Insert Figure 1 about here *****

The proxy for CVC compensation merits a discussion. Ideally, the variable should reflect the slope of the relationship between pay and measured performance (Guay, 1999). In practice,

prior work employs various measures, ranging from a simple sum of dollar value to a sophisticated discounting of stock-options (Lambert, Larcker and Weigelt, 1993; Balkin et al., 2000; Zenger and Marshall, 2000; Hoskisson et al., 2002). These studies utilize compensation data for key executives, which is publicly available per SEC regulations. Such data is unavailable for CVC personnel. We thus derive compensation data from a survey of ninety-five CVC programs (Birkinshaw et al., 2002). Respondents use five-item Likert scales to report the salience of the following compensation dimensions: (a) fixed salary, (b) performance-based bonuses, and (c) long term outcome-based pay. For example, managers were asked how frequently they used carried interest in portfolio companies to reward CVC managers, and response options were: 1 = "never", 2 = "only in exceptional cases", 3 = "occasionally", 4 = "frequently", and 5 = "almost always". While the lack of detailed dollar magnitudes is a disadvantage, the documentation of 'compensation schemes' may be less prone to bias (e.g., conscious over- or under-reporting).

A single measure of a program's compensation scheme is constructed. We create the measure by collapsing the responses to the various compensation dimensions into a single index.[4] The index, *CVC-Incentives*, ranges from a low of 1 for programs that remunerate solely through fixed salary, to a high of 4.4 for programs that employ IVC-like carried interest. Because survey data is unavailable for some corporate investors in our sample, the variable *CVC-Incentives* has the value zero for rounds that involve a CVC for which no compensation data is available. To flag these as CVC rounds, we create *CVC-Other*, which is set to one when

[4] Our compensation index has a Cronbach's alpha of 0.44. Alternatively, we focus on a single compensation dimension – carried-interest – because (a) it constitutes a substantial pay-for-performance scheme, and (b) it is common among independent venture capitalists. The measure of program's compensation scheme is equal to one if the response to the use of carried-interest is either 'frequently' or 'almost always', zero else. We repeat the multivariate analyses using this measure and find similar results. The results are available upon request.

CVC/IVC equals one and *CVC-Incentives* equals zero. Because *CVC-Incentives* and *CVC-Other* are collinear with *CVC/IVC*, we drop the latter in specifications that include the former two.[5]

To facilitate further interpretation and comparison, we derive two dichotomous variables from *CVC-Incentives*. They gauge whether a program utilizes high powered performance-pay with respect to all other programs: *CVC-Incentives-Low* (*CVC-Incentives-High*) is equal to one if focal CVC scores below (above) the median value of the compensation index, *CVC-Incentives*, zero else. Because the variables *CVC-Incentives-Low*, *CVC-Incentives-High* and *CVC-Other* are collinear with *CVC/IVC*, we drop the latter in specifications that include them.[6]

We employ several control variables. Some CVC programs pursue financial goals while others are strategically-oriented. We thus control for program's objective; *Strategic CVC* is equal to one if a CVC's main objective is strategic (e.g., window on technology), zero else. Using Lexis-Nexis, two research assistants examined announcements of CVC formation and coded program's primary objective (inter-coder reliability is 92%). Because these announcements shape future deal-flow, a firm is inclined to accurately announce its CVC objectives. Firms making announcements such as "*Dell… makes investments first and foremost to get access to important developing technology*" (Dell Ventures), or "*it is not primarily profit-oriented… take risks… for the sake of innovative ideas*" (Novartis) are coded as strategically-oriented CVC; whereas those stating "*solely for financial return*" (Mitsui PE), or "*the first priority of Oracle's*

[5] By construction, *CVC-Incentives* and *CVC-Other* are mutually exclusive and nested in *CVC/IVC*. Both *CVC-Incentives* and *CVC-Other* equal zero if a round consists solely of IVCs (*CVC/IVC*=0). For a round involving a CVC (*CVC/IVC*=1), one of two scenarios holds. If there is no compensation data for the CVC then *CVC-Other* equals one and *CVC-Incentives* is zero. If data is available then *CVC-Other* is zero and *CVC-Incentives* equals one or higher (depending on program's compensation scheme).

[6] By construction, *CVC-Incentives-Low, CVC-Incentives-High* and *CVC-Other* are mutually exclusive and nested in *CVC/IVC*. For all-IVC rounds (*CVC/IVC*=0), the variables equal zero. For a CVC round (*CVC/IVC*=1), one of the following holds: (a) if compensation data is unavailable then *CVC-Other* is one, and *-Low, -High* are zero; (b) if survey suggests a CVC offers low-power compensation then *-Low* is one and *CVC-Other, -High* are zero; (c) if survey suggests high-power compensation then *-High* is one and *CVC-Other, -Low* zero.

venture effort is financial returns" (Oracle) are labeled as financially-driven. Announcements are available for a sub-set of CVC in our sample.

The variable *Round Valuation*, the post-round valuation in thousands of dollars, controls for potential heterogeneity in a ventures' quality. Specifically, it is possible that CVC- and IVC-backed ventures differ in quality. This, for example, may be the result of high-quality ventures opting for CVC-backing in hope of gaining access to corporate complementary assets, customers, etc. Because these ventures are likely to command higher valuation and thus necessitate greater syndicate membership, one may systematically observe larger *CVC/IVC* syndicates, yet not for the hypothesized reasons. *Round Valuation*, allows us to control for a venture's latent quality. We note that pre-money valuation is a good proxy of a venture's quality, as it reflects informed-investors' assessment of the venture. Unfortunately, such data are unavailable due to confidentiality concerns. We use post-money valuation, which is readily observable for almost all ventures in our sample.

Finally, we control for investment characteristics. *Year Dummies* is a vector of dichotomous variables denoting the year of the focal round. *Venture Industry Dummies*, a vector of dichotomous variables denoting venture's 3-digits VEIC code. Venture Economics assigns an industry affiliation along its proprietary Venture Economics Industry Classification (VEIC).

Methodology. We conduct two separate analyses of venture capitalists' investment practices. In each case the dependent variable takes only non-negative integer values. *Investment Stage*, is a categorical variable where higher values are considered less risky investments. The assumptions of homoskedasticity and normally distributed errors which underlie the Ordinary Least Squares regression technique are therefore violated. To account for the ordinal nature of the variable we estimate an Ordered-Logit model, which is built around a latent regression in the

same manner as the Binomial Logit model (Greene, 2000). We estimate, $Pr[Investment\ Stage_{it} = j]$, the probability venture *i* funded in year *t* is at developmental stage *j* (*j* = 0, 1,…4), as a function of independent variables capturing the presence of a CVC investor (*CVC/IVC*) or its compensation scheme (*CVC-Incentives*, *CVC-Other*, *CVC-Incentives-Low*, and *CVC-Incentives-High*), and a vector of control variables.

In the second analysis, the dependent variable, *Syndicate Size*, is a count variable. Again, OLS assumptions are violated. Given the nature of the variable, we employ the Negative Binomial regression approach (Hausman, Hall and Griliches, 1984), and specify the following regression equation: $Syndicate\ Size_{it} = exp\ (X_{it}\beta_1 + C_{it}\beta_2)$, where $Syndicate\ Size_{it}$ is the number of syndicate members that participate in a focal round in venture *i* in year *t*, X_{it} is vector of independent variables denoting the presence of a CVC (*CVC/IVC*) or its compensation scheme (*CVC-Incentives*, *CVC-Other*, *CVC-Incentives-Low*, and *CVC-Incentives-High*), C_{it} is a vector of control variables affecting P_{it}, and β_1, β_2 are the corresponding vectors of coefficient estimates.

ANALYSIS & RESULTS

Table 1 reports descriptive statistics and correlations. Average investment stage is 2.50. Panel A of Table 2 presents the number and percentage of investment rounds by venture's stage and investor type. While almost 18% of IVCs investments go towards ventures at the Seed-stage, only 12% of CVC rounds go to ventures at that stage. In contrast, only 12% of IVCs rounds are at Later-stage venture, less than the 16% for CVC rounds. Gompers and Lerner (1998) and Gompers (2002) observe similar patterns for the 1988-1996 time period.

Using the Mann-Whitney-Wilcoxon (MWW) nonparametric test, we test a null hypothesis that *all-IVC* rounds and *CVC/IVC* rounds targeted ventures at similar stages of development. We opt for the MWW test because it does not require any distributional

assumptions on the data. The null is rejected, indicating the difference is highly significant (z-stats = 6.63, p <.001). Summarizing, corporations invest in mature and potentially less risky ventures, consistent with Hypothesis 1a.

***** Insert Table 1, 2 and 3 about here *****

Shifting to syndicate size, we note that the mean value is 2.81 (Table 1). Panel B of Table 2 presents univariate analysis of syndicate size. The mean is equal to 2.63 for *all-IVC* syndicates and 4.56 for *CVC/IVC* syndicates (Panel A). That is, syndicates in which only IVCs participate have, on average, 2.63 unique investors. Syndicates involving a single corporate investor along with IVCs, exhibit higher participation: on average there are 4.56 different investors. The average size of *all-IVC* syndicates is in line with prior studies in Canada (Brander et al., 2002), U.K. (Wright and Lockett, 2003) and the U.S. (Guler, 2003). The size of *CVC/IVC* syndicates is not reported elsewhere, to the best of our knowledge. The MWW test finds evidence in support of Hypothesis 1b; the conjecture that *all-IVC* syndicates are of the same size as syndicates involving a corporate investor is rejected (z-stat = 25.9, p <.001).

These syndication patterns may be an artifact of CVCs' propensity to invest in mature companies. That is, rounds in later stages usually require bigger investment amounts and may entail larger syndicate membership as more investors 'chip in.' We analyze syndicate size by venture stage and find that size disparity persists within each stage (Table 2, Panel C). The MWW tests indicate that the differences are significant. In other words, controlling for a venture's stage, we continue to find that rounds involving a CVC have more syndicate members than similar stage rounds where all syndicate members are IVCs.

***** Insert Table 2 and Figure 2 about here *****

Multivariate analysis is conducted next. Table 3 reports results for Ordered-Logit of investment stage. We control for factors that may affect stage of investment by including a vector of dichotomous variables denoting year of investment and a vector of dichotomous variables denoting venture's industry affiliation. For parsimony, we do not report coefficients on each dichotomous variable. We also include a proxy of venture's quality, *Round Valuation*, and an indicator of program's objective, *Strategic CVC*.

Model 3-1 finds a positive and significant coefficient on *CVC/IVC*. As with any nonlinear regression model, coefficient estimates do not necessarily represent marginal effects. We use the estimates to calculate the probability of investment in a Seed-stage venture. If a round consists of independent VCs (*CVC/IVC*=0) the probability is 18% but it drops to 13% if a corporate investor is involved (*CVC/IVC*=1). The pattern flips for rounds in more mature ventures: Early-stage (29% for *all-IVC* rounds vs. 25% for *CVC/IVC* rounds), Expansion-stage (41% vs. 45%), and Later-stage (12% vs. 17%), respectively. It is consistent with Hypothesis 1a; in comparison to IVCs' practices, CVCs invest in ventures at later stages of development. Prior work reports similar patterns (Gompers and Lerner, 1998; Gompers, 2002)

Model 3-2 directly tests the effect of CVC's compensation. By construction, compensation variables are collinear with *CVC*/*IVC*. We thus replace *CVC*/*IVC* with *CVC-Incentives* and *CVC-Other*. The coefficient for *CVC-Incentives* is positive and statistically significant. It captures the sensitivity of investment-stage to CVC compensation. The coefficient for *CVC-Other* reflects the stage disparity between IVC rounds and rounds involving a CVC for which compensation data is unavailable. The coefficient is positive, statistically significant, and of higher magnitude than the former. Taken together, the results are consistent with Hypothesis

2a. In comparison with IVCs, CVCs target ventures at later stages, but the stage disparity decreases for programs with high-powered compensation.

To facilitate further interpretation of the results, we substitute the compensation index with two dichotomous variables (Model 3-3). The coefficient for *CVC-Incentives-Low* is positive and highly significant, whereas *CVC-Incentives-High* is insignificantly different from zero. As before, *CVC-Other* has a positive and statistically significant coefficient. Again, we calculate the probability of funding a Seed-stage venture. It is 18% for an *all-IVC* round, 11% if corporate venture capitalists with little or no performance-pay are involved (*CVC-Incentives-Low = 1*), and 16% if CVCs are privy to high-powered performance-pay (*CVC-Incentives-High* = 1). The likelihood of funding a Later-stage venture is 12%, 19%, and 13%, respectively. The results support Hypothesis 2a. In the presence of performance-pay, CVC personnel engage in practices that only slightly differ from that of their independent venture capitalist counterparts. In contrast, the difference between *all-IVC* and *CVC/IVC* is evident when we focus on programs that offer little or no performance-pay. We note that the impact of compensation schemes is observed while controlling for numerous factors including ventures' industry and CVC objectives. It strengthens our belief that the compensation of corporate personnel face, rather than any counterfactual, drives investment practices.

We re-estimate the models in a few sub-samples. Model 3-4 replicates Model 3-3 while excluding investments by a single investor, irrespectively of investor type. That is, we analyze only syndicated rounds. The control variable *Strategic CVC* is not significantly different form zero. More importantly, the independent variables retain their sign and statistical significance, consistent with Hypotheses 1a and 2a.

Model 3-5 repeats the analysis for a sub-sample of IVC funds that currently, or previously, syndicated with CVC investors. Model 3-6 does the same while holding IVC firms constant (a firm can manage several funds, e.g., Kleiner Perkins). These models tackle concerns regarding IVC heterogeneity. Specifically, one might argue that sorting on the part of IVCs leads to the stage disparity. Each IVC makes two choices: (a) what is its preferred stage of investment, and (b) whether or not to co-invest with a corporate investor. Due to unobserved IVC's attributes (e.g., inherent capabilities, risk preferences), some IVCs may seek CVC participation as well as more mature ventures, while other IVCs may pursue younger ventures and no corporate involvement. By holding the IVC constant, we control for its unobserved attributes. Hence, we focus on those IVCs that previously syndicated with a CVC investor, comparing venture's stage in rounds where they invest along with other IVCs to those in which they co-invest with a corporation. Irrespectively of whether we hold the IVC fund (Model 3-5), or IVC firm (Model 3-6) constant, the coefficients are similar in sign and statistical significance to those of Model 3-3.

***** Insert Tables 3 and 4 about here *****

Table 4 reports the results of Negative Binomial regressions of syndicate size. We control for venture's stage by including a vector of dichotomous variables based on *Investment Stage*. We again control for year of investment, venture's industry affiliation, round valuation, and program's objective. In Model 4-1, the coefficient for *CVC/IVC* is positive and significant. Calculating the marginal effects, we find that rounds involving a CVC are associated with a syndicate size that is 49% larger in comparison to rounds where syndicate members are all IVCs. Hence, the results are consistent with Hypothesis 1b.

Next, we test the effect of CVC's compensation schemes. In Model 4-2, *CVC/IVC* is replaced with *CVC-Incentives* and *CVC-Other*. The coefficient for the former is positive and

statistically significant, reflecting syndicate-size sensitivity to CVC compensation. The coefficient for the latter is positive, significant, and of higher magnitude. Taken together, the results are consistent with Hypothesis 2b; the more a program is associated with high-powered incentives, the less is the size disparity between *CVC/IVC* and *all-IVC* syndicates. To facilitate interpretation, Model 4-3 substitutes the compensation index with two dichotomous variables. The coefficient for *CVC-Incentives-Low* is positive and highly significant, whereas *CVC-Incentives-High* is insignificantly different from zero. *CVC-Other* remains positive and significant. Marginal effect indicate that in comparison to *all-IVC* rounds, syndicate size is 73% larger for a round involving a CVC with little or no performance-pay. The syndicate-size disparity shrinks in the presence of performance-pay, as corporate personnel engage in practices that are not statistically different from those of IVCs. These findings support Hypothesis 2b.

We reproduce Model 4-3 in various sub-samples. As Figure 2 shows, an investment by a single investor is more common among IVCs (37% of rounds) than it is for CVCs (15% of rounds). Arithmetically, it drives downwards the average *all-IVC* syndicate size. To account for this fact, Model 4-4 excludes investments by a single investor irrespectively of investor type. The results are consistent with Model 4-3 and the hypotheses. Next, to address concerns regarding IVC heterogeneity, Models 4-5 (4-6) repeats the analysis for a sub-sample of IVC funds (firms) that have syndicated with CVC investors. The results are qualitatively similar to those of Model 4-3. The exception is Model 4-5 where *CVC-Incentives-High* has a positive and significant coefficient. Since the coefficient is of smaller magnitude than that on *Low-Incentives*, the findings remain consistent with Hypothesis 2b.

Table A1 (see Appendix) shows that the results are robust to various estimation techniques; OLS, Poisson, Ordered-Logit and Negative Binomial. A Seemingly Unrelated Regressions (SUR) analysis of investment-stage and syndicate-size also yields similar findings.

CVC Objectives and Endogeneity Concerns. Recall that CVC goals vary; many seek strategic objectives, while some pursue financial goals. This raises a concern that compensation and behavior of CVC personnel are endogenously determined.[7] If this is true than performance-pay does not shape investment-practices, rather both are an artifact of program goals.

Our response to these concerns is threefold. First, there are reasons to believe that CVC compensation is exogenous and have little to do with program's goals. For example, anecdotes indicate that performance-pay is associated with geographical distance between a program and its corporate headquarters. The distance attenuates frictions and envy between employees, and thus facilitates introduction of performance-pay. Note, distance is often a by-product of locating CVC programs in Silicon Valley, a common location irrespective of CVC goals. Second, Birkinshaw et al. (2002) find that performance-pay is offered by strategically- and financially-oriented programs alike.[8] Hence, it is unlikely that CVC goals determine personnel pay.

Third, we use an explicit empirical strategy – a Treatment-Effects model (Heckman, 1979; Maddala, 1983) – to address endogeneity concerns. The model accounts for the fact that an unobserved factor (namely, CVC objective) may be correlated with both (a) compensation scheme and (b) investment practices. Accordingly, the 1st stage regression estimates CVC's compensation scheme decision, and the 2nd stage regression estimates CVC's investment

[7] Consider an example. A firm with financially-oriented CVC might choose to offer IVC-like compensation and at the same time encourage IVC-like practices. In contrast, the compensation and 'encouraged behavior' of strategic-CVC managers might mimic corporate, rather than IVC, practices (Gompers & Lener, 1998).

[8] Nor do objectives determine syndicate size. Birkinshaw et al. (2002) finds that more than 85% of the CVCs have at least two co-investors, and that syndicate size does not vary by CVC goals.

practices (i.e., either investment stage or syndicate size). The model dictates the use of a sub-sample of CVC rounds for which compensation data is available.[9]

The 1st stage regression estimates the probability that CVC personnel receive performance-pay. We include the distance between CVC program and its corporate headquarters. To the extent that strategically-oriented programs are less likely to offer high-powered incentives, we also include *Strategic CVC* as an independent variable.[10] Finally, we include other variables that are known to drive strategic CVC investment (Dushnitsky & Lenox, 2005b, 2006); measures of technological opportunities, the strength of IP, the importance of complementary assets within the industry, as well as firm's innovativeness and cash-flow.

We estimate two separate Treatment models; one where 2nd stage dependent variable is *Investment Stage* (Model 5-1), and another where it is or *Syndicate Size* (Model 5-2). We employ similar 1st-stage specification in both models (reported in Table A3). Results of the 2nd stage are presented in Table 5. Note that in contrast to Tables 3 and 4 where CVCs practices are compared to IVCs, the current analysis focuses on CVCs. We compare investment practices of programs that offer high-incentives to those providing low-incentives. To facilitate interpretation, Table A2 replicates Models 3-3 and 4-3 for the sub-sample.

In Model 5-1, the coefficient for *CVC-Incentives-High* is negative and significantly. It has the same sign and significance in Model 5-2. These findings are consistent with Hypotheses 2a and 2b; CVC that offer performance-pay pursue investments in earlier stages and smaller syndicates. Next, we calculate the net economic effect of high-powered performance-pay

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[9] The 1st stage of the Treatment Effect model estimates the likelihood a CVC employs high incentives. Thus, we use a sub-sample of CVC rounds for which compensation data is available. Put differently, most of the rounds in the full sample (e.g., IVC rounds, CVC without compensation info) are irrelevant for our 1st stage regression.

[10] If a firm pursues investments as a form of external R&D, its CVC program likely has a strategic objective. To the extent that strategic programs avoid performance-pay (e.g., Gompers and Lerner, 1998), predicting strategic-CVC may thus predict the lack of high-powered incentives.

(Greene, 2000).[11] By comparing the size of syndicates involving (a) high-incentive CVCs, and (b) CVC that were likely to offer high-incentive but did not, we calculate that the latter programs partake in syndicates that are, on average, 0.97 smaller. Similar calculation for Model 5-1 indicates that performance-pay accounts for an average 'net' decrease of 0.12 in the targeted stage of investment.

DISCUSSION

We find a relationship between compensation and investment practices in the venture capital context. This section elucidates our research design and expands on syndication.

Research Design. We study the compensation—behavior relationship by comparing corporate and independent venture capitalists. The advantage of this approach is that we observe individuals who (a) pursue similar 'projects', (b) engage in the same investment practices, yet (c) do so under different pay schemes. Often such comparisons are challenging because the projects developed in large corporations differ from those sought by small companies or independent VCs (e.g., developing process-innovations rather than product-innovations; Klepper, 1996). In our sample, however, both corporate and independent investors invest in entrepreneurial ventures, as per point (a). In fact, the majority of CVC rounds involve IVCs, such that they jointly back the same venture. Points (b) and (c) are addressed earlier. Per point (b), staging and syndication are universal practices in the venture capital market. Per point (c), compensation schemes vary across CVC programs as some offer IVC-like pay while others pay a fixed-salary.

The Syndication Decision. An investment syndicate is a voluntary structure. It emerges if and only if all syndicate members agree to do so, each weighing the costs and benefits

[11] The differences in syndicate size between two programs that are equally likely to offer high-power performance-pay where one does so and the other doe not (Greene, 2000: 933):

$$E[Syn\_Size \mid likely, High-Incentives] - E[Syn\_Size \mid likely, Low-Incentives] = \delta + \rho\sigma_{\varepsilon}\left[\frac{\phi_i}{\Phi_i(1-\Phi_i)}\right]$$

associated with a particular syndicate configuration (i.e., each investor considers pros-and-cons along the four rationales: risk-sharing, selection, referral, and value-added). We review these rationales and address several key questions: Who affects syndicate size? Why would IVCs agree to a larger than usual syndicate size? What motivates CVCs' pursuit of large syndicates?

Extant work identifies several syndicate rationales: risk sharing, selection, referral, and value-added. This paragraph expands on the latter three. First, an approval process involving multiple members reduces the likelihood of accepting a bad project (Sah and Stiglitz, 1986). Hence, syndicates can improve the ability to select attractive targets, as syndicate members serve as a source of a 'second opinion' (Bygrave, 1987). Accordingly, Lerner (1994) finds that experienced venture capitalists syndicate early stage investments with other experienced VCs, who can provide expert opinion. Second, syndication may be instrumental in building a quality future deal flow.[12] Investor X includes investor Y in a lucrative investment in anticipation that Y, when recognizing another quality venture in the future, will syndicate it with X. Thus, syndication is motivated by anticipation of reciprocity (Sorenson and Stuart, 2001).[13] Third, it can be an important strategy to enhance a venture's prospects. The argument is based on the fact that each investor provides substantial value-added services in addition to capital infusion (Sapienza, 1992; Sapienza and Manigart, 1996). Indeed, Brander et al. (2002) report syndicated investments in Canadian ventures are associated with high returns.

Who affects syndicate size? We argue that the presence of a corporate investor affects syndicate size. It is possible that the corporation is the lead investor. It invites others to co-invest

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

[13] Reciprocity also allows a VC to 'window dress' its track record but with no real increase in performance. A track record is built by inviting each other to join, at a high valuation, a round in a soon-to-IPO venture. Because valuation is high, however, returns remain low (Lerner, 1994; Lakonishok, Shleifer, Thaler and Vishny, 1991).

and proactively determines syndicate size. Unfortunately, limited data regarding the identity of lead investors precludes testing this argument. We note that a CVC's presence would affect syndicate size irrespective of whether a corporation initiates an invitation, or conversely is invited, to co-invest in a venture. This is because syndicates are voluntary structures; a *CVC/IVC* syndicate is observed if and only if the CVC agrees to participate in it. CVC personnel can decline a co-investment invitation if syndicate membership is 'too small.' In sum, even if a CVC is not the lead investor, it can affect syndicate size by selectively accepting co-investment offers and abstaining from small syndicates.

Why would IVCs agree to a larger than usual syndicate? It is intriguing that in the presence of a corporate investor, IVCs agree to join an 'inflated' (i.e., larger than the usual *all-IVC*) syndicate. We believe that it occurs because corporate investors improve venture selection and contribute significantly to ventures' growth.[14] Thus, CVC presence may enhance a venture's prospects and benefit all co-investors. It follows that larger *CVC/IVC* syndicates transpire if and only if two conditions jointly hold: (a) CVC personnel prefers large syndicates, and (b) CVC offer unique advantages thereby winning IVCs consent for an 'inflated' syndicate. If one of the conditions is not satisfied, we would not observe size differences between *all-IVC* and *CVC/IVC* syndicates. To conclude, we make the reasonable assumption that CVCs offer value-enhancing advantages, which in turn, lead IVCs to accommodate CVC preferences. With this assumption, we can then focus our analysis on the risk-preferences of CVC personnel and its impact on syndicate size.

[14] Numerous anecdotes echo this assertion: "…as the VC business has begun focusing more and more on tech-heavy companies, traditional VC firms are turning with greater regularity to corporate VCs because of their connections to technology savvy engineers, who bring serious know-how to the due diligence process. 'People need us, we bring a lot to a syndicate and have strong relationships with a number of [VC] firms,' says One Motorola Venture's Holtsberg." (*VC Journal*, Nov., 2000), "We were invited to join the deal because of the value Applied Materials can bring to the company…" (*PE Week*, Nov., 2001).

What motivates CVCs' pursuit of larger syndicates? We suggest that risk-sharing is not only an important syndication rationale but also the main explanation consistent with larger syndicates. Other rationales would predict that *CVC/IVC* syndicates should be smaller – not larger – than *all-IVC* syndicates. Consider, for example, the 'selection' rationale. In a syndicate that already includes a few IVCs, the marginal contribution of adding a CVC would surpass that of an additional IVC. The latter's skill-set is redundant with existing syndicate members whereas the CVC offers access to unique due-diligence skills (e.g., leveraging advice from corporate R&D personnel).[15] The 'referral' and 'value-added' rationales yield similar predictions. Therefore, the risk-sharing rational is distinctively consistent with empirical findings that *CVC/IVC* syndicates are larger than *all-IVC* ones.

CONCLUSIONS

The paper explores a firm's ability to effectively invest in novel and highly uncertain technologies. We study investment staging and syndication, two investment practice that plays an important role in managing investment uncertainty (Gompers and Lerner, 2001). Based on an analysis of 13,096 investments in technology-based ventures during the 1990s, we find that CVC target ventures at later stages of development compared to IVCs, yet the magnitude of the difference is affected by corporate venture capitalists' compensation. It is large when CVC personnel receive fixed-salary, yet shrinks significantly when they are privy to performance-pay. Analysis of investment syndicates yields similar results. Syndicates where a corporate investor is a member are persistently larger in size (i.e., more participants are involved) than those involving only IVCs. The size disparity shrinks substantially if CVC program awards performance-pay.

[15] For example, a 3 member *CVC/IVC* syndicate (e.g., Sequoia, KPCB, and Intel Capital) likely exhibits better selection capabilities than a larger 4 member *all-IVC* syndicate (e.g., Sequoia, KPCB, Draper Fisher, and Mayfield fund). It is because the skill-set of the additional IVCs is redundant with existing syndicate members, whereas the CVC offers unique insights by leveraging corporate resources (e.g., corporate R&D personnel).

The history of corporate R&D management is a history of experimentation to find the right set of incentives (Merges, 1999). Jensen (1993) made a sharp distinction between the compensation and innovative performance of venture capitalists and established organizations. Almost a decade ago, Gompers and Lerner (1998) point to corporate venture capital as an appealing setting to study these issues, as well as related organizational design. To the best of our knowledge, this is the first study to heed these calls. Our analysis suggests that corporations exhibit risk-averse behavior, likely due to low-power compensation schemes. We believe that these insights are instrumental in enhancing established firms ability to achieve sustainable growth. The findings thus echo the call to bring 'silicon valley' inside the firm (Hamel, 1999).

Limitations. The compensation measures are not without limitations. Indeed, Gompers and Lerner (1998:34) state that compensation data for CVC personnel is difficult to come by. Yet, they also note that having such data can offer insights onto corporate practices. As discussed below, we hope that the limitations do not obscure the contribution of our findings.

First, the measure is coarse, yet it captures the main source of variance in CVC compensation. In a related study, Gompers and Lerner (1999) derive IVC compensation terms from 419 venture partnership agreements and offering-memoranda. They examine each contract for the percentage of profits received and fixed management fees and, ultimately calculate the elasticity of IVCs' compensation. Such calculation may be less relevant in the context of CVC investors. With most CVC programs, the relevant source of variation is not the percentage of 'carried interest', rather it is whether 'carried interest' is offered altogether (Block and Ornati, 1989; Gompers and Lerner, 1998; Birkinshaw et al, 2002). Therefore, even a coarse measure that merely reflects the presence or absence of performance-pay, could be informative. It may yield insightful findings on the compensation—investment practices relationship.

Second, the use of self-report measures is disconcerting. Ideally, data should be derived from standardized contracts. Unlike IVCs, however, CVCs exhibit various organizational forms (Gompers and Lerner, 1998; Dushnitsky, 2006), with no systematic format for delineating professionals' compensation. Hence, the use of a standard questionnaire actually introduces a much needed basis of comparison across different CVC programs. Moreover, the coarse responses may be advantageous given the self-report nature of the survey. Specifically, the documentation of 'compensation schemes' – rather than actual dollar amounts or percentages – may be less prone to self-report biases (e.g., conscious over- or under-reporting).

Finally, the survey covers compensation of managers outside the executive-suite, whereas most compensation studies are fueled by data availability for public firms and focuses on the compensation of the CEO, or other top executives.

Future Work. The performance implications of CVC practices merit further exploration. We know that ventures backed by CVC investors perform at least as well as IVC-backed ventures (Gompers and Lerner, 1998; Maula and Murray, 2000). Yet this is not conclusive evidence regarding the performance of CVC investors' who funded these ventures (for details see page 3, footnote 1). One interesting question is whether corporate investors manage to perform well even when they fail to adopt IVCs' 'best practices.' A related question is whether the empirical patterns we observe reflect 1st–best or 2nd-best outcomes. Namely, it is possible that CVC investors are doing well by leveraging corporate resources, yet they could have done even better had they featured appropriate structure compensation schemes.

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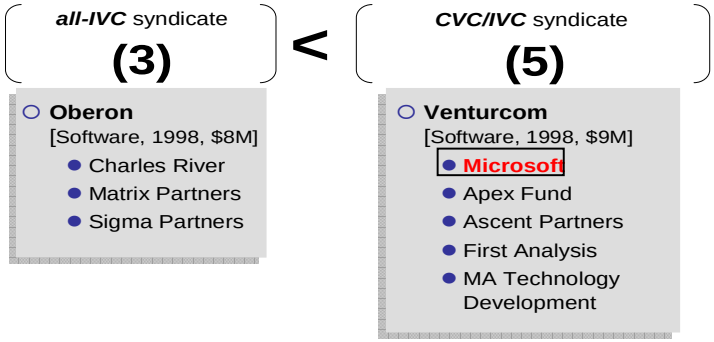
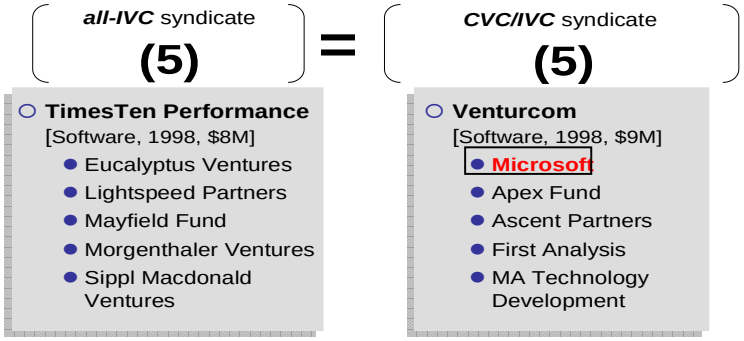
Figure 1: The Variable* Syndicate Size*: A Count of the Number of Syndicate Members

Panel A: Larger *CVC/IVC* Syndicate



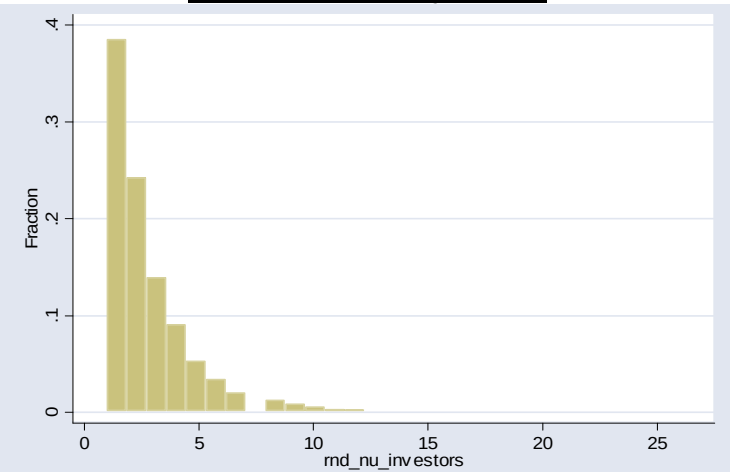
Panel B: Equal Size Syndicates



Figures provide examples of investment rounds. Below venture's name is a list of co-investor in that round. The syndicate size (i.e., count of unique syndicate members) is in parentheses. Brackets delineate venture's industry, year in which round took place, and post-round valuation.

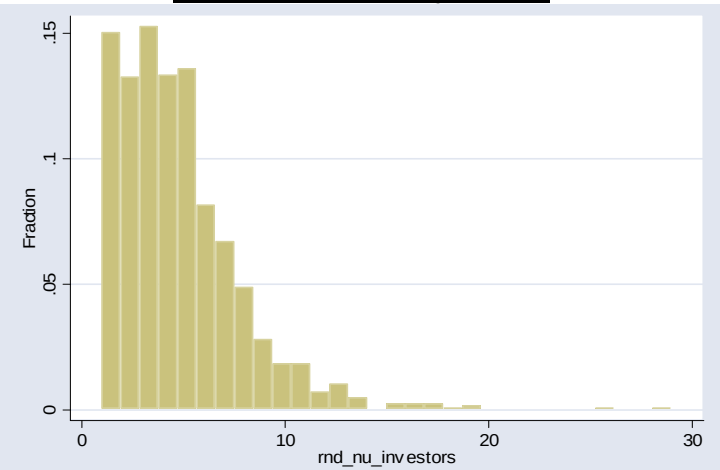
Figure 2: Distribution of Syndicate Sizes by Syndicate Type

Panel A: *All-IVC* Syndicates



Histogram of syndicate size where investment syndicate includes only independent venture capital funds (note Y-axis max at 40%).

Panel B: *CVC/IVC* Syndicates



Histogram of syndicate size where investment syndicate includes one corporate venture capital investor along with IVC funds (note Y-axis max at 15%).

Table 1: Descriptive Statistics and Correlations

	Variable	Mean	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	***Investment Stage***	2.50	1	4								
(2)	***Syndicate Size***	2.81	1	32	.166							
(3)	***CVC/IVC***	.092	0	1	.060	.245						
(4)	***CVC-Incentives***	.011	0	4.4	.012	.029	.255					
(5)	***CVC-Inc-Low***	.015	0	1	.035	.100	.387	.293				
(6)	***CVC-Inc-High***	.003	0	1	.001	-.002	.168	.831	-.007			
(7)	***CVC-Other***	.075	0	1	.049	.224	.890	-.023	-.05	-.015		
(8)	***Round Valuation***	5,907.3	.4	450,000	.125	.321	.152	.020	.055	.005	.140	
(9)	***Strategic-CVC***	.021	0	1	.048	.123	.463	.084	.559	.042	.243	.092

Table 2: Univariate Analysis of Investment-Stage and Syndicate-Size

	all-IVC	*CVC/IVC*	Mann-Whitney *z*- statistics
A. *Investment Stage (number of rounds / [%])*			
Seed Rounds	2,117 [17.8%]	142 [11.9%]	
Early Rounds	3,429 [28.8%]	311 [26.0%]	
Expansion Rounds	4,921 [41.4%]	549 [45.9%]	
Later Rounds	1,432 [12.0%]	195 [16.3%]	
ALL Rounds	11,899 [100%]	1,197 [100%]	
B. *Syndicate Size (mean size)*			
ALL Rounds	2.63	4.56	25.9 ***
C. *Syndicate Size by Stage (mean size)*			
Seed Rounds	2.27	3.32	7.0 ***
Early Rounds	2.41	3.55	10.3 ***
Expansion Rounds	2.73	4.97	18.9 ***
Later Rounds	3.31	5.98	11.7 ***

Panel A reports number of *all-IVC* and *CVC/IVC* investment rounds, by venture's stage at investment. Numbers in square brackets represents stage percentage of total investments. Panels B and C reports mean syndicate size for *all-IVC* and *CVC/IVC* rounds. Mann-Whitney-Wilcoxon tests significant at the level of * z<.05, ** z<.01, *** z<.001.

Table 3: Analysis of Investment Stage

	(3-1) Full	(3-2) Full	(3-3) Full	(3-4) Syndicated Rounds	(3-5) Holding IVC Fund	(3-6) Holding IVC Firm
CVC / IVC	.221*** [.07]	–	–	–	–	–
CVC-Incentives	–	.161* [.13]	–	–	–	–
CVC-Other	–	.193*** [.07]	.217*** [.07]	.270*** [.08]	.213*** [.08]	.236*** [.07]
CVC-Incentives-Low	–	–	.321** [.17]	.443** [.17]	.332** [.18]	.351** [.17]
CVC-Incentives-High	–	–	.143 [.32]	.418 [.40]	.192 [.32]	.198 [.32]
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Round Valuation	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]
Strategic CVC	.324*** [.12]	.444*** [.11]	.280** [.15]	.202 [.15]	.273* [.15]	.258* [.14]
N	13,096	13,096	13,096	8,520	5,896	8,241
Log-Likelihood	-16553***	-16554***	-16552***	-10843***	-7418***	-14966***

Ordered-Logit regression results. The dependent variable is a categorical measure denoting whether the venture receiving the investment round is at a Seed (1), Early (2), Expansion (3) or Later stage (3). 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. *CVC-Incentives* is an index of compensation intensity for CVC programs. *CVC-Incentives-Low* (*CVC-Incentives-High*) get the value one when compensation is below (above) index's median value, and the value zero if information about CVC's compensation is unavailable. *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 3-digits VEIC code of the venture. *Round Valuation*, post-round valuation in thousands of dollars. *Strategic CVC*, gets the value one if CVC stated strategic orientation, zero else. The table reports parameter coefficient estimates, robust standard errors clustered by funded venture are in brackets (* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$). For vectors of dichotomous variables, the table reports inclusion of a vector. As robustness test, the analysis is replicated in various sub-samples: only syndicated rounds (Models 3-4), rounds where IVC funds previously syndicated with a CVC investor (Models 3-5), and rounds where IVC firm previously syndicated with a CVC (Models 3-6).

Table 4: Analysis of Syndicate Size

	(4-1) Full	(4-2) Full	(4-3) Full	(4-4) Syndicated Rounds	(4-5) Holding IVC Fund	(4-6) Holding IVC Firm
CVC / IVC	.449*** [.03]	–	–	–	–	–
CVC-Incentives	–	.157*** [.03]	–	–	–	–
CVC-Other	–	.432*** [.03]	.459*** [.03]	.318 *** [.02]	.751 *** [.03]	.592 *** [.03]
CVC-Incentives-Low	–	–	.493 *** [.05]	.263 *** [.05]	.787 *** [.06]	.627 *** [.06]
CVC-Incentives-High	–	–	.039 [.14]	.079 [.11]	.318 ** [.14]	.165 [.14]
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Stage Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Round Valuation	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]
Strategic CVC	.026 [.05]	.160*** [.05]	.005 [.06]	.033 [.05]	–.009 [.06]	–.009 [.06]
Constant	1.845*** [.08]	1.844*** [.08]	1.843*** [.08]	1.964*** [.07]	1.277*** [.10]	1.333*** [.09]
N	13,096	13,096	13,096	8,520	5,896	8,241
Log-Likelihood	-25532***	-25559***	-25525***	-17334***	-10173***	-14966***

Negative binomial regression results. 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. *CVC-Incentives* is an index of compensation intensity for CVC programs. *CVC-Incentives-Low* (CVC-*Incentives-High*) get the value one when compensation is below (above) index's median value, and the value zero if information about CVC's compensation is unavailable. *Year Dummies*, a vector of dichotomous variables denoting the year of the focal round (1990-1999). *Venture Stage Dummies*, a vector of dichotomous variables denoting whether the focal round is Seed, Early, Expansion or Later. *Venture Industry Dummies*, a vector of dichotomous variables denoting the 3-digits VEIC code of the venture. *Round Valuation*, post-round valuation in thousands of dollars. *Strategic CVC*, gets the value one if CVC stated strategic orientation, zero else. The table reports parameter coefficient estimates, robust standard errors clustered by funded venture are in brackets (* $z < 0.05$, ** $z < 0.01$, *** $z < 0.001$). For vectors of dichotomous variables, the table reports inclusion of a vector. As robustness test, the analysis is replicated in various sub-samples: only syndicated rounds (Models 4-4), rounds where IVC funds previously syndicated with a CVC investor (Models 4-5), and rounds where IVC firm previously syndicated with a CVC (Models 4-6).

Table 5: Treatment Effects Model of Investment Stage and Syndication

	Investment Stage (2^{nd} stage results)	**Syndicate Size (2^{nd} stage results)**
	(5-1)	**(5-2)**
CVC-Incentives-High	–.360* [.25]	–2.116*** [.66]
Venture Stage Dummies	–	*Incl.*
Year Dummies	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*
Round Valuation	.000* [.00]	.000 [.00]
Lambda	.016 [.22]	.427 [.57]
Constant	2.849*** [.56]	4.403*** [1.78]
N	237	237
Wald Chi2	30.27***	53.29***

These results are for a sub-sample of rounds involving CVC programs for which compensation data is available. Models 5-1 (Models 5-2) report the 2^{nd} stage results where *Investment Stage* (*Syndicate Size*) is the dependent variables. Table A3 reports the 1^{st} stage results, and Table A2 replicates Model 3-3 and 4-3 within the sub-sample.

Appendix: Robustness Tests

Table A1: Different Models for Investment Stage and Syndicate Size

	Investment Stage			Syndicate Size			Seemingly Unrelated Regressions (SUR)	
	(A1-1) **OLS**	**(A1-2)** **Poisson**	**(A1-3)** **Neg. Binomial**	**(A1-4)** **OLS**	**(A1-5)** **Poisson**	**(A1-6)** **Ordered Logit**	**(A1-7)** **Investment Stage**	**(A1-8)** **Syndicate Size**
CVC-Other	.128*** [.04]	.056*** [.01]	.056*** [.01]	1.706 *** [.12]	.510 *** [.02]	1.259 *** [.08]	.128 *** [.03]	1.713 *** [.08]
CVC-Incentives-Low	.162** [.08]	.067** [.03]	.067** [.03]	1.789 *** [.25]	.524 *** [.04]	1.574 *** [.15]	.162 *** [.08]	1.800 *** [.19]
CVC-Incentives-High	.058 [.15]	.025 [.06]	.025 [.06]	.084 [.37]	.045 [.10]	–.033 [.33]	.058 [.15]	.089 [.36]
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Stage Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	–	–	–	*Incl.*	*Incl.*	*Incl.*	–	*Incl.*
Round Valuation	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]	.000*** [.00]
Strategic CVC	.157** [.07]	.060** [.03]	.060** [.03]	.040 [.27]	.013 [.04]	–.106 [.15]	.157** [.07]	.048 [.17]
Constant	2.573*** [.05]	.947*** [.02]	.947*** [.02]	6.001*** [.39]	1.870*** [.05]	–	2.573*** [.04]	5.978*** [.22]
N	13,096	13,096	13,096	13,096	13,096	13,096	13,096	13,096
Log-Likelihood / [R2]	[.036]***	-20308***	-20308***	[.176]***	-26312***	-23078***	[.036]***	[.176]***

Models A1-1 through A1-3 analyze *Investment Stage* using an OLS, Poisson, and Negative Binomial estimation, respectively. The sign and significance of the coefficients is similar to Model 3-3. We also re-estimate *Syndicate Size* using an OLS (A1-4), Poisson (A1-5), and Ordered-Logit (A1-6). The coefficients are similar in sign and significance to those in Model 4-3. We note that in Model A1-6, *CVC-Incentives-High* now has a negative sign, but it remains insignificantly difference from zero. Finally, while the stage and syndication regressions are seemingly unrelated, we recognize that the errors may be correlated across the equations. Accordingly, Models A1-7 and A1-8 report the results of Seemingly Unrelated Regressions (SUR; Zellner, 1962). Again, the coefficients are similar in sign and significance to Models 3-3 and 4-3, respectively.

Table A2: Treatment Effects Model Auxiliary Table – Sub-Sample Benchmark Results

	Investment Stage		Syndicate Size	
	Ordered Logit **(A2-1)**	**OLS** **(A2-2)**	**Negative Binomial** **(A2-3)**	**OLS** **(A2-4)**
CVC-Incentives-High	–.626*	–.331*	–.431***	–1.533***
	[.41]	[.21]	[.14]	[.48]
Venture Stage Dummies	–	–	*Incl.*	*Incl.*
Year Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Venture Industry Dummies	*Incl.*	*Incl.*	*Incl.*	*Incl.*
Round Valuation	.000	.000*	.000	.000
	[.00]	[.00]	[.00]	[.00]
Strategic CVC	.048	.030	.082	.392
	[.32]	[.15]	[.07]	[.35]
Lambda	–	–	–	–
Constant	–	2.834***	1.353***	3.993***
		[.25]	[.48]	[1.90]
N	237	237	237	237
Log Likelihood /[R2]	-292***	[.12***]	-511***	[.21***]

Results for a sub-sample of rounds involving CVC programs for which compensation data is available. Model A2-1 (A2-3) replicates Model 3-3 (Model 4-3) within the sub-sample. To facilitate interpretation of the Treatment-Effects model, we first estimate similar specifications using a simple OLS regression (Models A2-2 and A2-4).

Table A3: Treatment Effects Model Auxiliary Table – 1st Stage Results

	1st Stage (A3-1)
Industry Tech Opportunities	37.6*** [1.5]
Industry IPP	–270.6*** [40.0]
Industry Complementary Assets	–308.0*** [19.7]
Firm Cash-Flow	–22.6*** [2.0]
Firm R&D	16.9*** [1.6]
Strategic CVC	.823 [.78]
Distance between HQ-CVC	.004*** [.00]
Constant	–.312 [.26]
N	237
Log Likelihood	-50.25**

1st stage specification models the probability CVC personnel receive performance-pay. To the extent that strategically-oriented programs are less likely to offer high-powered incentives, the independent variables include *Strategic CVC* as well as other variables known to drive strategic CVC (Dushnitsky & Lenox, 2005b, 2006). We also include the distance between CVC and its headquarters.