

**A PROPERTY RIGHTS PERSPECTIVE ON VENTURE CAPITAL INVESTMENT
DECISIONS**

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Abstract

To understand how ownership differences influence specific types of strategic decisions, we examine the investment decisions of venture capital (VC) firms, for which a variety of property rights arrangements exist. We describe how VC firms are characterized by important differences in how and to whom various property rights are allocated. On this basis, we develop a series of hypotheses regarding differences in the range and types of investment opportunities pursued by private, corporate and bank affiliated VC firms. Evaluating our hypotheses using data on investments carried out by 3,557 firms, we find that these types of firm perform distinct roles in the ecology of VC financing.

Keywords: Venture Capital, Investment Decisions, Corporate Venturing, Limited Partnerships, Property Rights.

INTRODUCTION

Research in the fields of strategic management and entrepreneurship suggests that a firm's ownership structure influences its general strategic orientation (e.g. Carney and Gedajlovic, 2002; Peng, Tan, and Tong, 2004) as well as the cognitive heuristics employed by key decision-makers (e.g. Wright, Hoskisson, Busenitz, and Dial, 2000). Yet, there is not much research on how ownership differences influence specific types of strategic decisions. In this paper, we examine the investment decisions of venture capital (VC) firms. We reason that the VC industry represents an excellent setting for the exploration of the effects of ownership arrangements on specific strategic decisions, because it features firms with different property rights arrangements engaged in the same basic strategic task – the selection of portfolio firms in which to invest.

In this respect, the VC industry encompasses organizations with different organizational arrangements linking potential investors with young entrepreneurial firms seeking financing (Fenn, Liang, and Prowse, 1995). Distinct streams of research have evolved to study particular types of these VC firms, such as private limited partnerships (e.g. Sahlman, 1990) and corporate VC firms (e.g. Dushnitsky and Lenox, 2005a; Siegel, Siegel, and MacMillan, 1988). As a consequence, the literature is largely silent on broader questions pertaining to why different types of firms performing quite similar functions coexist in the VC industry, and what their relative tendencies are regarding the types of entrepreneurial ventures that are financed.

We utilize property rights theory, which provides a framework that lends itself well to the comparative analysis of alternative organizational arrangements (Coase, 1937; Hart and Moore, 1990; Milgrom and Roberts, 1992). In doing so, we adapt property rights theory to the VC context by describing how types of VC firms differ in terms of how and to whom decision and

income rights are allocated. We also discuss how these alternative allocations of property rights influence the incentives of investors and VC managers, and place effective decision control in the hands of parties having differing objectives and capacities. On this basis, we develop a series of hypotheses regarding the range and types of investment opportunities pursued by private, corporate and bank affiliated VC firms. We evaluate these hypotheses using comprehensive data on US-based VC firms pertaining to the portfolio composition of 1,297 firms and 11,625 industry-entry decisions by 3,557 firms, and find that these varieties of firm perform distinct roles in the ecology of VC financing.

VENTURE CAPITAL AND THE ALLOCATION OF PROPERTY RIGHTS

Entrepreneurs pursuing new, innovative ideas need capital to make them work and this capital typically comes from third parties. Unfortunately, transaction costs make raising money directly on public equity markets impractical or impossible for such entrepreneurs (Berger and Udell, 1998) and, from the perspective of investors, such investments are difficult to monitor and fraught with information asymmetry and moral hazard (Amit, Brander, and Zott, 1998). To address the financing needs of young firms and to manage the investment risk of investors, specialized professional VC investment entities are often used as intermediaries between them (Chan, 1983). The focus in this paper is on the relationship between such VCs and the investors who fund their activities.

Arrangements of Property Rights

Like other equity holders, the providers of VC possess two types of property rights associated with their investments. First, income rights provide these investors with a claim on profits from their investments. Second, decision rights provide them with a say in how invested capital is managed, such as which entrepreneurial firms are funded and the terms and timing of

such investments. The quality of such decisions is vitally important to both investor and entrepreneurial firm. The decisions, however, are highly complex and their effectiveness calls for specialized managerial and technical skill and knowledge not commonly held by equity investors (Amit *et al.*, 1998; Chan, 1983). Poor decision making and inadequate monitoring of investments can have negative implications for both investors and entrepreneurial firms, but substantial value can also be created through careful selection (Lerner, 1994), extensive monitoring and oversight (Gompers, 1995; Lerner, 1995), and sound strategic and operational advice (Hellman and Puri, 2002; Sapienza, 1992).

It is important to note that the income and decision rights afforded equity investors are not absolute. They are defined and can be augmented or diminished by law or public policy (North, 1990). For instance, corporate, employment, capital gains and dividend tax obligations imposed by governments define the income rights of equity holders and are often used instrumentally to provide incentives (or disincentives) for certain types of activities. With respect to decision rights, government policies define standards that constrain or empower the discretion of decision makers (Nee, 1992). In this respect, Fenn *et al.* (1995) link several key policy changes to the emergence and growth of VC intermediaries in the U.S.

Net of the limitations imposed by law and custom, equity holders have broad discretion over the use of their property (Williamson, 1991) and they may retain, or contract away, any or all of their specific remaining rights to other parties in various ways (Milgrom and Roberts, 1992). Importantly, equity owners typically retain residual rights – that is, those rights available to them under prevailing laws and regulations which have not been specifically contracted away (Alchian and Demsetz, 1972). The importance of tacit knowledge as well as the complexities and unknowns involved in providing VC financing to young entrepreneurial firms (Dimov and

Shepherd, 2005) create difficulties in specifying contracts accounting for all contingencies (Wright and Lockett, 2003). We reason that such features of the VC environment lead to situations of incomplete contracting that make the efficient allocation of residual rights especially critical (Grossman and Hart, 1986).

Most commonly, VC financing is channeled through funds organized as Limited Partnerships (Fenn *et al.*, 1995). Under such governance regimes, managers of the fund act as general partners, but typically invest only 1% or less (often in the form of a promissory note) of the fund's total capital (Gompers and Lerner, 1999). Outside investors, or limited partners (LPs), provide the remainder of the capital, but are prohibited from engaging in the active management of the fund. Thus, in exchange for limited liability and favorable tax treatments, LPs cede decision rights to professional managers (Sahlman, 1990). Under this scenario, VC management act as agents having the fiduciary responsibility to act in the best interests of their principals (LPs), but also have both the incentive and often the discretion to pursue investment strategies which benefit them at their expense (Gompers and Lerner, 1996). In this regard, the inability of LPs to engage in active management provides fund managers with significant discretion.

A number of other arrangements for VC financing are also common. Most notably, the financing of entrepreneurial firms is also often undertaken by the dedicated VC units of industrial corporations or by the VC affiliates of financial institutions (Fenn *et al.*, 1995). Viewed from the perspective of property rights theory, both these arrangements involve the vertical integration of the specialized managerial function by equity investors and allow investors to retain most, or all, decision and income rights over their investments. While these VC unit managers may be granted specific decision and income rights as part of their compensation package in an attempt to emulate the incentives of general partners in private VC firms

(Chesbrough, 2000), important residual decision and income rights rest with the providers of equity or their designated agents (e.g., senior management). To the extent that these residual right holders have different competencies and preferences, there are important implications for the relative efficiency of the VC units in providing resources to different types of ventures (Grossman and Hart, 1986; Hart, 1988).

Types of VC Firms and Their Investment Decisions

We focus on three distinct types of VC firm: *private* (PVCs), which operate independently through limited partnerships; *corporate* (CVCs), which are the subsidiaries of industrial corporations; and *bank affiliated* (BVCs), which are investment subsidiaries of financial institutions. These types represent close to 80% of all VC firms and account for almost 90% of all VC transactions in the US over the last 40 years (VentureXpert, 2004). As summarized in Table I, we distinguish these types of firms in terms of four related characteristics that stem from the property rights arrangements under which they operate: a) the intensity of the financial incentives of VC managers; b) the tightness of control or oversight exercised by property rights holders on their managerial agents; c) whether the type of controls used by the property rights holders emphasize financial or strategic objectives; and d), whether property rights holders possess complementary resources that may be leveraged to the firms in which a VC firm invests, and if so, the types of these resources.

----- Insert Table I about here -----

Private Venture Capital Firms (PVCs). PVCs operate independent investment funds, structured as limited partnerships, in which equity comes from a variety of actors, most notably wealthy individuals and families, public and corporate pensions funds, and endowments and

foundations (Sahlman, 1990). These investors typically have purely financial objectives for their investments, which represent but one element in their diversified pool of investments (Gompers and Lerner, 1998b; Jeng and Wells, 2000). Under this arrangement, PVC managers are paid a management fee of 2-3% and, once capital is returned to the investors, they also receive 20-30% of the upside (Metrick and Yasuda, 2008). This type of contractual arrangement allows managers to benefit from high upside performance without a concomitant downside risk and provides them with a strong incentive to pursue high risk/return investment opportunities (Gompers and Lerner, 1999).

Beyond the explicit restrictions imposed by LPs and the financing agreement (Gompers and Lerner, 1996), PVC managers possess substantial residual decision rights over fund investments. Consequently, PVC managers have broad discretion (Wright and Robbie, 1998). At the same time, they are subject to what Baysinger and Hoskisson (1990) term a system of financial controls because they “are rewarded primarily, if not solely on the basis of their success (*ex post*) in meeting performance criteria” (p. 78). This occurs because PVCs typically operate several funds, each with a fixed fund life of 10-12 years. As a consequence, PVC managers need to raise new capital on a regular basis, often from the same investors (Gompers and Lerner, 1998b; Lerner and Schoar, 2004) and thus stand to benefit from a proven track record of effective fund stewardship and the delivery of superior returns (Cumming, Fleming, and Suchard, 2005).

Corporate Venture Capital Firms (CVCs). The incentives and discretion of CVC managers are defined by their status as corporate employees. That is, CVC managers are subordinate to the senior management of their corporate parent who themselves have the fiduciary responsibility to act in the best interest of the firm and to satisfy multiple stakeholders.

In this respect, CVC managers don't possess ultimate decision rights and are subject to monitoring and the strategic controls of their corporate parents that relate to the *ex ante* strategic desirability of the investments (*cf.* Baysinger and Hoskisson, 1990) in relation to corporate priorities rather than their standalone investment return (Manigart *et al.*, 2002).

By retaining the residual decision rights, the corporate parent can share and leverage its organizational resources and knowledge across the various investments made by the CVC managers (Maula, Autio, and Murray, 2005). CVCs can also serve as an important tool for the parent to gain new knowledge or capture resources to enhance their core businesses (Block, 1993; Dushnitsky and Lenox, 2005b; Siegel *et al.*, 1988). In this respect, an important focus of CVCs is on investments in new businesses that have the potential to provide or receive synergistic benefits beyond enhanced legitimacy and reputation, based on access to complementary resources. The sorts of resources that can be transferred from/to the corporate parent tend to be industrial or technological in nature (Dushnitsky and Lenox, 2005a,b), and can be highly specialized, internally developed, and firm-specific. Such assets have fairly limited fungibility (*cf.* Barney, 1991), a factor that delimits the types of markets and technologies to which they may be profitably leveraged. We reason that these considerations imply that CVC investments are primarily strategic and often aimed at gaining synergies through the combination of existing corporate resources and capabilities with the new technologies, products, or markets of the firms in which their VC subsidiaries invest (Covin and Miles, 2007; Gompers and Lerner, 1998a; Maula *et al.*, 2005).

Bank Venture Capital Firms (BVCs). Similarly to CVCs, the equity of BVCs is provided by their corporate parents. Also like their counterparts in CVCs, the incentives and discretion of BVC managers are defined by their status as corporate employees. Although they

may face less intensive direct monitoring, they are still subject to strategic controls that reflect the interests of their corporate parent rather than just the standalone financial returns of their particular investments (Wright and Robbie, 1996).

Beyond these commonalities with CVCs, a key difference in BVCs lies in the types and amounts of potentially complementary resources that may be leveraged to produce synergies. That is, due to their non-industrial character, financial institutions are unlikely to have many specialized or tangible resources that may be applied to achieve synergistic benefits, but they are typically more skilled at managing the financial needs of established companies (Wright and Robbie, 1996). Importantly, they can also stand to benefit from the investments of their VC units if they can be leveraged into profitable opportunities to provide commercial banking, consulting, investment banking, or insurance services contracts (Fenn *et al.*, 1995; Hellman, Lindsey, and Puri, 2008). These financial services are substantially more fungible than the industrial/technological resources possessed by non-financial corporations. As we will see, this distinction plays a pivotal role in determining the types of opportunities acted upon by CVCs and BVCs respectively.

HYPOTHESES

The VC Firm's Investment Opportunity Set

Investment decisions of VC managers involve identifying and selecting among alternative opportunities. Such opportunities vary within and across industries and over time, as existing opportunities are taken up or elapse and new ones emerge and take shape (Klevorick, Levin, Nelson, and Winter, 1995). We conceive of the collection of all opportunities (for a given period in time) as a *market opportunity set* (MOS). MOS is an aggregate snapshot of VC investments in different industries over a particular period and thus reflects the distribution of

opportunities across industries.

At the level of the organization, we conceive of the portfolio of investment decisions made by particular VC firms as the *firm opportunity set* (FOS). A firm's FOS is determined by the aggregation of its individual investments within and across industries and, as such, is an indicator of realized outcomes strongly reflective of its strategic intent (*cf.* Mintzberg and Waters, 1985). VC managers can choose to closely emulate the MOS and follow the overall relative market preference of each industry; or they can choose to develop portfolios with more idiosyncratic industry compositions. Such choices reflect the VC firm's specialization in certain industrial sectors. Two characteristics distinguish a VC firm's FOS relative to the MOS: absolute deviation (how closely the investments in a firm's FOS match the MOS); and direction of deviation (whether the investments in a firm's FOS are more or less concentrated than the MOS).

As described above, key decision rights regarding the selection of investments by BVCs are held by corporate managers and delegated to VC managers who are employees of the firm and are subject to a system of strategic controls. We reason that since these controls are based on the utilization of complementary assets with a broad scope of applicability (financial services), BVCs face low pressure to deviate from the MOS. In this respect, emulating the MOS increases the likelihood of a BVC achieving adequate (close to market) returns, while also creating business opportunities for their investment or commercial banking affiliates.

Since PVCs managers hold key decision rights, but are subject to *ex post* financial controls (Sahlman, 1990; Wright and Robbie, 1998), we reason that they face moderate pressure to deviate from the MOS. On the one hand, given the strong competition among PVC managers for investment dollars and the need to achieve above-market returns to attract future financing (Gompers and Lerner, 1998b), PVC managers cannot simply emulate the MOS. In this regard,

their portfolio composition will be based on their expected efforts and relative efficiency in sourcing, evaluating, and performing due diligence on prospective deals in particular industries. *Ex ante*, these assessments are based on their experience and tend to steer them towards a manageable set of investment domains. On the other hand, given the 5-7 year time line for harvesting investments (Cochrane, 2005) and uncertainty regarding how markets and technologies will evolve (von Burg and Kenney, 2000), deviating too much from the MOS can endanger the relative position of PVC managers by making them vulnerable to unfavorable market swings. Thus, we reason that PVC managers will select investment opportunities that deviate moderately from the MOS to create the potential for above-market returns.

We reason that CVCs will be the least attuned to the MOS. This is due to the employee status of their managers, the *ex ante* strategic controls placed on them, and the unique industrial assets possessed by their property rights holders. Under such circumstances, we expect the investment choices of CVCs to be highly idiosyncratic and reflective of the heterogeneous distribution of such valuable resources across firms (Peteraf, 1993). Therefore, we reason that the opportunity sets (FOS) of CVCs will exhibit the greatest deviation from the MOS.

The above arguments suggest the following hypotheses:

Hypothesis 1a. *Compared to PVCs, CVCs exhibit greater deviations of their opportunity sets from the market opportunity set.*

Hypothesis 1b. *Compared to PVCs, BVCs exhibit smaller deviations of their opportunity sets from the market opportunity set.*

We reason that the direction of deviation – towards higher or lower portfolio concentration – will be related to a firm’s need to evaluate potential investments and its managers’ ability to monitor and add and extract value from these investments. For CVCs, the

limited fungibility of the technological and industrial assets of their property rights holders creates the biggest restriction on the industry scope of their portfolios. Such a restriction is dictated by the need for CVC managers to continuously evaluate the possibilities for moving knowledge and assets between the corporate parent and the portfolio company (Chesbrough and Tucci, 2002). In contrast, we reason that given the fungible character of the underlying assets of their property rights holders, BVC managers are less concerned with whether these assets can be deployed and more concerned with producing balanced cohorts of portfolio companies that will demand financial services (Manigart *et al.*, 2002).

PVCs again occupy a middle ground since their property rights holders are predominantly focused on achieving financial returns rather than strategic fit. In looking to position themselves for sustained financial performance, they need to strike a balance between their ability to add value to their investments and their dependence on (potentially diminishing) returns from particular industries. In this respect, while restricting their opportunity sets allows PVCs to better monitor and advise the firms in which they invest (Amit *et al.*, 1998), they need not be overly restrictive in their focus, and should instead cast a fairly broad net for good business opportunities (Norton and Tenenbaum, 1993) to achieve above-average returns.

These considerations are summarized in the following hypotheses:

Hypothesis 2a. *Compared to PVCs, CVCs have more concentrated portfolios.*

Hypothesis 2b. *Compared to PVCs, BVCs have less concentrated portfolios.*

Order and Stage of Industry Entry

When investing in new industries, VC managers must make decisions regarding their timing as well as the developmental stage of the companies they choose to back (Dimov, Shepherd, and Sutcliffe, 2007). In this regard, VC management can adopt a strategy of investing

relatively early in new industries and technologies, or alternatively choose to be a late entrant. Earlier, pioneering investments are inherently much more risky, but also offer the potential of significantly higher returns (Arthur, 1996). The evaluation of such early entry investments can impose higher search and information costs due to greater uncertainty regarding assessments of their upside potential and downside risks (von Burg and Kenney, 2000). We reason that the incentives and controls inherent in different property rights arrangements can affect the ways in which these considerations are balanced and thus the appeal of earlier versus later investments.

PVCs should have the strongest tendency to make earlier investments since the allocation of decision and income rights in these firms provides their managers with broad discretion over the selection of opportunities and allows them to benefit from high upside performance without a concomitant down risk (Gompers and Lerner, 1999). In this respect, the ceding of decision rights by LPs to PVC managers alleviates managers of the need to collect information to justify their sometimes intuitive assessments of expected returns and risks (Lerner and Tetlock, 1999). This latitude enables them to respond quickly to emerging and ephemeral business opportunities (Eisenhardt, 1989).

In contrast, as employees subordinate to the management of their corporate parents and subject to their strategic controls, the managers of CVCs and BVCs have less discretion and need to foresee and justify the strategic value of potential investments to corporate bosses (Chesbrough, 2000). We reason that such assessments and justifications are more difficult in the early stages of a sector's evolution when there is greater uncertainty about the business models that will become dominant (von Burg and Kenney, 2000) and where capital requirements and risks are more ambiguous. Under these circumstances, we expect that the retention of decision rights by corporate parents and the concomitant constraints on the discretion of VC management

will tend to delay decision making in both CVCs and BVCs, resulting in relatively fewer investments in newly emerging industrial sectors.

Overall, these considerations suggest that the allocation of property rights in PVCs affords their managers relative advantages in quickly identifying and acting upon opportunities in new sectors.

***Hypothesis 3a.** Compared to CVCs, PVCs will enter new industry sectors earlier.*

***Hypothesis 3b.** Compared to BVCs, PVCs will enter new industry sectors earlier.*

Another choice that VC firms face when investing in new industries is whether to back more or less developed companies. Whereas early-stage companies may be still in the process of exploring ideas for which they have not yet developed commercial products or tested markets, later-stage companies have more established products and better defined markets (Gupta and Sapienza, 1992). Investing in early-stage companies allows investors to exercise greater control over their development because: a) such companies command lower valuations, allowing investors to obtain greater control at a lower cost (Gompers and Lerner, 2000); b) such companies are less likely to have received previous infusions of equity from other firms who may also wish to exert significant control; and c) commonly used contractual mechanisms (e.g., pre-emptive rights and anti-dilution clauses) allow early investors to preserve their influence in future financing rounds (Sahlman, 1990).

We reason that the benefits of tighter control is most valuable to CVCs due to the specificity of the complementary resources of their corporate parents and their resulting need to prevent others from capturing the value that they create. Given the transaction costs involved in transferring and protecting the knowledge and assets of entrepreneurial companies (Teece,

1998), CVC managers may operate under a mandate to exert tight control over their portfolio companies. Consequently, we expect the portfolios of CVCs will be heavily weighted towards investments in earlier stage companies. In this respect, when CVC managers look for targets whose technology or business model can be potentially beneficial to the corporate parent, lack of, or insufficient, control may result in undesirable knowledge spillovers (Almeida and Kogut, 1999) or the inability of the CVC to rein in the investment when necessary (Hellman, 1998). Furthermore, enhanced control over the venture increases the CVC parent firm's ability to learn from its investments (Dushnitsky and Lenox, 2005b). These considerations are particularly significant with respect to investments in new sectors, where greater control can give corporate investors better opportunities to understand and explore the market's strategic potential.

In contrast, we reason that BVCs are more concerned with the speed and probability that new investments can be leveraged into business opportunities for their investment or commercial banking affiliates. In this regard, later-stage companies – having already established businesses and seeking further expansion – are more likely to demand and absorb such services. As a result, we expect that the portfolios of BVCs will be more heavily weighted towards later-stage investments (Wright and Robbie, 1996). Finally, given their need to consistently demonstrate high financial returns (Gompers and Lerner, 1998b), we reason that PVCs will seek to smooth the timing of their financial returns and thus can benefit from a more balanced portfolio of early- and late-stage investments.

Therefore, because of the differing capabilities and investment objectives of their property rights holders and their related effects on the incentives and discretion of VC management, we hypothesize that,

***Hypothesis 4a.** When entering new industry sectors, CVCs back less developed*

companies than PVCs.

Hypothesis 4b. *When entering new industry sectors, BVCs back more developed companies than PVCs.*

METHODS

Data

We use data from the *VentureXpert* database on VC investment transactions executed by U.S.-based firms between 1962 and 2004. Typically, a VC firm invests in a company over several rounds and for most portfolio companies more than one VC investor is involved. The data thus contains multiple observations by VC firm (for each portfolio company and each investment round) and by portfolio company (for each VC firm and each investment round).

As we are interested in the construction and characteristics of portfolios, our observations consist only of the rounds in which a particular VC firm invests in a particular portfolio company for the first time. We further narrow the data to include only the three types of VC firms featured in our hypotheses – PVCs (2,175 firms), CVCs (763 firms), and BVCs (619 firms) – rendering a total of 69,939 first-time investments. We use the following descriptions from the *VentureXpert* database to determine whether a VC firm belongs to one of these 3 categories: ‘private equity firm investing own capital’ (PVC), ‘corporate subsidiary or affiliate’ or ‘corporate venturing program’ (CVC), and ‘bank group’, ‘commercial bank affiliate or subsidiary’, ‘affiliate/subsidiary of other financial institution’, ‘investment/merchant bank investing own or client funds’, ‘investment/merchant bank subsidiary or affiliate’ or ‘insurance firm affiliate or subsidiary’ (BVC). To check the robustness of the BVC categorization we used an alternative specification based on the more homogeneous subset of investment bank affiliates.

We obtained results consistent with those reported below, except that for relative concentration the difference between investment bank VC firms and PVCs is not significant.

For each firm, we track its cumulative portfolio over time, as new investments are added. Since our data are combined at the firm level, each firm's opportunity set represents the aggregation of investments made through all of its individual funds. We determine the industry of each investment based on the categorization made by *VentureXpert* and in line with other work using the same data (e.g. Gompers, Kovner, Lerner, and Scharfstein, 2005). *VentureXpert* uses nine main industry categories: (1) communications, (2) computer-related, (3) electronics, (4) biotechnology, (5) medical/pharmaceutical, (6) energy, (7) consumer related, (8) industrial/chemical, and (9) other manufacturing and services. To facilitate our analysis of the entry of each VC firm into these industries, we order chronologically all investments made in each of these industries and then, for each investment, recorded the number of other firms already invested in that industry. Table II presents summary firm and portfolio statistics for each type of VC firm. These statistics indicate that CVCs operate a smaller number of funds, have smaller portfolios, and invest in fewer industries than either PVCs or BVCs.

----- Insert Table II about here -----

Variables

Opportunity set characteristics. To derive and characterize each VC firm's FOS, we identify the last investment made by each VC firm as a marker of the firm's 'final' portfolio. As our data extends to the end of 2004, some of the observations are right-censored because some VC firms may have made only a few investments by that date and thus not revealed their desired portfolio composition. For such firms, limited investment data may not provide a valid representation of the firm's investment preferences and are problematic for calculating and

working with the relative proportions of each industry. Also, as Gompers and Lerner observe, larger VC firms tend to have stronger strategic objectives (1998a) and so conform better to our theoretical distinction of VC firm types. We address these concerns by limiting our opportunity set analysis to VC firms that had invested in at least ten portfolio companies by the end of 2004. This requirement was met for 1,297 of the 3,557 VC firms. Of the firms with fewer than ten investments, sixty-five percent were founded after 1990.

We derive the firm and market opportunity sets as follows:

$$FOS_i = [w_{i,j}]; MOS_i = [W_{i,j}], j = 1,2,..9$$

where FOS_i represents the opportunity set of VC firm (i) and MOS_i represents the market opportunity set for the period in which VC firm (i) was active. Each opportunity set is characterized by a set of weights ($w_{i,j}$ and $W_{i,j}$), respectively representing the relative proportion of industry(j) in the set of investments made by VC firm(i) and by all firms over the period in which firm(i) had been active (i.e., from its first investment until its last investment). To determine the industry distribution of the investments made by all VC firms over that period ($W_{i,j}$), we identify all companies that had received VC financing over that time period and then calculated the relative proportion of each of the industries in this aggregate investment activity.

We measure the deviation and concentration of FOS_i relative to MOS_i as follows:

$$DEV_i = \sum (w_{i,j} - W_{i,j})^2, j = 1, 2, \dots, 9$$

$$RELCONC_i = \sum w_{i,j}^2 / \sum W_{i,j}^2, j = 1, 2, \dots, 9$$

where DEV_i represents the deviation and $RELCONC_i$ represents the relative concentration of VC firm (i)'s portfolio relative to the market portfolio. DEV_i represents the Euclidean distance between FOS_i and MOS_i , with greater values reflecting greater deviations of VC firm(i) from the market portfolio. $RELCONC_i$ captures the ratio of the concentrations of FOS_i and MOS_i , with

each concentration measured as a Herfindahl index using the respective proportions of each industry(j) in each portfolio ($w_{i,j}$ and $W_{i,j}$). Greater values of $RELCONC_i$ suggest that FOS_i is more concentrated relative to the MOS_i .

Table III shows descriptive statistics for the deviation and relative concentration of VC firm portfolios. The statistics suggest that the portfolios of CVCs deviate the most from the market portfolio and are also the most concentrated. In contrast, the portfolios of BVCs exhibit the least deviation and are the least concentrated.

----- Insert Table III about here -----

Order and stage of industry entry. For each VC firm (i) and industry (j), we select the first investment made by this firm in the industry. Overall, our data contain 11,625 entries made by 3,557 firms. We measure VC firm(i)'s order of entry into industry(j) as follows:

$$OE_{ij} = \ln(NF_{j,entry} - NF_{j, founding})$$

where $NF_{j,entry}$ is the number of other firms that have already invested in industry(j) at the time of VC firm(i)'s entry and $NF_{j, founding}$ is the number of firms already active in industry(j) at the time VC firm (i) was founded. In this way, each entry is bound to the time at which a firm is established.

For each entry by firm(i) in industry(j), we measure the development stage of the company receiving VC firm(i)'s investment using the following categories: (1) seed and start-up, (2) first and expansion stage, and (3) later stage/acquisition and other. These three categories represent a gradation of diminishing uncertainty (from earliest to latest stage) and our approach is consistent with that of Mayer et al. (2005).

Table IV shows descriptive statistics for the order and stage of VC firm's first

investments in the industrial sectors. Although there are no discernible differences among the three types of firms in regard to their order of entry, statistics suggest that CVCs tend to back earlier-stage companies, while BVCs back later-stage companies.

----- Insert Table IV about here -----

Control variables. To account for various alternative explanations, we include a large set of control variables in the models we estimate. First, we control for the total number of investments made by a firm (logged), the firm's age (in years) at the time of a focal investment, the number of funds operated by a firm, and the proportion of successful exits (IPO and trade sale) by the firm. Second, in order to account for different periods and opportunities in the development of the VC industry, we control for the period in which a firm was founded, using 5 categories (1960s, 1970s, 1980s, 1990s, 2000s). Third, in estimating industry entry, we control for the order of that entry for the firm as well as the possible herding tendency (Scharfstein and Stein, 1990) associated with two distinct "bubble" periods, 1981 to 1986 and 1996 to 2001. Finally, given the key roles played by Silicon Valley in California and Route 128 in Massachusetts in the gestation and history of the VC industry in the U.S. and the funding of high-technology industries (Saxenian, 1994), we control for whether a firm was headquartered in either state.

ANALYSES AND RESULTS

Our hypotheses represent comparisons between CVCs and PVCs and between BVCs and PVCs. In the analyses reported below, we use PVC as the omitted (base) category, so the reported coefficients for CVCs and BVCs capture the differences between these two categories and the base category (PVCs), and provide direct tests of the hypotheses.

Portfolio Deviation and Relative Concentration

We use OLS regression to estimate the deviation and relative concentration of the VC firms' portfolios. We used robust standard errors in our estimations due to heteroskedasticity in the error terms (Huber, 1967; White, 1980). Table V presents descriptive statistics and bi-variate correlations. The OLS results are shown in Table VI. For both portfolio deviation and relative concentration, the addition of the VC firm type indicators significantly improves the fit of the models (ΔR^2 of .017 and .05 respectively, $p < .001$). We checked the robustness of our results by re-estimating the models on two subsets of the data: VC firms with at least twenty portfolio companies and those still active after 2002 and found those results to be fully consistent with those reported below.

The results for opportunity set deviation are shown in Model 2. The coefficient for CVC is positive and significant ($\beta = .04$, $p < .001$), while the coefficient for BVC is negative and significant ($\beta = -.02$, $p < .05$). These results indicate that CVCs exhibit greater portfolio deviation than PVCs, while BVCs exhibit smaller portfolio deviation than PVCs. Thus, both Hypothesis 1a and 1b are supported.

In regard to relative concentration (Model 4), the coefficient for CVCs is positive and significant ($\beta = .38$, $p < .001$), while the coefficient for BVCs is negative and significant ($\beta = -.16$, $p < .01$). These results suggest that CVCs have the most focused portfolios, while BVCs have the most diversified portfolios, thereby supporting both Hypotheses 2a and 2b.

----- Insert Tables V, VI about here -----

Order and Stage of Industry Entry

The descriptive statistics and bi-variate correlations of the variables used in these analyses are shown in Table VII. The data for these analyses have a nested, multi-level structure

since there are repeated observations (i.e., multiple entries) by VC firm, year, and industry. Since there is unobserved heterogeneity at these levels that is not captured in our models – for example, related to the particular investment skills of the VC managers or the market conditions in a given year or industry – not accounting for this heterogeneity can affect the validity of the estimation (*cf.* Hofmann, 1997). Therefore, we used a multi-level modeling program (aML) and specified each investment as nested within a firm. We estimated our models using a maximum-likelihood procedure and incorporated random heterogeneity effects for firm and year (there were no random heterogeneity effects for industry). Both effects were significant. Further, we evaluated the robustness of our results by focusing only on entries occurring between the two high-tech “bubbles” of the early 1980s and late 1990s, and excluding the first entry by each firm. These results are consistent with those reported below.

Order of entry results are shown in Table VIII, Models 1 and 2. The addition of the VC type indicators improves the fit of the model ($\Delta\chi^2 = 28.2, 2 \text{ df}, p < .001$). The coefficient for CVC is positive and significant ($\beta = .17, p < .001$), while the coefficient for BVCs is not significant. These results suggest that CVCs tend to enter new industries later than PVCs and BVCs. This provides support for Hypothesis 3a, but not for Hypothesis 3b.

Given the ordinal nature of the development stage variable, we used an ordered logit model, which estimates it as a linear function of the independent and control variables and a set of cut-off points that characterize the transition from one development stage to the next. Table VIII, Models 3 and 4 present the ordered logit results. The addition of the VC type variables improves the fit of the model ($\Delta\chi^2 = 56.0, 2\text{df}, p < .001$). The coefficient for CVCs is negative and significant ($\beta = -.23, p < .01$), while the coefficient for BVC is positive and significant ($\beta = .41, p < .001$). We examined the marginal effects for the VC firm variables, computed at the

sample means of the model variables (Wiersema and Bowen, 2009). For CVCs, this effect is positive for early-stage entries ($\beta_m = .05, p < .01$), not significant for expansion-stage entries, and negative for later-stage entries ($\beta_m = -.03, p < .05$); for BVCs, it is negative for early-stage entries ($\beta_m = -.07, p < .05$), not significant for expansion-stage entries, and positive for later-stage entries ($\beta_m = .07, p < .05$). In addition, supplementary analyses of these marginal effects across all observations revealed that they were of the same pattern and significance for the predictions of a particular stage at entry. Overall, the results suggest that when entering new industries, CVCs tend to select earlier-stage and BVCs later-stage companies. Thus, Hypotheses 4a and 4b are both supported.

----- Insert Table VII, VIII about here -----

DISCUSSION

Seeking to better understand the implications of different ownership arrangements on strategic decisions, we examine the investment behavior of VC firms through the lens of property rights theory. We link the specific manifestations of property rights arrangements to specific strategic behaviors that are affected by these arrangements. In particular, we distinguish three types of VC firms (i.e., PVCs, CVCs, BVCs) in terms of how/to whom income and decision rights are allocated and explain how these alternative arrangements result in differences in managerial incentives and discretion, and place key decision rights in the hands of parties with differing complementary assets and capabilities. We reason that these differences strongly influence investment decisions and develop and evaluate a series of hypotheses positing differences across PVCs, CVCs and BVCs in the range and types of funded opportunities.

Our findings are supportive of the hypothesized relationships. We find that CVCs, subject to strategic controls bound to the narrowly applicable underlying assets of their investors, tend to

act on the most restricted range of opportunities (H1a, H2a). In contrast, BVCs, looking to leverage a more fungible asset base, fund a more balanced range of opportunities, more synchronized with the overall market developments (H1b, H2b). For PVCs, strong financial incentives and their management's possession of key decision rights lead them towards an intermediate degree of specialization. These findings indicate that the three varieties of VC firm considered here exhibit different tendencies with respect to the range of investments that are funded, with CVCs having the most focused and BVCs the most diverse portfolios.

With regard to investments made in new industries, we hypothesized that because CVCs management seek to enhance the value of the assets of their investors, controlling the relationship with the portfolio companies is important to them, leading them to back less developed companies (H4a). Our findings support this hypothesis and are consistent with prior research that found that firms are most effective in harvesting innovations from the investments of their CVC arms in contexts of weak intellectual property regimes (Dushnitsky and Lenox, 2005b), perhaps as a result of their understanding of technology in its early stages. At the same time, we also posit and find that BVCs seeking to leverage their investor's more fungible assets back more developed companies (H4b). For PVC managers, upside-related incentives and the *ex post* financial controls placed on them lead them to avoid both less developed companies (where the risk of total loss is highest) and more developed companies (where there is less room to create upside value). Again, these findings indicate that the three varieties of VC firms considered here have marked preferences for different types of opportunities.

Collectively, our findings suggest that PVCs, CVCs and BVCs perform distinct and complementary roles in the ecology of VC financing and are consistent with the core premise of property rights theory that how and to whom decision and income rights are allocated have

important efficiency and social welfare implications (Milgrom and Roberts, 1992). In this respect, we note that these differences have been obscured in the management literature on new venture creation which has focused on investment selection processes within CVCs, but has largely ignored analogous processes within PVCs and BVCs. Consequently, broader issues, such as why different types of VC arrangements coexist and whether they are structurally equivalent or serve different functions in the ecology of VC financing have been left unaddressed. We have begun to address these important, but largely unanswered, questions by using property rights theory, which is well suited for the comparative assessment of alternative organizational arrangement.

Relatedly, our findings also open up new avenues for future research related to competition and cooperation among types of VC firms. A number of interesting questions emerge. For instance, how do different types of VC firms cooperate and reconcile their possibly divergent interests when they make joint investments in particular entrepreneurial companies? Addressing this question can contribute to the literature on venture capital syndication and, particularly, the selection of syndicate partners (De Clercq and Dimov, 2008; Wright and Lockett, 2003) by understanding how the interaction of VC managers with different property rights can affect investment selection and outcomes. How do economic and credit cycles, which affect the ability of firms to raise capital from external providers (Gompers and Lerner, 2000), change the borders of their distinct niches within the market for entrepreneurial finance as the prevalence and vitality of the niche inhabitants change? In the current environment of pending financial regulation, how will new rules affect the roles played by the different types of VC firms? Will new regulations engender new types of property rights arrangements not currently in use in the VC industry?

There are limitations to our study. First, we were unable to observe the specific processes that led to the observed investment decisions. Consequently, we could not consider the specific investment models or expertise of VC firms. To better understand how property rights arrangements influence such micro processes, future research could focus on eliciting the specific rationales behind investment decisions based on surveys or observations of internal management processes or of specific interactions between property rights holders and management. Second, due to data limitations, we could not account for other factors in the VC firms' investment decisions, such as the quality of the management team of the recipient companies. More broadly, some of our analyses were cross-sectional in nature and so could not incorporate the more endogenous elements of investment decisions. Additional insights can be gained from examining whether the discretion and constraints of VC managers can affect their ability to attract, appraise, and engage high-quality entrepreneurs. Third, we did not consider other types of VC firm, such as those operating in public sectors, which tend to be more common outside of the US. Finally, we did not have the requisite data to assess the performance implications of observed portfolio differences and whether the observed patterns reflect an efficient specialization of function. Future research probing whether prevailing patterns of property rights allocation in the VC industry reflect economically efficient outcomes appear warranted.

In conclusion, the dissatisfaction with the view of the firm as a black box (combined with the resultant urge by scholars adopting theories from organizational economics to pry open that box) has resulted in the use of simplifying behavioral assumptions and a failure to consider how organizational contexts differ. In this regard, our work highlights the utility of property rights theory for the study of organizations, stemming from its promise for illuminating many issues

and phenomena of interest to scholars in strategic management and entrepreneurship that are overlooked or obscured by other, more widely used theoretical perspectives. Unlike prevalent conceptions of firm governance that are built on archetypal representations of owners and managers, we provide a framework for studying behavior across (rather than within) organizational forms in ways that current management theories – for which organizational forms are relegated to the set of boundary conditions – lack precise access. In doing so, the property rights distinctions highlighted in Table I, creates a basis for strategy scholars to explore many possible moderating effects of governance on the relationship between organizational decision-making and performance outcomes. Similarly, this property rights framework may also provide a basis for further entrepreneurship research examining the moderating influences of governance differences on the relationship between processes of opportunity identification, evaluation and resources mobilization.

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TABLE I
A Comparison of Three Types of VC Firm

	PRIVATE	CORPORATE	BANK
Incentives of VC Managers	Higher Powered	Lower Powered	Lower Powered
Tightness of Control on VC Managers	Relatively Loose	Relatively Tight (Hierarchical Oversight)	Moderate (Hierarchical Oversight)
Type of Control System	Financial (<i>ex post results</i>)	Strategic (<i>ex ante</i> strategic desirability)	Strategic (<i>ex ante</i> strategic desirability)
Complementary Resources of Property Rights Holders	Few and they are prohibited from direct involvement	Non-fungible, industry / technology specific	Fungible, primarily financial

TABLE II
Characteristics of the Types of VC Firm

	Type of VC Firm		
	Private	Corporate	Bank
Panel A: All firms			
Number of firms	2,175 61.1%	763 21.5%	619 17.4%
Founding year	1,992.7	1,992.0	1,989.4
Number of raised funds	2.0	1.2	1.8
Age at final portfolio (years)	6.4	4.5	7.9
Number of portfolio companies	21.9	9.8	23.9
Number of industries in portfolio	3.5	2.2	3.8
Panel B: Firms with at least 10 companies in portfolio			
Number of firms	879 67.8%	175 13.5%	243 18.7%
Founding year	1,989.9	1,990.6	1,985.9
Number of raised funds	3.2	1.7	2.8
Age at final portfolio (years)	11.5	10.0	14.3
Number of portfolio companies	49.1	33.8	56.1
Number of industries in portfolio	5.6	4.3	6.3

TABLE III
Characteristics of the VC Firms' Portfolios (Opportunity Sets)

	Type of VC Firm		
	Private	Corporate	Bank
Number of firms	879 67.8%	175 13.5%	243 18.7%
Panel A: Opportunity set deviation			
Average	0.139	0.182	0.103
Bottom quintile distribution	68.5%	4.2%	27.3%
Top quintile distribution	70.7%	19.7%	9.7%
P-value of difference from PVC		0.000	0.000
Panel B: Opportunity set relative concentration			
Average	1.646	2.098	1.445
Bottom quintile distribution	68.9%	2.3%	28.9%
Top quintile distribution	61.8%	29.3%	8.9%
P-value of difference from PVC		0.000	0.000

TABLE IV
The Order and Stage of Entry by VC Firms in New Industries

	Type of VC Firm		
	Private	Corporate	Bank
Number of firms	7,600 65.4%	1,703 14.6%	2,322 20.0%
Panel A: Order of entry			
Average	4.624	4.639	4.626
P-value of difference from PVC		0.687	0.938
Share of first 100 VC firms	54.6%	13.2%	32.2%
Panel B: Development stage at entry			
Average	1.910	1.834	2.042
P-value of difference from PVC		0.000	0.000
Early-stage distribution	68.2%	15.1%	16.7%
Expansion stage distribuiton	63.7%	17.0%	19.4%
Late-stage distribution	64.9%	9.6%	25.5%

TABLE V
Descriptive Statistics and Correlations for VC Firm Portfolios (N = 1,297)

Final portfolios (N = 1,297)	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Opportunity set deviation	0.14	0.14	1.00												
2 Opportunity set relative concentration	1.67	0.68	0.56	1.00											
3 Corporate VC firm	0.13	0.34	0.13	0.25	1.00										
4 Bank VC firm	0.19	0.39	-0.12	-0.16	-0.19	1.00									
5 Number of investments	3.39	0.88	-0.27	-0.18	-0.11	0.05	1.00								
6 VC firm age	11.85	8.46	-0.21	-0.22	-0.09	0.14	0.57	1.00							
7 Number of funds operated	2.92	2.37	-0.15	-0.20	-0.20	-0.01	0.73	0.53	1.00						
8 Proportion of successful exits	0.33	0.18	-0.09	0.05	0.07	0.09	0.23	0.44	0.14	1.00					
9 Founded in 1970s	0.10	0.30	-0.11	-0.09	0.00	0.09	0.17	0.42	0.17	0.26	1.00				
10 Founded in 1980s	0.30	0.46	-0.01	0.04	-0.03	0.00	0.13	0.31	0.14	0.38	-0.22	1.00			
11 Founded in 1990s	0.48	0.50	0.10	0.06	0.07	-0.11	-0.21	-0.60	-0.22	-0.41	-0.32	-0.64	1.00		
12 Founded in 2000s	0.07	0.25	0.07	0.02	-0.05	-0.01	-0.22	-0.28	-0.17	-0.34	-0.09	-0.18	-0.26	1.00	
13 Location in California	0.28	0.45	0.01	0.13	0.01	-0.09	0.08	-0.05	0.02	0.01	-0.01	-0.02	0.04	0.02	1.00
14 Location in Massachusetts	0.10	0.30	0.02	0.03	-0.04	-0.02	0.09	0.09	0.11	0.01	0.04	0.00	-0.04	-0.02	-0.21

TABLE VI
OLS Estimation of VC Firms' Opportunity Sets

	Deviation					Relative Concentration						
	Model 1			Model 2		Model 3			Model 4			
Corporate vs. Private VC firm				0.043	(0.01)	***				0.385	(0.05)	***
Bank vs. Private VC firm				-0.021	(0.01)	*				-0.157	(0.05)	***
Number of investments	-0.050	(0.01)	***	-0.050	(0.01)	***	-0.033	(0.03)		-0.037	(0.03)	
Firm age	0.000	(0.00)		0.000	(0.00)		-0.023	(0.00)	***	-0.022	(0.00)	***
Number of funds operated	0.007	(0.00)	**	0.008	(0.00)	***	-0.023	(0.01)	*	-0.013	(0.01)	
Proportion of successful exits	0.019	(0.03)		0.012	(0.03)		0.481	(0.13)	***	0.416	(0.12)	***
Founded in 1970s	0.025	(0.02)		0.021	(0.02)		-0.032	(0.11)		-0.065	(0.11)	
Founded in 1980s	0.065	(0.02)	**	0.060	(0.02)	**	0.034	(0.11)		-0.001	(0.11)	
Founded in 1990s	0.076	(0.03)	**	0.070	(0.03)	*	-0.124	(0.14)		-0.174	(0.14)	
Founded in 2000s	0.081	(0.03)	*	0.079	(0.03)	*	-0.165	(0.17)		-0.173	(0.16)	
Location in California	0.009	(0.01)		0.008	(0.01)		0.222	(0.04)	***	0.209	(0.04)	***
Location in Massachusetts	0.021	(0.01)		0.021	(0.01)		0.208	(0.06)	***	0.205	(0.06)	***
Constant	0.209	(0.04)	***	0.212	(0.04)	***	1.944	(0.18)	***	1.959	(0.17)	***
R-squared	0.093			0.110			0.110			0.160		
Change in R-square				0.017						0.050		
F value	13.17	***		13.16	***		15.95	***		20.39	***	
F-change				11.99		***				38.03		
Number of firms	1,297			1,297				1,297		1,297		

* p < .05; ** p < .01; *** p < .001

TABLE VII
Descriptive Statistics and Correlations for VC Firms' Industry Entries

Industry Entries (N = 11,625)	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 Order of entry	4.63	1.38	1.00																		
2 Corporate VC firm	0.15	0.35	0.00	1.00																	
3 Bank VC firm	0.20	0.40	0.00	-0.21	1.00																
4 Number of investments	1.22	1.11	0.50	-0.13	0.04	1.00															
5 VC firm age	2.71	4.33	0.51	-0.03	0.09	0.59	1.00														
6 Number of funds	2.53	2.40	-0.05	-0.19	-0.01	0.34	0.18	1.00													
7 Proportion of successful exits	0.27	0.35	0.31	-0.04	0.05	0.48	0.39	0.23	1.00												
8 Founded in 1970s	0.10	0.30	-0.10	0.00	0.08	0.10	0.20	0.19	0.17	1.00											
9 Founded in 1980s	0.33	0.47	-0.03	-0.01	0.01	0.06	0.08	0.09	0.10	-0.24	1.00										
10 Founded in 1990s	0.38	0.48	0.13	0.05	-0.08	-0.01	-0.16	-0.13	-0.07	-0.26	-0.54	1.00									
11 Founded in 2000s	0.15	0.36	0.02	-0.03	-0.04	-0.21	-0.21	-0.23	-0.27	-0.14	-0.29	-0.33	1.00								
12 Second entry	0.22	0.41	0.05	0.03	-0.03	-0.16	-0.10	-0.10	0.03	-0.04	-0.04	0.05	0.05	1.00							
13 Third entry	0.16	0.36	0.14	-0.01	0.00	0.11	0.02	-0.02	0.14	-0.02	-0.01	0.04	-0.02	-0.23	1.00						
14 Fourth entry	0.11	0.31	0.14	-0.05	0.01	0.24	0.11	0.05	0.15	0.02	0.02	0.02	-0.07	-0.19	-0.15	1.00					
15 Fifth entry	0.08	0.27	0.14	-0.06	0.03	0.29	0.17	0.09	0.15	0.04	0.03	-0.01	-0.08	-0.16	-0.13	-0.10	1.00				
16 Sixth entry	0.06	0.23	0.12	-0.06	0.04	0.31	0.19	0.13	0.14	0.06	0.05	-0.04	-0.08	-0.13	-0.10	-0.09	-0.07	1.00			
17 Seventh entry	0.04	0.19	0.11	-0.05	0.04	0.31	0.21	0.16	0.13	0.07	0.05	-0.06	-0.08	-0.10	-0.09	-0.07	-0.06	-0.05	1.00		
18 Eighth entry	0.03	0.16	0.10	-0.04	0.02	0.31	0.25	0.18	0.12	0.08	0.05	-0.08	-0.06	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	1.00	
19 Ninth entry	0.01	0.10	0.05	-0.03	0.01	0.24	0.20	0.17	0.07	0.07	0.01	-0.06	-0.04	-0.05	-0.04	-0.04	-0.03	-0.02	-0.02	-0.02	1.00
20 Location in California	0.24	0.43	0.02	0.02	-0.09	0.04	-0.01	0.06	0.03	0.02	-0.05	0.02	0.03	0.01	0.01	0.01	-0.01	-0.01	-0.01	0.00	
21 Location in Massachusetts	0.09	0.29	-0.02	-0.02	-0.02	0.05	0.04	0.12	0.05	0.04	-0.01	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.02	0.02	
22 Peak 1 (1981-1986)	0.23	0.42	-0.11	0.00	0.06	-0.01	-0.07	0.08	0.08	0.10	0.55	-0.42	-0.23	-0.04	-0.03	0.00	0.01	0.03	0.03	0.03	
23 Peak 2 (1996-2001)	0.42	0.49	0.32	0.06	-0.09	-0.05	-0.02	-0.20	-0.11	-0.25	-0.44	0.55	0.14	0.06	0.03	-0.02	-0.04	-0.06	-0.07	-0.06	

	19	20	21	22
20	0.00	1.00		
21	0.02	-0.18	1.00	
22	0.04	-0.04	0.01	1.00
23	-0.05	0.04	-0.05	-0.46

Note: The variable 'development stage' is not included in this table because it is ordinal. Its distribution is as follows: seed and startup stage (31.5%), first and expansion stage (45.0%), later/acquisition and other stage (23.5%).

TABLE VIII
Multi-level Estimation of Industry Entry by VC Firms

	Order of entry (OLS)			Stage at entry (Ordered Logit)		
Corporate vs. Private VC firm		0.173 (0.03) ***			-0.233 (0.08) **	
Bank vs. Private VC firm		0.031 (0.03)			0.413 (0.07) ***	
Number of investments	0.201 (0.02) ***	0.198 (0.02) ***		-0.290 (0.06) ***	-0.275 (0.06) ***	
Firm age	0.144 (0.00) ***	0.144 (0.00) ***		0.065 (0.01) ***	0.065 (0.01) ***	
Number of funds operated	-0.064 (0.01) ***	-0.057 (0.01) ***		0.027 (0.01) *	0.023 (0.01)	
Proportion of successful exits	0.304 (0.04) ***	0.300 (0.04) ***		-0.090 (0.08)	-0.086 (0.08)	
Founded in 1970s	0.722 (0.07) ***	0.721 (0.07) ***		0.714 (0.19) ***	0.771 (0.19) ***	
Founded in 1980s	1.343 (0.07) ***	1.352 (0.07) ***		1.101 (0.17) ***	1.187 (0.17) ***	
Founded in 1990s	1.797 (0.06) ***	1.810 (0.07) ***		1.609 (0.19) ***	1.704 (0.18) ***	
Founded in 2000s	2.138 (0.07) ***	2.168 (0.07) ***		1.248 (0.19) ***	1.319 (0.19) ***	
Second entry	0.660 (0.02) ***	0.669 (0.02) ***		0.254 (0.08) ***	0.228 (0.08) **	
Third entry	0.793 (0.04) ***	0.806 (0.04) ***		0.444 (0.11) ***	0.399 (0.11) ***	
Fourth entry	0.808 (0.05) ***	0.824 (0.05) ***		0.500 (0.13) ***	0.439 (0.13) ***	
Fifth entry	0.821 (0.06) ***	0.840 (0.06) ***		0.598 (0.16) ***	0.525 (0.16) ***	
Sixth entry	0.801 (0.07) ***	0.822 (0.07) ***		0.702 (0.18) ***	0.618 (0.18) ***	
Seventh entry	0.764 (0.08) ***	0.785 (0.08) ***		0.670 (0.20) ***	0.581 (0.20) **	
Eighth entry	0.667 (0.09) ***	0.688 (0.09) ***		0.667 (0.23) **	0.578 (0.23) *	
Ninth entry	0.362 (0.12) **	0.384 (0.12) **		0.356 (0.30)	0.266 (0.30)	
Location in California	0.014 (0.03)	0.009 (0.03)		-0.449 (0.07) ***	-0.407 (0.07) ***	
Location in Massachusetts	-0.054 (0.05)	-0.057 (0.05)		-0.469 (0.10) ***	-0.449 (0.10) ***	
Peak 1 (1981-1986)	0.396 (0.03) ***	0.394 (0.03) ***		-0.491 (0.06) ***	-0.496 (0.06) ***	
Peak 2 (1996-2001)	0.550 (0.02) ***	0.545 (0.02) ***		-0.457 (0.06) ***	-0.441 (0.06) ***	
Constant	1.784 (0.06) ***	1.718 (0.07) ***				
Threshold for mid-stage				-0.061	0.051	
Threshold for late-stage				2.420	2.536	
Log-likelihood	-14,372.3	-14,358.2		-11,871.6	-11,843.6	
Chi-squared	-28,744.7 ***	-28,716.5 ***		330.7 ***	386.69 ***	
LL change		28.2 ***			56.0 ***	
Number of firms	3,557	3,557		3,557	3,557	
Number of entries	11,625	11,625		11,625	11,625	

* p < .05; ** p < .01; *** p < .001