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THE DETERMINANTS OF CORPORATE
VENTURE CAPITAL SUCCESS:
ORGANIZATIONAL STRUCTURE,
INCENTIVES, AND COMPLEMENTARITIES

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The Determinants of Corporate Venture
Capital Successes: Organizational Structure,
Incentives, and Complementarities
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ABSTRACT

We examine a sample of over thirty thousand transactions by corporate and other venture organizations. Corporate venture investments in entrepreneurial firms appear to be at least as successful (using such measures as the probability of the portfolio firm going public) as those backed by independent venture organizations, particularly when there is a strategic overlap between the corporate parent and the portfolio firm. While corporate venture capitalists tend to invest at a premium to other firms, this premium appears to be no higher in investments with a strong strategic fit. Finally, corporate programs without a strong strategic focus appear to be much less stable, frequently ceasing operations after only a few investments, but strategically focused programs appear to be as stable as independent venture organizations. The evidence is consistent with the existence of complementarities that allow corporations to effectively select and add value to portfolio firms, but is somewhat at odds with suggestions that the structure of corporate venture funds limits their effectiveness.

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1. Introduction

The structure of private equity organizations—in particular, the reliance on limited partnerships of finite life with substantial profit sharing—has been identified as critical to their success. Jensen [1993] and Shleifer and Vishny [1997b], among others, have attributed the rapid growth of private equity organizations to the ways in which their design addresses moral hazard and information asymmetry problems. These claims, however, have received little empirical scrutiny.

This paper addresses this omission by comparing investments made by traditional venture capital organizations with those of venture funds sponsored by corporations. These corporate funds have similar missions and are staffed by individuals with backgrounds resembling those in independent organizations. But the organizational and incentive structures in corporate funds are very different: most are structured as corporate subsidiaries and have much lower incentive-based compensation. In this respect, corporate funds differ dramatically from both independent venture organizations and funds associated with commercial and investment banks. (Many bank-affiliated funds retain the autonomous partnership structure employed by independent venture organizations, albeit with a lower share of the profits accruing to the venture investors.)

Thus, the contrast between corporate and independent venture funds provides a natural test case for examining the impact of organizational structure on investment performance. The arguments regarding the importance of the structure of independent private equity organizations suggest that corporate programs would prove less successful. Either their process of selecting or overseeing investments would be distorted or else the programs would prove unstable. It may

be, however, that corporate programs enjoy benefits that offset some of these costs. A lengthy literature on complementarities in the strategy literature argues that corporations can benefit from closely related activities [for a review and formalization, see Athey and Stern, 1997]. Corporations may be able to select better ventures using the information from their related lines-of-business or may add greater value to the firms once the investments are made.

Before turning to the empirical analysis, we consider the experience of Xerox Technology Ventures, which illustrates both of these points. This corporate venture fund compiled excellent financial returns between 1988 and 1996 by aggressively exploiting the technology and knowledge of the corporate parent. Nonetheless, the corporate parent dissolved the fund before the ending date originally intended. The case highlights that—contrary to both popular wisdom and academic arguments—corporate venture programs can still be successful without the traditional partnership structure. The case also suggests, however, some of the difficulties that these efforts encounter, and the apparent importance of having a strong linkage between the fund’s investment focus and the corporate parent’s strategic focus.

We then consider the more general evidence. Using the VentureOne database of private equity financings, we examine over thirty thousand investments into entrepreneurial firms by venture capital programs. The mix of firms in which corporate venture funds invested is little different than that of traditional organizations.

The first set of tests relates to the performance of firms financed by corporate venture capitalists versus those funded by independent funds. If the structural features of the independent

funds are critical, we should expect that their investments would have a superior performance. The corporate funds, hampered by poor incentives and management interference, would be unable to effectively select or oversee firms. If corporations can exploit complementarities with their existing lines-of-business while evaluating or assisting portfolio firms, however, their investments may actually perform better. This should be particularly true for corporate investments in very similar businesses. It is unclear whether corporations will pay more or less than other investors in these cases: it may be that the corporate investor will be willing to pay more than other investors due to the indirect benefits that it alone enjoys.

When we examine the empirical evidence, we find that far from being outright failures, corporate venture investments in entrepreneurial firms appear to be at least as successful (using such measures as the probability of the portfolio firm going public) as those backed by independent venture organizations. This appears to be particularly true for investments in which there is strategic overlap between the corporate parent and the portfolio firm. It is harder to assess the relative returns that independent and corporate venture organizations enjoy. Corporations are likely to benefit from indirect gains (e.g., strategic alliances and greater understanding of industry trends) as well as direct financial returns. While corporate venture capitalists tend to invest at a premium to other firms, this premium appears to be no higher in investments with a strong strategic fit where these benefits are likely to be greatest.

We then consider the duration of the programs themselves. We consider two potential reasons why corporate programs might be short-lived. First, it may be that corporations only need to employ such programs during periods of severe technological discontinuity. After such

periods of rapid change pass, the programs are no longer needed. If programs were generally designed to address short-run technological discontinuities, it should be the strategic programs that have the shortest duration. A second possibility is that large corporations find it difficult to duplicate the autonomy and the high-powered compensation schemes offered in independent venture funds. As a result, key personnel may depart once they establish a track record and relationships with outside investors.

The empirical evidence suggests that corporate programs are much less stable than those of independent funds. The programs frequently cease operations after only a few investments. We show that the instability is particularly great in corporate funds whose investments do not have a strong strategic focus. This result is hard to reconcile with the first hypothesis.

In short, the evidence seems to underscore the importance of the complementarities hypothesis outlined above. Portfolio companies receiving funds from corporate investors with a well-defined strategic focus enjoy greater success. Investments are made at a premium, but this may reflect the indirect benefits that the corporation receives. Corporate programs with a well-defined strategic focus also appear to be as stable as traditional independent venture organizations. Among the corporate funds without a strong strategic focus, we see significantly less success in the investments and less stability than among the focused funds.

We end with a more general discussion of the implications. It may be that—contrary to the emphasis in the finance literature—the structure of corporate venture funds is not a critical barrier. Rather, the presence of a strong strategic focus may be critical. Alternatively, the

corporate programs without a strong strategic focus may also have particularly weak incentive schemes and other problematic structural characteristics.

This paper is related to an extensive corporate finance literature about the relationship between organizational structure and corporate performance [reviewed, for instance, in Jensen, 1993]. More specifically, a set of papers has examined the structure of financial institutions and investment performance. Among these are studies of the performance of initial public offerings underwritten by investment banks that are and are not affiliated with commercial banks [Kroznor and Rajan, 1994], the performance of loans underwritten by savings and loan institutions structured as mutual and stock organizations [Cordell, MacDonald, and Wohar, 1993], and the impact of mutual fund performance on investment choices and returns [Chevalier and Ellison, 1997]. As far as we are aware, however, no paper has analyzed the impact of the limited partnership structure on investment performance.

This paper is also related to a body of literature on private equity partnerships more generally. These writings suggest reasons to be both positive and skeptical about the importance of the partnership structure. On the one hand, a set of articles document that investments by private equity organizations are associated with real changes in the firms that they fund, measured on both an accounting [Muscarella and Vetsuypens, 1990] and a financial basis [Brav and Gompers, 1997]. Moreover, the structure of private equity groups—whether measured through the sensitivity of compensation to performance [Gompers and Lerner, 1998a] or the extent of contractual restrictions [Gompers and Lerner, 1996]—appears to be responsive to the changing investment mix and characteristics of the funds. On the other hand, it appears that

other factors (e.g., relative supply and demand conditions for private equity funds [Gompers and Lerner, 1996]) can also affect the structure of partnerships. Furthermore, certain features of partnerships apparently can lead to pathological outcomes. For instance, policies allowing venture capitalists to distribute shares in stock, designed to maximize investors' choices regarding the liquidation of their positions, have been exploited by some private equity groups to inflate returns and to boost their compensation [Gompers and Lerner, 1998b]. This paper raises questions about the necessity of the partnership structure employed by independent private equity funds.

The organization of this paper is as follows. In Section 2, we briefly summarize the history of corporate venture capital funds. Section 3 discusses the case of Xerox Technology Ventures. Section 4 describes the data set. The empirical analysis is presented in Section 5. Section 6 concludes the paper.

2. The History of Corporate Venture Capital Investment¹

The first corporate venture funds began in the mid-1960s, about two decades after the first formal venture capital funds.² The corporate efforts were spurred by the successes of the first

¹This history is based in part on Fast [1978], Gee [1994], and Venture Economics [1986], among other sources.

²The origin of the formal venture capital industry in the United States dates back to the formation of American Research and Development in 1946. (Venture capital can be defined as equity or equity-linked investments in young, privately held companies, where the investor is a financial intermediary who is typically active as a director, advisor, or even manager of the firm.) A handful of other venture funds were established in the years after the pioneering fund's formation, but the annual flow of money into new venture funds was quite modest in the first three decades of the industry.

organized venture capital funds, which backed such firms as Digital Equipment, Memorex, Raychem, and Scientific Data Systems. Excited by this success, large companies began establishing divisions that emulated venture capitalists. During the late 1960s and early 1970s, more than 25% of the Fortune 500 firms attempted corporate venture programs.

These efforts generally took two forms, external and internal. At one end of the spectrum, large corporations financed new firms alongside other venture capitalists. In many cases, the corporations simply provided funds for a venture capitalist to invest. Other firms invested directly in start-ups, giving them a greater ability to tailor their portfolios to their particular needs. At the other extreme, large corporations attempted to tap the entrepreneurial spirit within their organizations. These programs sought to allow entrepreneurs to focus their attention on developing their innovations, while relying on the corporation for financial, legal, and marketing support.

In 1973, the market for new public offerings—the primary avenue through which venture capitalists exit successful investments—abruptly declined. Independent venture partnerships began experiencing significantly less attractive returns and encountered severe difficulties in raising new funds. At the same time, corporations began scaling back their own initiatives. The typical corporate venture program begun in the late 1960s was dissolved after only four years.

Funds flowing into the venture capital industry and the number of active venture organizations increased dramatically during the late 1970s and early 1980s. An important factor accounting for the increase in money flowing into the venture capital sector was the 1979 amendment to the "prudent man" rule governing pension fund investments, as well as the lowering

of capital gains tax rates in 1978. Prior to 1979, the Employee Retirement Income Security Act limited pension funds from investing substantial amounts of money into venture capital or other high-risk asset classes. The Department of Labor's clarification of the rule explicitly allowed pension managers to invest in high-risk assets including venture capital. Fueled by these eased restrictions and a robust market for public offerings, fundraising by independent venture partnerships recovered in the early 1980s. Corporations were also once again attracted to the promise of venture investing in response. These efforts peaked in 1986, when corporate funds managed two billion dollars, or nearly 12% of the total pool of venture capital.

After the stock market crash of 1987, however, the market for new public offerings again went into a sharp decline. Returns of and fundraising by independent partnerships declined sharply. Corporations scaled back their commitment to venture investing even more dramatically. By 1992, the number of corporate venture programs had fallen by one-third and their capital under management represented only 5% of the venture pool.

Interest in corporate venture capital climbed once again in the mid-1990s, both in the U.S. and abroad. Once again, much of this interest was stimulated by the recent success of the independent venture sector: *i.e.*, the rapid growth of funds and their attractive returns. These corporate funds have invested directly in a variety of internal and external ventures, as well as in funds organized by independent venture capitalists. (Venture Economics estimates that corporate investors accounted for 30% of the commitments to new funds in 1997, up from an average of 5% in the 1990-1992 period.)

This brief discussion makes clear that corporate involvement in venture capital has mirrored (perhaps even in an exaggerated manner) the cyclical nature of the entire venture capital industry over the past three decades. At the same time, numerous discussions suggest that certain basic non-cyclical issues also have a significant impact on corporate venture capital activity.

In particular, it appears that the frequent disillusion of earlier corporate venture programs was due to three structural failings. First, these programs suffered from a lack of well-defined missions [Fast, 1978; Siegel, Siegel, and MacMillian, 1988]. Typically, they sought to accomplish a wide array of not necessarily compatible objectives: from providing a window on emerging technologies to generating attractive financial returns. The confusion over program objectives often led to dissatisfaction with the outcomes. For instance, when outside venture capitalists were hired to run a corporate fund under a contract that linked compensation to financial performance, management frequently became frustrated about their failure to invest in the technologies that most interested the firm.

A second cause of failure was insufficient corporate commitment to the venturing initiative [Hardymon, DiNino, and Salter, 1983; Rind, 1982; Sykes, 1990]. Even if top management embraced the concept, middle management often resisted. R&D personnel preferred that funds be devoted to internal programs; corporate lawyers disliked the novelty and complexity of these hybrid organizations. In many cases, new senior management teams terminated programs, seeing them as expendable "pet projects" of their predecessors. Even if they did not object to the idea of the program, managers were often concerned about its impact on the firm's accounting earnings.

During periods of financial pressure, money-losing subsidiaries were frequently terminated in an effort to increase reported operating earnings.

A final cause of failure was inadequate compensation schemes [Block and Ornati, 1987; Lawler and Drexel, 1980]. Corporations have frequently been reluctant to compensate their venture managers through profit-sharing (“carried interest”) provisions, fearing that they might need to make huge payments if their investments were successful. Typically, successful risk-taking was inadequately rewarded and failure excessively punished. As a result, corporations were frequently unable to attract top people (*i.e.*, those who combined industry experience with connections to other venture capitalists) to run their venture funds. All too often, corporate venture managers adopted a conservative approach to investing. Nowhere was this behavior more clearly manifested than in the treatment of lagging ventures. Independent venture capitalists often stop funding to failing firms because they want to devote their limited energy to firms with the greatest promise. Corporate venture capitalists have frequently been unwilling to write off unsuccessful ventures, lest they incur the reputational repercussions that a failure would entail.

3. The Case of Xerox Technology Ventures

These general observations can be illustrated through a case study. The Xerox Corporation originated as a photography-paper business called the Haloid Company.³ The Haloid Company’s entrance into what would later become its principal business came in 1947 when it and Battelle Memorial Institute, a research organization, agreed to produce a machine based on the recently developed process named xerography. Invented by patent lawyer Chester

³The first sixteen paragraphs of this section are based on Hunt and Lerner [1995].

Carlson, xerography involved a process by which images were transferred from one piece of paper to another by means of static electricity. Rapid growth and a redirection of the company's emphasis towards xerography characterized the Haloid Company in the 1950s. In 1961, in recognition of the spectacular growth of sales engendered by the first plain paper copier, the firm was renamed the Xerox Corporation.

In response to IBM's entrance into the copier field in the late 1960s, Xerox experimented with computers and with designing an electronic office of the future. It formed Xerox Computer Services, acquired Scientific Data Systems, and opened its Palo Alto Research Center (PARC) in California. These efforts were only the beginning of the copier giant's effort to become a force in the computer industry. Throughout the 1970s, Xerox completed several acquisitions in order to further their project for an "architecture of information." Unfortunately, in assembling these non-copier companies and opening PARC, Xerox created a clash of cultures. Differences between its East Coast operations and West Coast computer people would severely impact the company.

The focus for much of this division was PARC. In the 1970s, PARC was remarkably successful in developing ingenious products that would fundamentally alter the nature of computing. The Ethernet, the graphical user interface (the basis of Apple Computer's and Microsoft's Windows software), the "mouse," and the laser printer were all originally developed at PARC. The culmination of much of PARC's innovation was its development of the Alto, a very early personal computer. The Alto's first prototype was completed in 1973, and later

versions were placed into the White House, Congress, and various companies and universities. Nonetheless, the Alto project was terminated in 1980.

Inherent in the Alto's demise was Xerox's relationship with PARC. Xerox did not have a clear-cut business strategy for its research laboratory, and in turn many of PARC's technologies did not fit into Xerox's strategic objectives. For instance, the Alto's ability to adapt to large customer's computer systems was inconsistent with Xerox's strategy of producing workstations compatible only with its own equipment.

The establishment of XTV was driven by two events in 1988. First, several senior Xerox managers were involved in negotiating and approving a spin-off from Xerox, ParcPlace, which sought to commercialize an object-oriented programming language developed at PARC in the 1970s. The negotiation of these agreements proved to be protracted and painful, highlighting the difficulty that the company faced in dealing with these contingencies. More importantly, in this year a book documenting Xerox's failure to develop the personal computer, *Fumbling the Future*, appeared. Stung by the description in the book, Xerox Chairman David Kearns established the task force, with the mandate of preventing the repetition of such a failure to capitalize on Xerox innovations.

The task force reviewed Xerox's history with corporate venture programs. Xerox had invested since the early 1970s in venture-backed firms. For instance, it had joined a variety of venture capitalists in investing in Rolm, Apple, and a number of other firms. The investments, while successful financially, were made on an *ad hoc* basis. In the early 1980s, Xerox

established two venture funds with an external focus. These did not prove particularly successful, largely due to disputes within the firm about appropriate investments. The task force, in member (and future XTV president) Robert Adams' words, rapidly "concluded that we needed a system to prevent technology from leaking out of the company" [Armstrong, 1993]. The committee focused on two options: (1) to begin aggressively litigating those who try to leave with new technologies, and (2) to invest in people trying to leave Xerox. Due to variations in employee non-competition law across states (and particularly the weak level of protection afforded by the California courts), it was unclear how effective a policy of aggressive litigation would be. Furthermore, such a policy might reduce Xerox's ability to recruit the best research personnel, who might not want to limit their future mobility.

Based on the task force's recommendation, Chairman Kearns decided to pursue a corporate venture capital program. He agreed to commit \$30 million to invest in promising technologies developed at Xerox. As he commented at the time, "XTV is a hedge against repeating missteps of the past" [Armstrong, 1993]. He briefly considered the possibility of asking an established venture capital firm to jointly run the program with Xerox, but decided that the involvement of another party would introduce a formality that might hurt the fledgling venture.

Modeling XTV after venture organizations had several dimensions. The most obvious was the structure of the organization. While this was a corporate division, rather than an independent partnership like most venture organizations, the XTV partners crafted an agreement

with Xerox that resembled typical agreements between limited and general partners in venture funds.

The spinout process was clearly defined in the agreement, in order to insure that disputes did not arise later on and to minimize the disruption to the organization. The XTV officials insisted on a formal procedure to avoid the ambiguity that had plagued earlier corporate ventures. The agreement made clear that the XTV partners had the flexibility to respond rapidly to investment opportunities, as independent venture capitalists typically possess. They essentially had full autonomy when it came to monitoring, exiting, or liquidating companies. The partners were allowed to spend up to two million dollars at any one time without getting permission from the corporation. For larger expenditures, they were required to obtain permission from XTV's governing board, which consisted of Xerox's chief executive officer, chief financial officer, and chief patent counsel.

Similar to independent venture organizations (but unlike many corporate programs), the program also had a clear goal: to maximize return on investment. The XTV partners felt that the ambiguous goals of many of the 1970s corporate venture programs had been instrumental in their downfall. They hoped to achieve a return of investment that exceeded both the average returns of the venture capital industry and Xerox's corporate hurdle rate for evaluating new projects.

Not only was the level of compensation analogous to that of the 20% "carried interest" which independent venture capitalists received, and the degree of autonomy similar, but XTV

operated under the same ten-year time frame employed in the typical partnership agreement. Under certain conditions, however, Xerox could dissolve the partnership after five years.

The analogy to independent venture organizations also extended to the companies in which XTV invested. These were structured as separate legal entities, with their own board and officers. XTV sought to recruit employees from other start-ups who were familiar with managing new enterprises. The typical CEO was hired from the outside, on the grounds that entrepreneurial skills, particularly in financial management, were unlikely to be found in a major corporation. XTV also made heavy use of temporary executives who were familiar with a variety of organizations.

The independence of management also extended to technological decision-making in these companies. The traditional Xerox product—for instance, a copier—was designed so that it could be operated and serviced in almost any country in the world. This meant not only constraints on how the product was engineered, but also the preparation of copious documentation in many languages. These XTV ventures, however, could produce products for “leading edge” users, who emphasized technological performance over careful documentation.

Like independent venture capitalists, XTV intended to give up control of the companies in which they invested. Transferring shares to management and involving other venture capitalists in XTV companies would reduce Xerox’s ownership of the firm. Their goal was that over the long run, after several rounds of financing, Xerox would hold from 20 to 50% equity stake. XTV sought to have under a 50% equity stake at the time of a spinout firm went public.

In this way, it would not need to consolidate the firm in its balance sheet (*i.e.*, it would not need to include the company's equity on its balance sheet, which would reduce Xerox's return on equity). The Xerox lawyers had originally only wanted employees to receive "phantom stock" (typically bonuses based on the growth in the new units' performance). Instead, XTV insisted that the employees receive options to buy real shares in the venture-backed companies, in line with traditional Silicon Valley practices. The partners believed that this approach would have a much greater psychological impact, as well as a cleaner capital structure to attract follow-on financings by outside investors.

Between 1988 and 1996, the organization invested in over one dozen companies. These covered a gamut of technologies, mostly involving electronic publishing, document processing, electronic imaging, workstation and computer peripherals, software and office automation. These not only successfully commercialized technology lying fallow in the organization, but also generated attractive financial returns.

One successful example of XTV's ability to catalyze the commercialization of technological discoveries was Documentum, which marketed an object-oriented document-management system. Xerox had undertaken a large number of projects in this area for over a decade prior to Documentum's founding, but had not shipped a product. After deciding this was a promising area, XTV recruited Howard Shao and John Newton, both former engineering executives at Ingress Corporation (a relational database manufacturer) to lead up the technical effort.

Shao spent the first six months assessing the state of Xerox's knowledge in this area—including reviewing the several 300+-page business plans prepared for earlier proposed (but never shipped) products—and assessing the market. He soon realized that while Xerox understood the nature of the technical problems, they had not grasped how to design a technologically appropriate solution. In particular, the Xerox business plans had proposed building document management systems for mainframe computers, rather than for networked personal computers (which were rapidly replacing mainframes at many organizations). With the help of the XTV officials, Shao and Newton led an effort to rapidly convert Xerox's accumulated knowledge in this area into a marketable product. Xerox's accumulated knowledge—as well as XTV's aggressive funding of the firm during the Gulf War period, when the willingness of both independent venture capitalists and the public markets to fund new technology-based firms abruptly declined—gave Documentum an impressive lead over its rivals.

Documentum went public in February 1996 with a market capitalization of \$351 million.⁴ XTV was able to exit a number of other companies successfully, whether through an initial public offering, a merger with an outside firm, or a repurchase by Xerox (at a price determined through arms-length bargaining). A conservative calculation (assuming that Xerox sold its stakes in firms that went public at the time of the initial public offering, rather than the substantially appreciated prices thereafter, and valuing investments that Xerox has not yet exited or written off at cost, less a 25% discount for illiquidity), indicates that the \$30 million fund generated capital gains of \$219 million. Given the 80%-20% split established in the XTV

⁴The next two paragraphs are based on public security filings and press accounts.

agreement, the proceeds to Xerox should have been at least \$175 million, those to the three XTV partners, at least \$44 million.

The same assumptions suggest a net internal rate of return for Xerox (*i.e.*, after fees and incentive compensation) of at least 56%. This compares favorably to independent venture capital funds begun in 1989, which had a mean net return of 13.7% (an upper quartile fund begun in that year had a return of 20.4%) [Venture Economics, 1997]. These calculations of Xerox's IRR do not include any ancillary benefits generated by this program for the corporation. For instance, some observers argued that high expected value projects that might have otherwise not been funded through traditional channels due to their high risk were increasingly funded during this period, apparently out of the fear that they would otherwise be funded by XTV and prove successful.

Despite these attractive returns, Xerox decided to terminate XTV in 1996, well before the completion of its originally intended ten-year life.⁵ The organization was replaced with a new one, Xerox New Enterprises (XNE), which did not seek to relinquish control of firms or to involve outside venture investors. The XNE business model called for a much greater integration of the new units with traditional business units. The autonomy offered to the XNE managers and their compensation schemes were much closer to those in a traditional corporate division. As such, XNE appears to represent a departure from the several of the key elements that the XTV staff believed were critical to their success, such as their considerable degree of autonomy and high-powered incentives.

⁵This paragraph is based on www.xerox.com/xne and Turner [1997].

The experience of the Xerox Technology Ventures has several implications for corporate venture capital programs more generally:

- The case makes clear that corporate venture capital programs—contrary to the suggestions in writings by both venture capitalists and financial economists—need not be failures. Xerox’s financial returns, as noted above, were exceedingly favorable when compared to returns from comparable independent venture funds.
- Xerox Technology Ventures’ successes—such as Document Sciences and Documentum—were concentrated in industries closely related to the corporate parent’s core line-of-business (*i.e.*, document processing). This suggests that the fund’s strong strategic focus was important in its success.
- The Xerox Corporation was unable to commit to a structure akin to that of a traditional venture capital partnership. Despite efforts by XTV’s founders to model the fund as closely as possible after a traditional venture partnership, the fund was still dissolved early. This experience underscores the challenges that these hybrid organizational forms face.

4. The Data Set

We now turn to assessing the experience of corporate venture programs more systematically. Before doing so, however, we discuss the VentureOne database used in this analysis. VentureOne, established in 1987, collects data on firms that have obtained venture capital financing. The database includes firms that have received early-stage equity financing from venture capital organizations, corporate venture capital programs, and other organizations.

The companies are initially identified from a wide variety of sources, including trade publications, company Web pages, and telephone contacts with venture investors. VentureOne then collects information about the businesses through interviews with venture capitalists and entrepreneurs. Among the data collected are the names of the investors, the amount and valuation of the venture financings, and the industry, history, and current status of the firm. Data on the firms

are updated and validated through monthly contacts with investors and firms.⁶ VentureOne then markets the database to venture funds and corporate business development groups (see Gompers and Lerner [1997] for a detailed discussion of the database).

We supplemented the VentureOne data when necessary. Some firms in the VentureOne sample were missing information, such as an assignment to one of the 103 VentureOne industry classes or information on the firm's start date. We examined a variety of reference sources to determine this information, including Corporate Technology Information Service's *Corporate Technology Directory* [1996], Dun's Marketing Services' *Million Dollar Directory* [1996], Gale Research's *Ward's Business Directory of U.S. Private and Public Companies* [1996], National Register Publishing Company's *Directory of Leading Private Companies* [1996], and a considerable number of state and industry business directories in the collections of Harvard Business School's Baker Library and the Boston Public Library. We also employed several electronic databases: the Company Intelligence and Database America compilations available through LEXIS's COMPANY/USPRIV library and the American Business Disk CD-ROM directory.

The investors in the VentureOne database were diverse. They included individuals, institutional investors such as pension funds, traditional independent venture funds (such as Kleiner, Perkins, Caufield & Byers), and funds sponsored by corporations, financial institutions,

⁶Information about the financing of private firms is typically not revealed in public documents and investors and entrepreneurs may consider this to be sensitive information. VentureOne seeks to overcome this reluctance by emphasizing that its database also helps firms obtain financing. In particular, firms can alert investors whether they intend to seek further private financing or intend to go public in upcoming months.

and government bodies. In order to understand the impact of organizational structure, we concentrate in many of the analyses below on two types of funds: independent venture partnerships and corporate funds. As discussed above, we eliminated other hybrid venture funds, such as those affiliated with commercial and investment banks, because many of these closely resembled traditional venture organizations.

In order to identify independent and corporate venture capital organizations, we used an unpublished database of venture organizations assembled by Venture Economics' Investors Services Group. Venture Economics is a unit of Securities Data Company and tracks the venture capital industry. The organization was known as Capital Publishing when it was established in 1961 to prepare a newsletter on federally chartered Small Business Investment Companies (SBICs). Since 1977, the company has maintained a database on venture partnerships, which includes over two thousand venture capital funds, SBICs, and related organizations. The Investors Services Group database is used in preparation of directories, such as the Venture Economics annual *Investment Benchmark Performance*. The database is compiled from information provided by venture capitalists and institutional investors. We excluded from either classification a variety of private equity investors, including individuals, SBICs, funds sponsored by banks and other financial institutions, and funds associated with financial subsidiaries of non-financial corporations (such as General Electric Capital). In order to determine whether a company was a non-financial corporation, we consulted the firm directories noted above to determine the main lines-of-business in the year of the investment. By so doing, we sought to draw as sharp a contrast as possible between corporate and independent funds.

In some cases, it was difficult to ascertain whether an investor was a corporate venture organization. Some U.S. and several European companies invest in companies through traditional venture capital partnerships. For example, Eastman Kodak not only makes direct equity investments but also invests through a partnership called Aperture Partners, in which it is the sole limited partner. While we were able to identify many of these cases, in some cases we may have missed such affiliations. In other cases, independent venture organizations also cater to corporate investors. A prominent example is Advent, a Boston-based organization which organizes co-mingled funds for financial investors and other funds for single corporate limited partners. From the VentureOne, it is usually difficult to determine whether the private equity group is investing its traditional partnerships or one of its corporate funds.

Finally, for the corporate venture capital investments, we characterized the degree of fit between the corporation and the portfolio firm. To do this, we examined the corporate annual reports for the 1983, 1989, and 1994 fiscal years. We classified investments as to whether there was a direct fit between one of the corporation's lines-of-business during the period and the portfolio firm, whether there was an indirect relationship, or whether there was no apparent relationship at all. In the analyses below, we denoted investments as having a strategic fit only if there was a direct relationship between a line-of-business of the corporate parent and the portfolio firm. The results are robust to expanding the definition to include indirectly related transactions as well: e.g., when a corporate fund invests in a firm that is a potential supplier to or customer of the corporate parent. Not all investments were classified. In some cases, we were not able to determine the relationship. In others, we could not obtain the proximate annual reports. In particular, it was difficult to obtain the 1983 and 1989 annual reports for many of the foreign firms.

We limited the analysis to investments in privately held firms between 1983 and 1994. While VentureOne has sought to “back-fill” its database with information on earlier venture investments, its coverage of the 1970s and early 1980s is poor. Furthermore, we were concerned that their methodology may have introduced selection biases. While the database does not include all venture investments between 1983 and 1994, we believe that it provides a reasonable view of the activity in the industry during this period.⁷ We did not include investments made after 1994 because we wish to assess the outcomes of the investments: it may take several years until the fate of venture-backed firms is clear. We also eliminated a variety of investments outside the scope of this analysis, such as purchases of shares of publicly traded firms and other financings.

5. Empirical Analyses

We now analyze this sample empirically. After presenting an overview of the sample, we undertake analyses of the ultimate success of corporate and other venture investments as well as the duration of the venture investment programs themselves.

A. Summary Statistics

Table 1 provides an overview of the sample by year. After the deletions noted above, the sample consists of 32,364 investments. Investments by independent venture funds represent over one-half of the total transactions in the sample. Corporate venture investments represent a much

⁷See Gompers and Lerner [1997] for an analysis of the comprehensiveness of the VentureOne database over time. We address concerns about selection biases by repeating the analyses below only using observations from 1988 to 1994, when VentureOne’s coverage of the industry was much more comprehensive. The results are little changed.

smaller share, about 6%. Because on average about four investors participate in each financing round, the number of rounds, 8506, is significantly smaller. In the analyses below, we will analyze patterns on both the investment- and round-level.⁸

Table 2 provides a comparison of four categories of investments: the total sample, those by corporate and independent venture capital organizations, and corporate investments where there was a strategic fit between the parent and the portfolio firm. In general, the corporate investments closely resemble those of the other funds:

- *Status at time of investment.* Corporate funds tend to invest slightly less frequently in start-up and mature private firms. Instead, they are disproportionately represented among companies in the middle stages such as “development” or “beta.”⁹
- *Location of firm.* The sample disproportionately includes investments in firms based in California. This reflects VentureOne’s greater coverage of this region, particularly in the early years [see Gompers and Lerner, 1997, for a discussion]. While corporate venture investments as a whole are slightly more common in California than other venture investments, corporate investments with a strong strategic fit are more frequent elsewhere.
- *Industry of the firm.* Venture capital investments tend to focus on a few high-technology industries. This is even more true for corporate venture investments with a strategic focus.
- *Maturity of firm and investment characteristics.* Corporate venture funds tend to invest in later and larger financing rounds and in slightly older firms than other venture funds.

⁸The reader may note that the dollar amounts reported here are greater in some years than the cumulative disbursements from venture capital funds reported elsewhere [e.g., Kortum and Lerner, 1998]. This reflects the fact that the VentureOne data represents total financings from all sources for privately held venture-backed firms, rather than just funds from venture capital organizations.

⁹See the Appendix for definitions of stages, regions, and industries.

B. Success of Investments

We now consider the success of the investments by the various types of venture organizations. The discussions of the importance of the independent venture organizations' partnership structure noted above suggest that these investors should have the greatest success. Meanwhile, potential complementarities with existing lines-of-business suggest that corporate investments may also perform well, at least those where there is a strong strategic fit.

The measurement of returns presents some challenging issues. Ideally, we would capture the direct and indirect returns to each class of venture investor. Unfortunately, because VentureOne does not compile the stake held by each investor, we cannot compute the direct financial returns for particular investors. Furthermore, it is difficult to identify the indirect benefits—e.g., an insight that leads to a redirected research program in a corporate laboratory—that corporate venture investors receive, much less to quantify these benefits. As a result, we employ two less satisfactory, but more tractable measures.

The first is the success of the firm receiving the funds. This is likely to be a reasonable measure for traditional venture groups. Venture capitalists generate the bulk of their profits from firms that go public. A Venture Economics study [1988] finds that a \$1 investment in a firm that goes public provides an average cash return of \$1.95 in excess of the initial investment with an average holding period of 4.2 years. The next best alternative as estimated by Venture Economics [1988], an investment in an acquired firm, yields a cash return of only 40 cents over a 3.7 year mean holding period. This measure is also likely to have some validity for corporate venture investors. If the venture fails, the key people and knowledge are likely to be scattered, and the benefits to the

corporation are likely to be few. A more successful venture may or may not provide indirect benefits to the corporate parent, but at least should have attractive financial returns.

We determine the status of the firms in the spring of 1998 from the VentureOne database. Table 3 presents the outcomes for four classes of investors, as well as tests of the statistical significance of the differences between them. Firms backed by corporate venture groups are significantly more likely to have gone public than those financed by other organizations and are less likely to have been liquidated. These differences are particularly strong for investments in which there was a strategic tie between the corporate parent and the portfolio firm. These comparisons may be influenced, however, by differences between the firms backed by corporate and other venture investors.

To address this concern, we examine these patterns in a regression framework. We estimate logit regressions, alternatively using each investment and each financing round as observations. We seek to explain the probability that the investment had gone public by the spring of 1998 or the probability that the firm had gone public, filed a registration with the U.S. Securities and Exchange Commission (a preliminary step before going public), or been acquired for a valuation of at least twice the post-money valuation¹⁰ of the financing.¹¹ As independent variables, we use the age of

¹⁰The post-money valuation is defined as the product of the price paid per share in the financing round and the shares outstanding after to the financing round. In calculating the valuations, VentureOne converts all preferred shares into common stock at the conversion ratios specified in the agreements. Warrants and options outstanding are included in the total, as long as their exercise price is below the price per share being paid in the financing round.

¹¹The results are also robust to the use of a third dependent variable, the probability that the firm has not been liquidated by the spring of 1998.

the firm at the time of the investment and the ordinal rank of the investment round. We also employ dummy variables denoting investments by corporate and independent venture capital funds, corporate venture investments where there was a strategic fit with the portfolio firm, firms based in California and Massachusetts, the status of the firm at the time of the investment, the year of the investment, the industry of firm, and a constant.

The results are consistent with the univariate comparisons above. Corporate venture investments are significantly more successful than other investments. (In most of the regressions, independent venture investments are also more successful, though the effect is smaller in magnitude and statistical significance.) When the dummy variable denoting corporate venture investments with a strategic fit is added to the regressions, the corporate venture dummy variable becomes insignificant (and frequently negative). Corporate venture investments in general do not perform better, only those with a strategic fit. These results seem consistent with the complementarities hypothesis above.

Our second proxy for the direct and indirect returns for corporate and other investors is the valuation assigned to the firm at the time of the investment. All else being equal, the higher the valuation (*i.e.*, the higher price paid per share), the lower the direct financial returns to the investor (subject to the caveats in the discussion below). For each investment round where the data was available (about one-half of the entire sample), we computed the pre-money valuation, the product

of the price paid per share in the financing round and the shares outstanding before the financing round.¹²

Table 5 presents the pre-money valuations for four classes of investors tabulated above as well as tests of the statistical significance of these differences. Corporate venture funds do appear to pay significantly more, with a mean pre-money valuation of \$28.5 million versus an average of \$18.1 million for the independent venture firms. Corporate investments in which there is a strategic fit are also priced at a premium, but the average price (\$26.9 million) is lower than the other corporate investments.

Once again, we seek to corroborate these patterns through a regression analysis. Following the approach of Gompers and Lerner [1997], we estimate a hedonic regression, seeking to explain the logarithm of the pre-money valuations (see that paper for a detailed discussion of this methodology). We once again use each investment and each financing round as observations. As independent variables, we use the logarithm of the age of the firm at the time of the investment and the logarithm of the ordinal rank of the investment round. We also employ dummy variables denoting investments by corporate and independent venture capital funds, corporate venture investments where there was a strategic fit with the portfolio firm, firms based in California and Massachusetts, the status of the firm at the time of the investment, the year of the investment, the industry of firm, and a constant.

¹²As discussed at length in Lerner [1994], the pre-money valuation is a more appropriate dependent variable than the post-money valuation because it is independent of the amount invested in the firm during the current financing round. As Gompers [1995] discusses, the amount invested may vary with many considerations including the fundraising environment.

We find results similar to those in the univariate comparisons. Corporate venture investments are associated with between 18% and 30% higher valuations, while those by independent funds are associated with between 7% and 18% lower valuations. The dummy variable denoting corporate venture investments with a strategic fit is inconsistent in sign and never significant.

These results suggest two possible interpretations. First, traditional venture investors and entrepreneurs could be exploiting the relative inexperience of the corporate venture investors, persuading them to invest in overvalued transactions. [See, for instance, AbuZayyad, *et al.*, 1997.] Second, corporate investors are likely to enjoy some indirect benefits from their involvement with portfolio firms that independent venture firms do not enjoy. Standard bargaining models [e.g., Nash, 1950] suggest that the additional surplus enjoyed by the corporation will lead to corporate venture capitalists investing at a higher prices than others. In this way, some of the additional value created will be allocated to the smaller firm and its existing investors.

Disentangling these interpretations is difficult. Nonetheless, we are struck by the lack of a relationship between the price premium paid and the degree of strategic fit. We suggest that this may reflect the fact that corporations are also more savvy investors in companies close to their existing lines-of-business. While the indirect benefits to the parent may be greater in these instances resulting in a willingness to pay more, its understanding of the market is also likely to be better. As a result, the corporation may be less likely to invest in overpriced transactions in

these cases. In areas outside the corporation's experience, overpaying for investments may be a more common phenomenon.

C. Duration of Programs

We finally consider the duration of the venture organizations. Table 7 presents several measures of the stability of these organizations. First, we examine the total number of investments in the sample. Similarly, we examine the time-span (in years) between the first and the last investment in the sample by each venture organization. (A venture organization that made a single investment would be coded as having a time-span of zero.)

Both of these measures, however, are somewhat problematic. Many corporate venture programs have begun in recent years. As a result, they may have made only a few investments to date. This does not imply, however, that they will not continue to exist for a long time in the future. To control for this "vintage effect," we create a third measure: the time between the first and last investments by the venture organization in the sample expressed as a percentage of the time from the first investment by the venture organization to December 1994. Using this approach, both a long-standing venture group and relatively recent program that remains active through the end of the sample period would be coded as 1.0.

Unlike the earlier analyses, we confine the analysis (and that in Table 8 below) to independent and corporate venture funds. Some of the other investors are reported in an inconsistent manner, which would make this type of analysis potentially misleading. For

instance, when only a small number of individuals invest, the more prominent ones are identified by name. When a large number invest, all are lumped together as “individuals.”

Stark differences appear between the corporate and independent funds. The corporations make a mean of 4.4 investments over 2.5 years, while the independent funds make 43.5 investments over 7.1 years. Even using the ratio of the active time-span to the possible time-span, the differences are dramatic: the average is 34.8% for the corporate funds, as opposed to 71.7% for the independent funds. The differences are less extreme, but still significant, for the corporate programs where there was a strategic fit in at least one-half of the investments.

We then examine these patterns in a regression analysis. The first two regressions employ all corporate and independent venture organizations in the sample as observations; the second set, only those organizations with four or more investments in the sample.¹³ As a dependent variable, we use the ratio of the time-span that the fund was active to the time span from its first investment to December 1994. Independent variables include the date of the venture organization’s first investment, dummy variables denoting observations of corporate venture capital funds and of corporate venture funds where there was a strategic fit with the portfolio firms in at least one-half of the investments, and a constant. Reflecting the fact that the dependent variable must fall between zero and one, we employ a double-censored regression specification.

¹³In this way, we seek to examine whether groups that dissolve after only one or two investments drive the results, or whether this is a more general pattern. The results are also robust to the use of other cut-off points.

Once again, the corporate venture programs have a significantly shorter duration. The dummy variable for corporate venture programs in which at least one-half of the investments were strategic, however, has a positive coefficient of almost equal magnitude. While corporate programs without a strategic focus are very unstable, those with such a focus appear to have a longevity equivalent to more traditional independent funds, at least using this measure.

We consider two explanations for the shorter time-span of the corporate investments. One possibility is that this is a response to technological change. An extensive literature on the economics of innovation has highlighted that new entrants often exploit technological breakthroughs in more innovative and aggressive ways than the established incumbents, and that these changes are often associated with dramatic shifts in market leadership.¹⁴ In many cases, product leaders have rapidly lost their commanding position after many years of dominance. Academics have attributed these patterns to a rational reluctance on the part of existing industry leaders to jeopardize their current revenues and profits, as well as the myopic reluctance of many successful organizations to recognize that their leadership is waning. (In many instances, the continuing financial success of mature product lines masks the organizations' failure to introduce new products.).¹⁵ Corporate venture capital programs may be a response to these short-run periods of technological discontinuity.¹⁶ Once this transition period has passed, the corporation may dissolve the effort.

¹⁴Two academic studies documenting these patterns (there are also many other more anecdotal accounts) are Henderson [1993] and Lerner [1997].

¹⁵For an overview, see Reinganum [1989].

¹⁶For instance, the pharmaceutical industry was ill prepared for the biotechnology revolution in the early 1980s. Henderson and Cockburn [1996] show that the more successful firms responded

Alternatively, the instability may reflect the manner in which the corporate programs are designed. One important argument in favor of the decade-long partnership structure typically employed by independent venture funds is that it allows venture capitalists to make long-run investments, without the fear of demands to liquidate their portfolios. [For a discussion of how such fears can affect the behavior of hedge fund managers, who typically do not have these protections, see Shleifer and Vishny, 1997a.] Corporate venture funds are typically structured as corporate divisions or affiliates without the protections afforded by a legal partnership agreement. Furthermore, field research suggests that corporate venture groups are often plagued by defections of their most successful investors, who become frustrated at their low level of compensation. These defections may also affect the stability of the groups. This view suggests that all corporate venture programs should be less stable.

The evidence seems challenging to reconcile with either hypothesis. If programs were generally designed to address short-run technological discontinuities, it should be the strategic programs that were of the shortest duration. This is clearly not the case. The structural view suggests that most corporate venture programs should rapidly be terminated, which is hard to reconcile with the success of programs with strong strategic objectives. One possibility is that the organizations without a clear strategic focus also tend to be the ones with a low degree of autonomy and low levels of incentive compensation. Thus, the limited duration of the funds

by aggressively establishing outside relationships to access new ideas in response to this technological discontinuity. One avenue through which the firms built external relationships was corporate venture programs.

without a clear strategic focus may thus be a proxy for the organizational structure employed by independent venture funds.

6. Conclusions

This paper has compared investments by corporate venture organizations with those of independent and other venture groups. Corporate venture investments in entrepreneurial firms appear to be at least as successful (using such measures as the probability of the portfolio firm going public) as those backed by independent venture organizations, particularly when there is a strategic overlap between the corporate parent and the portfolio firm. While corporate venture capitalists tend to invest at a premium to other firms, this premium appears to be no higher in investments with a strong strategic fit. Finally, corporate programs without a strong strategic focus appear to be much less stable, frequently ceasing operations after only a few investments, but strategically focused programs appear to be as stable as independent venture organizations. The evidence is consistent with the existence of complementarities that allow corporations to effectively select and add value to portfolio firms, but somewhat at odds with the suggestion that the structure of corporate funds introduces distortions.

The paper suggests that the presence of a strong strategic focus is critical to the success of corporate venture funds. This subset of corporate funds appears to have been quite successful, despite having very different structures from traditional funds. This finding appears to challenge the emphasis in the finance literature on the importance of the partnership structure employed by independent private equity funds. But, as alluded to in Section 5, it may well be that corporate programs without a clear strategic focus are also the ones with a low degree of autonomy and low

levels of compensation. To comprehensively distinguish between these hypotheses, we would need to have information on the compensation schemes and organization structures employed by these groups. While this paper has only skimmed the surface of this issue, this is a rich area for further exploration, which we hope to explore in future research.

The analysis raises several puzzles that cannot be answered with the existing data. We end by highlighting two of these. First, why do corporations set up programs that appear likely to be unsuccessful? In the sample, for instance, we see repeated examples of funds being established that do not have a clear relationship to the corporate parent's lines-of-business. Certainly, in many cases, carefully thought-through proposals appear to have been modified during the review process in ways that are likely to substantially reduce their likelihood of success. Understanding these processes and placing them in the context of the broader literature on the problems that can beset corporate decision-making is an interesting area for future research.

Second, is there an optimal mixture between internally funded corporate research and outside ideas accessed through initiatives such as corporate venture programs? Some high technology corporations, such as AT&T and IBM, have historically funded internal research laboratories at high levels. Other high-technology giants, such as Cisco Systems, have relied on acquisitions and strategic investments to identify and access product and process innovations. The "make-or-buy" decisions that corporate R&D managers face is an important but little-researched issue.

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Appendix: Definition of Firm Categorizations

Definition of Investment Stages

Start-Up: Company with a skeletal business plan, product, or service development in preliminary stages.

Development: Product or service development is underway, but the company is not generating revenues from sales.

Beta: For companies specializing in information technology, the beta phase is when the product is being tested by a limited number of customers but not available for broad sales. For life sciences companies, beta is synonymous with a drug in human clinical trials or a device being tested.

Shipping: The product or service is being sold to customers and the company is deriving revenues from those sales, but expenses still exceed revenues.

Profitable: The company is selling products or services and the sales revenue yields a positive net income.

Re-Start: A recapitalization at a reduced valuation, accompanied by a substantial shift in the product or marketing focus.

Definition of Industry Groups

Computer hardware: Firms whose primary lines-of-business are personal computing, minicomputers or workstations, mainframe computers, CAD/CAM/CAE systems, data storage, computer peripherals, memory systems, office automation, source data collection, multimedia devices, and computer networking devices.

Computer Software: Firms whose primary lines-of-business are compilers, assemblers, and systems, application, CAD/CAM/CAE/CASE, recreational and home, artificial intelligence, educational, multimedia software, and on-line services.

Communications: Firms whose primary lines-of-business include modems, computer networking, fiber optics, microwave and satellite communications, telephone equipment, pocket paging, cellular phones, radar and defense systems, television equipment, teleconferencing, and television and radio broadcasting.

Medical: Firms whose primary lines-of-business include biotechnology, pharmaceuticals, diagnostic imaging, patient monitoring, medical devices, medical lab instruments, hospital equipment, medical supplies, retail medicine, hospital management, medical data processing, and medical lab services.

Definition of Regions

Eastern U.S.: Firms whose headquarters are located in Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia.

Western U.S.: Firms whose headquarters are located in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming.

Source: Adapted from VentureOne [1998].

Table 1. Distribution of the sample, by year. The table depicts the number of venture capital investments in the VentureOne sample by year between 1983 and 1994, as well as the number of financing rounds (a round may consist of several investments by different investors) and the aggregate amount of funding disbursed (in millions of 1994 dollars). Similar tabulations of the number of investments are presented for corporate and independent venture funds.

| <i>Year</i> | <i>Number of Investments</i> | | | <i>Number of Rounds</i> | <i>Dollar Amount</i> |
|--------------|------------------------------|---------------------|-----------------------|-------------------------|----------------------|
| | <i>Total</i> | <i>Corporate VC</i> | <i>Independent VC</i> | | |
| 1983 | 1,841 | 53 | 1,013 | 436 | \$2,219 |
| 1984 | 2,249 | 91 | 1,206 | 550 | 2,905 |
| 1985 | 2,593 | 139 | 1,382 | 625 | 2,910 |
| 1986 | 2,557 | 129 | 1,381 | 592 | 2,394 |
| 1987 | 2,675 | 152 | 1,397 | 642 | 3,065 |
| 1988 | 2,599 | 179 | 1,385 | 611 | 2,687 |
| 1989 | 2,866 | 202 | 1,490 | 720 | 3,069 |
| 1990 | 2,826 | 233 | 1,455 | 784 | 3,640 |
| 1991 | 2,890 | 249 | 1,472 | 757 | 3,207 |
| 1992 | 3,166 | 214 | 1,699 | 911 | 3,891 |
| 1993 | 3,118 | 198 | 1,586 | 931 | 4,532 |
| 1994 | 2,984 | 193 | 1,601 | 947 | 4,973 |
| <i>Total</i> | <i>32,364</i> | <i>2,032</i> | <i>17,067</i> | <i>8,506</i> | <i>39,492</i> |

Table 2. Characteristics of firms at the time of investment. The sample consists of 32,364 investments in privately held venture-backed firms between 1983 and 1994. The table presents the stage of the firm's development at the time of the investment, the geographic location of the firm, the industry of the firm, the ordinal rank of the venture round, the age of the firm at the time of the investment (in years), and the amount of the investment in the financing round (in millions of 1994 dollars). Separate tabulations are presented for investments by corporate venture firms, corporate funds where there was a strategic fit between the parent and portfolio firms, and independent venture funds.

| | <i>Entire Sample</i> | <i>Corporate VC Only</i> | <i>Corporate VC and Strategic Fit</i> | <i>Independent VC Only</i> |
|---|----------------------|--------------------------|---------------------------------------|----------------------------|
| <i>Status at Time of Investment:</i> | | | | |
| Start-Up | 9.8% | 7.1% | 6.4% | 10.4% |
| Development | 30.5 | 33.6 | 35.9 | 31.2 |
| Beta | 4.1 | 5.5 | 6.4 | 4.1 |
| Shipping | 45.5 | 44.4 | 42.9 | 44.8 |
| Profitable | 7.6 | 6.9 | 5.6 | 7.3 |
| Re-Start | 2.4 | 2.5 | 2.8 | 2.3 |
| <i>Location of Firm:</i> | | | | |
| All Western U.S. | 59.7% | 63.7% | 59.6% | 60.8% |
| California | 51.6 | 53.7 | 51.3 | 52.7 |
| All Eastern U.S. | 24.1 | 25.2 | 29.1 | 23.4 |
| Massachusetts | 12.8 | 14.0 | 16.5 | 12.6 |
| <i>Industry of Firm:</i> | | | | |
| Medical | 25.5% | 25.9% | 24.2% | 24.2% |
| Computer Hardware | 16.7 | 17.0 | 16.2 | 16.8 |
| Communications | 14.5 | 14.2 | 22.1 | 15.5 |
| Computer Software/On-Line Services | 15.1 | 15.1 | 14.0 | 16.2 |
| Other | 28.1 | 27.9 | 23.5 | 27.3 |
| <i>Round of Investment:</i> | | | | |
| Mean | 2.4 | 2.8 | 2.9 | 2.4 |
| Median | 2 | 3 | 3 | 2 |
| <i>Age of Firm at Time of Investment:</i> | | | | |
| Mean | 3.9 | 4.0 | 4.2 | 3.8 |
| Median | 3.0 | 3.3 | 3.4 | 2.8 |
| <i>Amount Invested in Venture Round:</i> | | | | |
| Mean | 6.1 | 6.2 | 6.0 | 5.7 |
| Median | 4.3 | 4.5 | 4.7 | 4.2 |

Table 3. Status of firms in the spring of 1998. The sample consists of 32,364 investments in privately held venture-backed firms between 1983 and 1994. Panel A presents the status of the firms in the spring of 1998. Separate tabulations are presented for investments by corporate venture firms, corporate funds where there was a strategic fit between the parent and portfolio firms, and independent venture funds. Panel B presents the p-values from Pearson χ^2 -tests of the equality of three outcomes (completion of an initial public offering; IPO or filing of a registration statement or acquisition at twice (in inflation-adjusted dollars) the post-money valuation at the time of the investment; and not being liquidated) in different sub-samples.

| Panel A: Status of Firms in the Spring of 1998 | | | | |
|---|---------------------------|---|---------------------------------------|----------------------------|
| | <i>Entire Sample</i> | <i>Corporate VC Only</i> | <i>Corporate VC and Strategic Fit</i> | <i>Independent VC Only</i> |
| <i>Status in the Spring of 1998:</i> | | | | |
| Initial Public Offering Completed | 31.1% | 35.1% | 39.3% | 30.6% |
| Registration Statement Filed | 0.7 | 0.2 | 0.3 | 0.7 |
| Acquired | 29.0 | 29.0 | 27.5 | 30.3 |
| Still Privately Held | 20.6 | 21.1 | 18.3 | 19.7 |
| Liquidated | 18.7 | 14.6 | 14.7 | 18.7 |
| Panel B: p-Value, Tests of Equality of Firm Status in the Spring of 1998 | | | | |
| | <i>Probability of IPO</i> | <i>Probability of IPO, Registration, or Acquisition at >2X Value</i> | <i>Probability of Not Liquidated</i> | |
| Corporate VC vs. All Others | 0.000 | | 0.002 | 0.000 |
| Independent VC vs. All Others | 0.043 | | 0.557 | 0.796 |
| Corporate VC vs. Independent VC | 0.000 | | 0.005 | 0.000 |
| Corporate VC and Strategic Fit vs. Independent VC | 0.000 | | 0.000 | 0.006 |

Table 4. Logit regression analyses of firms' status in the spring of 1998. The sample in the first four regressions consists of 32,364 investments in privately held, venture-backed firms between 1983 and 1994; in the fifth and sixth regressions, 8,506 financing rounds of privately held, venture-backed firms between 1983 and 1994. The dependent variable in the first, second, fifth, and sixth regressions is a dummy variable that takes on the value of one if the firm had gone public by the spring of 1998. In the third and fourth regressions, the dummy takes the value of one if the firm had gone public, filed a registration statement, or been acquired at twice (in inflation-adjusted dollars) the post-money valuation at the time of the investment by the spring of 1998. Independent variables include the age of the firm at the time of the investment, the ordinal rank of the investment round, and dummy variables denoting investments by corporate and independent venture capital funds, corporate venture investments where there was a strategic fit with the portfolio firm, firms based in California and Massachusetts, the status of the firm at the time of the investment, the year of the investment (not reported), the industry of firm (not reported), and a constant (not reported). All dummy variables take on the value of one if the answer to the posed question is in the affirmative. Absolute t-statistics reported in brackets.

| | Observations are Investments | | Observations are Rounds | |
|---|------------------------------|---|-----------------------------|-----------------------------|
| | <i>Did Firm Go Public?</i> | <i>Did Firm Go Public, Register, Or Have Favorable Acquisition?</i> | <i>Did Firm Go Public?</i> | <i>Did Firm Go Public?</i> |
| Age of Firm at Time of Financing Round Number | -0.02 [5.52] 0.13 [11.39] | -0.02 [6.17] 0.13 [11.48] | -0.02 [2.47] 0.17 [7.13] | -0.02 [2.50] 0.16 [6.95] |
| Corporate Venture Investment? | 0.15 [2.54] | 0.12 [2.15] | 0.20 [2.87] | 0.03 [0.31] |
| Independent Venture Investment? | -0.003 [0.09] | 0.07 [2.54] | 0.14 [1.92] | 0.13 [1.82] |
| Corporate Investment and Strategic Fit? | 0.52 [3.15] | 0.57 [3.55] | 0.40 [3.32] | 0.40 [3.32] |
| Firm Based in California? | 0.30 [9.29] | 0.23 [7.44] | 0.25 [3.96] | 0.26 [4.04] |
| Firm Based in Massachusetts? | 0.36 [7.83] | 0.24 [5.26] | 0.25 [2.77] | 0.25 [2.71] |
| Firm is in Development Stage? | 0.44 [7.73] | 0.38 [6.99] | 0.37 [3.70] | 0.36 [3.68] |
| Firm is in Beta Stage? | 0.25 [2.83] | 0.14 [1.60] | 0.13 [0.70] | 0.13 [0.69] |
| Firm is in Shipping Stage? | 0.38 [6.28] | 0.30 [5.20] | 0.33 [3.12] | 0.34 [3.23] |
| Firm is in Profitable Stage? | 1.32 [17.08] | 1.10 [14.77] | 1.44 [10.52] | 1.46 [10.65] |
| Firm is in Re-Start Stage? | -0.56 [4.20] | -0.43 [3.64] | -0.45 [1.70] | -0.45 [1.68] |
| Log Likelihood | -14743.6 | -15477.4 | -3694.4 | -3688.9 |
| χ^2 -statistic | 2409.9 | 2065.5 | 609.0 | 620.1 |
| p-Value | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of Observations | 24,515 | 24,515 | 6,445 | 6,445 |

Table 5. Pre-money valuation at the time of financing. The sample consists of 32,364 investments in privately held venture-backed firms between 1983 and 1994. Panel A presents the mean and median pre-money valuation of the firms at the time of the financing. The pre-money valuation is defined as the product of the price paid per share in the financing round and the shares outstanding prior to the financing round. Separate tabulations are presented for investments by corporate venture firms, corporate funds where there was a strategic fit between the parent and portfolio firms, and independent venture funds. Panel B presents the p-values from t-tests and Wilcoxon rank-sum tests of the equality of the mean and median valuations in different sub-samples.

| Panel A: Pre-Money Valuation at Time of Financing | | | | |
|--|--------------------------|------------------------------|---|--------------------------------|
| | <i>Entire Sample</i> | <i>Corporate VC Only</i> | <i>Corporate VC and Strategic Fit</i> | <i>Independent VC Only</i> |
| Mean | 20.1 | 28.5 | 26.9 | 18.1 |
| Median | 12.9 | 17.4 | 15.9 | 11.7 |

| Panel B: p-Value, Tests of Equality of Pre-Money Valuations | | |
|--|-------------|---------------|
| | <i>Mean</i> | <i>Median</i> |
| Corporate VC vs. All Others | 0.000 | 0.000 |
| Independent VC vs. All Others | 0.000 | 0.000 |
| Corporate VC vs. Independent VC | 0.000 | 0.000 |
| Corporate VC and Strategic Fit vs. Independent VC | 0.000 | 0.000 |

Table 6. Ordinary least squares regression analyses of the pre-money valuation at the time of the financing. The sample in the first two regressions consists of 32,364 investments in privately held, venture-backed firms between 1983 and 1994; in third and fourth regressions, 8,506 financing rounds of privately held, venture-backed firms between 1983 and 1994. The dependent variable is the logarithm of the pre-money valuation of the firms at the time of the financing. The pre-money valuation is defined as the product of the price paid per share in the financing round and the shares outstanding prior to the financing round. Independent variables include the logarithm of the age of the firm at the time of the investment, the logarithm of the ordinal rank of the investment round, and dummy variables denoting investments by corporate and independent venture capital funds, corporate venture investments where there was a strategic fit with the portfolio firm, firms based in California and Massachusetts, the status of the firm at the time of the investment, the year of the investment (not reported), the industry of firm (not reported), and a constant (not reported). All dummy variables take on the value of one if the answer to the posed question is in the affirmative. Absolute t-statistics reported in brackets.

| | <i>Observations are Investments</i> | | <i>Observations are Rounds</i> | |
|---|-------------------------------------|---------------|--------------------------------|--------------|
| | | | | |
| Logarithm of Age of Firm | 0.14 [11.32] | 0.14 [11.26] | 0.15 [6.01] | 0.15 [6.00] |
| Logarithm of Round Number | 0.68 [49.43] | 0.69 [48.94] | 0.68 [24.09] | 0.68 [24.04] |
| Corporate Venture Investment? | 0.18 [7.39] | 0.26 [4.38] | 0.30 [9.43] | 0.27 [6.76] |
| Independent Venture Investment? | -0.07 [5.76] | -0.07 [5.75] | -0.18 [4.85] | -0.18 [4.91] |
| Corporate Investment and Strategic Fit? | | -0.09 [1.37] | | 0.07 [1.22] |
| Firm Based in California? | 0.20 [14.78] | 0.20 [14.54] | 0.14 [4.76] | 0.14 [4.80] |
| Firm Based in Massachusetts? | 0.06 [2.79] | 0.06 [2.82] | 0.03 [0.61] | 0.03 [0.59] |
| Firm is in Development Stage? | 0.40 [14.08] | 0.38 [13.30] | 0.37 [7.01] | 0.37 [6.99] |
| Firm is in Beta Stage? | 0.51 [13.24] | 0.50 [12.81] | 0.48 [6.11] | 0.48 [6.10] |
| Firm is in Shipping Stage? | 0.58 [18.86] | 0.57 [18.26] | 0.60 [10.28] | 0.60 [10.30] |
| Firm is in Profitable Stage? | 1.10 [29.06] | 1.09 [28.61] | 1.15 [15.51] | 1.15 [15.54] |
| Firm is in Re-Start Stage? | -0.85 [17.22] | -0.84 [17.00] | -0.72 [7.04] | -0.72 [7.04] |
| Adjusted R ² | 0.39 | 0.39 | 0.43 | 0.43 |
| F-statistic | 397.1 | 371.5 | 102.0 | 98.3 |
| p-Value | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of Observations | 15895 | 15406 | 3544 | 3544 |

Table 7. Duration of investment programs. The sample consists of 19,099 investments by 855 corporate and independent venture funds in privately held firms between 1983 and 1994. Panel A presents the mean and median number of investments during the sample period by each venture organization, the time-span between the first and last investments by the venture organization in the sample (in years), and the time-span between the first and last investments by the venture organization in the sample expressed as a percentage of the time-span from the first investment by the venture organization to December 1994. Separate tabulations are presented for investments by corporate venture firms, corporate venture funds where there was a strategic fit with the portfolio firm in at least one-half of the investments, and independent venture funds. Panel B presents the p-values from t-tests and Wilcoxon rank-sum tests of the equality of the mean and median measures of duration in different sub-samples.

| Panel A: Duration of Investment Programs | | | | | | |
|---|---|------------------------------|---|--------------------------------|--|---------------|
| | <i>Corporate & Independent VC Funds</i> | <i>Corporate VC Only</i> | <i>Corporate VC and Strategic Fit</i> | <i>Independent VC Only</i> | | |
| <i>Number of Investments:</i> | | | | | | |
| Mean | 22.3 | 4.4 | 9.8 | 43.5 | | |
| Median | 4 | 2 | 4 | 21 | | |
| <i>Time-Span:</i> | | | | | | |
| Mean | 4.6 | 2.5 | 4.4 | 7.1 | | |
| Median | 3.8 | 1.0 | 4.2 | 8.0 | | |
| <i>Ratio of Active to Possible Time-Span:</i> | | | | | | |
| Mean | 51.7% | 34.8% | 55.6% | 71.7% | | |
| Median | 58.7 | 21.8 | 71.5 | 90.4 | | |
| Panel B: p-Value, Tests of Equality of Investment Program Duration | | | | | | |
| | <u>Number of Investments</u> | | <u>Time-Span</u> | | <u>Ratio of Active to Possible Time-Span</u> | |
| | <i>Mean</i> | <i>Median</i> | <i>Mean</i> | <i>Median</i> | <i>Mean</i> | <i>Median</i> |
| Corporate VC vs. Independent VC | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Corporate VC and Strategic Fit vs. Independent VC | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |