

# The structure and governance of venture-capital organizations

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Venture-capital organizations raise money from individuals and institutions for investment in early-stage businesses that offer high potential but high risk. This paper describes and analyzes the structure of venture-capital organizations, focusing on the relationship between investors and venture capitalists and between venture-capital firms and the ventures in which they invest. The agency problems in these organizations and to the contracts and operating procedures that have evolved in response are emphasized. Venture-capital organizations are contrasted with large, publicly traded corporations and with leveraged buyout organizations.

## 1. Introduction

The venture-capital industry has evolved operating procedures and contracting practices that are well adapted to environments characterized by uncertainty and information asymmetries between principals and agents. By venture capital I mean a professionally managed pool of capital that is invested in equity-linked securities of private ventures at various stages in their development. Venture capitalists are actively involved in the management of the ventures they fund, typically becoming members of the board of directors and retaining important economic rights in addition to their ownership rights. The prevailing organizational form in the industry is the limited partnership, with the venture capitalists acting as general partners and the outside investors as limited partners.

Venture-capital partnerships enter into contracts with both the outside investors who supply their funds and the entrepreneurial ventures in which

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they invest. The contracts share certain characteristics, notably:

- (1) staging the commitment of capital and preserving the option to abandon,
- (2) using compensation systems directly linked to value creation,
- (3) preserving ways to force management to distribute investment proceeds.

These elements of the contracts address three fundamental problems:

- (1) the sorting problem: how to select the best venture capital organizations and the best entrepreneurial ventures,
- (2) the agency problem:<sup>1</sup> how to minimize the present value of agency costs,
- (3) the operating-cost problem: how to minimize the present value of operating costs, including taxes.

From one perspective, venture capital can be viewed as an alternative model for organizing capital investments. Like corporations, venture-capital firms raise money to invest in projects. Many projects funded by venture capitalists (for example, the development of a new computer hardware peripheral) are similar to projects funded within traditional corporations. But the governance systems used by venture-capital organizations and traditional corporations are very different. This paper addresses some of the differences.

The information and analysis in the paper comes from two basic sources. Most of the data cited come from Venture Economics, the leading information source on the venture-capital industry. Venture Economics publishes the *Venture Capital Journal* (VCJ), a monthly magazine on trends in the industry, as well a number of specialized studies. The second major source is extensive field research I have done over the past eight years. This effort has resulted in 20 Harvard Business School cases based on decisions in venture-capital firms or in the companies they fund [e.g., Sahlman (1986c), Knights and Sahlman (1986d)], four technical and industry notes [e.g., Sahlman and Scherlis (1988)], and several articles [e.g., Sahlman and Stevenson (1985)]. The field research embodied in the cases and notes has been supplemented with on-site interviews with 25 venture-capital-firm management teams, over 150 venture capitalists, and approximately 50 venture-capital-backed entrepreneurial management teams.

Section 2 provides background information on the venture-capital industry, emphasizing the great uncertainty about returns on individual venture-capital projects. Sections 3, 4, and 5 discuss the general structure of a venture-capital firm and the contracts between external investors and venture capitalists. Sections 6 and 7 examine the contractual relationship between the venture-

<sup>1</sup>See Jensen and Meckling (1976), Fama (1980), and Fama and Jensen (1985) for background on the theory of agency costs. See also Williamson (1975, 1988) for background on transaction-cost theory. For related articles using the same basic framework to analyze organizational forms, see Wolfson (1985) on oil and gas limited partnerships and Brickley and Dark (1987) on franchises. Smith and Warner (1979) provide a similar analysis of financial contracts.

capital firm and the companies in which it invests. Venture-capital organizations are compared with other organizational forms for corporate or project governance in section 8. Section 9 summarizes the paper.

## **2. General industry background**

Table 1 presents historical data on the venture-capital industry from 1980 to 1988. In 1988 an estimated 658 venture-capital firms in the U.S. managed slightly over \$31 billion in capital and employed 2,500 professionals (panel A, table 1).<sup>2</sup> Industry resources were concentrated: the largest 89 firms controlled approximately 58% of the total capital. The average amount controlled by these 89 firms was just under \$200 million [VCJ April 1990, p. 13].

In each of the last several years, venture capitalists disbursed approximately \$3 billion to fewer than 2,000 companies, most in high-technology industries (panel C, table 1). Although a typical large venture-capital firm receives up to 1,000 proposals each year, it invests in only a dozen or so new companies.

Venture capitalists invest at reasonably well-defined stages (panel C, table 1). The seed stage typically precedes formation of a complete management team or completion of a product or service design. Each successive stage is generally tied to a significant development in the company, such as completion of design, pilot production, first profitability, introduction of a second product, or an initial public offering [Plummer (1987), Kozmetsky et al. (1985)]. The stages of investment are described more completely in table 2.

Approximately 15% of the capital disbursed in each of the last three years went to ventures in early stages, whereas 65% was invested in later-stage companies, typically still privately held. The remaining 20% was invested in leveraged buyout or acquisition deals. In recent years venture capitalists have channeled roughly two-thirds of the capital invested each year into companies already in their portfolios, and one-third into new investments. Venture capitalists often participate in several rounds of financing with the same portfolio company, as illustrated in table 3.

Venture-capital investing plays a small role in overall new-business formation. According to Dun & Bradstreet, approximately 600,000 to 700,000 new businesses are incorporated in the United States each year [Council of Economic Advisors (1990)]. The vast majority of those that seek external funding do so from sources other than venture capitalists. Some analysts

<sup>2</sup>Venture Economic's estimate of total industry capital is based on commitments of capital and is measured at cost rather than market value: thus, the \$31.1 billion cited in table 1 consists of capital that has been committed to venture-capital funds but not yet invested, some cash, and portfolio investments in individual ventures by venture-capital funds. The market value of the assets under management in the industry probably exceeds book value.

Table 1  
Selected data on the United States venture-capital industry, 1980-1988.<sup>a</sup>

	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Panel A: Aggregate venture-capital industry statistics</i>									
1 Total venture-capital pool (\$M)	\$4,500	\$5,800	\$7,600	\$12,100	\$16,300	\$19,600	\$24,100	\$29,000	\$31,100
2 Number of venture-capital firms	NA	NA	331	448	509	532	587	627	658
3 Number of industry professionals	NA	NA	1,031	1,494	1,760	1,899	2,187	2,378	2,474
4 Net new commitments to the venture-capital industry (\$M)	\$700	\$1,300	\$1,800	\$4,500	\$4,200	\$3,300	\$4,500	\$4,900	\$2,900
<i>Panel B: Data on the independent private sector (noncorporate and non-SBIC venture capital organizations)</i>									
1 Net new commitments to the independent private sector (\$M)	\$661	\$867	\$1,400	\$3,400	\$3,200	\$2,300	\$3,300	\$4,200	\$2,100
<i>Sectoral analysis (% of total capital)</i>									
2 Independent private	40.0%	44.0%	58.0%	68.7%	72.0%	73.0%	75.0%	78.0%	80.0%
3 Corporate	31.1%	28.0%	25.0%	21.0%	18.0%	17.0%	16.0%	14.0%	13.0%
4 SBIC	28.9%	28.0%	17.0%	11.0%	10.0%	10.0%	9.0%	8.0%	7.0%
<i>Sectoral analysis - Average capital per firm (\$M)</i>									
5 Independent private	NA	NA	\$27	\$36	\$45	\$52	\$57	\$65	\$65
6 Corporate	NA	NA	\$30	\$37	\$36	\$37	\$34	\$32	\$29
7 SBIC	NA	NA	\$6	\$5	\$5	\$5	\$5	\$6	\$5
8 Median size of independent private firms (\$M)	NA	NA	\$22	\$18	\$21	\$25	\$30	\$30	\$30

<i>Independent private-sector partnership formation</i>		22	37	54	89	101	77	77	110	84
9	Total # of funds raising capital	\$661	\$866	\$1,423	\$3,460	\$3,300	\$2,327	\$3,320	\$4,184	\$2,810
10	Total capital raised (\$M)	12	13	18	47	58	40	44	66	59
11	# of follow-on funds	\$418	\$477	\$628	\$2,383	\$2,300	\$1,396	\$2,800	\$3,347	\$2,422
12	Capital raised by follow-on funds (\$M)	10	24	36	42	43	37	33	44	25
13	# of new funds	\$243	\$389	\$795	\$1,077	\$1,000	\$931	\$520	\$837	\$388
14	Capital raised by new funds (\$M)	<i>Sources of capital to the independent private sector (%)</i>								
15	Corporations	19.0%	17.0%	12.0%	12.0%	14.0%	12.0%	11.0%	10.0%	12.0%
16	Individuals	16.0%	23.0%	21.0%	21.0%	15.0%	13.0%	12.0%	12.0%	8.0%
17	Pension funds	30.0%	23.0%	33.0%	31.0%	34.0%	33.0%	50.0%	39.0%	47.0%
18	Foreign	8.0%	10.0%	13.0%	16.0%	18.0%	23.0%	11.0%	14.0%	13.0%
19	Endowments	14.0%	12.0%	7.0%	8.0%	6.0%	8.0%	6.0%	10.0%	11.0%
20	Insurance companies	13.0%	15.0%	14.0%	12.0%	13.0%	11.0%	10.0%	15.0%	9.0%

Panel C: Investment activity of venture capitalists

<i>Disbursements</i>		6	10	18	25	34	42	58	66	77	84
1	Estimated value of disbursements (\$M)	\$610	\$1,160	\$1,450	\$2,580	\$2,760	\$2,670	\$3,230	\$3,940	\$3,650	\$2,448
2	Number of companies financed	504	797	918	1,320	1,469	1,377	1,504	1,729	1,474	\$2,448
3	Average investment per company	\$1.21	\$1.46	\$1.58	\$1.95	\$1.88	\$1.94	\$2.15	\$2.28	\$2.48	\$2,448
<i>Allocation of investments</i>		<i>Stages of financing</i>									
4	New company commitments as a % of total	58.0%	55.0%	39.0%	34.0%	31.0%	23.0%	37.0%	39.0%	33.0%	67.0%
5	Follow-on financings as a % of total	42.0%	45.0%	61.0%	66.0%	69.0%	77.0%	63.0%	61.0%	67.0%	20.0%
<i>Stages of financing</i>		<i>Seed and startup as a % of total</i>									
6	Seed and startup as a % of total	25.0%	22.6%	20.0%	17.2%	21.0%	15.0%	19.0%	13.0%	12.5%	67.5%
7	Expansion and later-stage as a % of total	75.0%	77.4%	68.0%	70.8%	67.0%	69.0%	58.0%	69.0%	67.5%	20.0%
8	Leveraged buyouts as a % of total	NA	NA	12.0%	12.0%	12.0%	16.0%	23.0%	18.0%	20.0%	20.0%

Table 1 (continued)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	
<i>Panel D: Exiting venture-capital investments</i>										
1	# of venture-capital-backed companies that are acquired	28	32	40	49	86	101	120	147	106
<i>Venture-capital-backed initial public offerings (IPOs)</i>										
2	# of companies	27	68	27	121	53	46	97	81	35
3	Total amount raised (\$M)	\$420	\$770	\$549	\$3,031	\$743	\$838	\$2,118	\$1,840	\$756
4	Total market value of companies with IPO in each year (\$M)	\$2,626	\$3,610	\$2,374	\$14,035	\$3,495	\$3,258	\$8,434	\$6,893	\$3,122
<i>All IPOs</i>										
5	# of companies	95	227	100	504	213	195	417	259	96
6	Total amount raised (\$M)	\$1,089	\$2,723	\$1,213	\$9,580	\$2,545	\$3,166	\$8,190	\$5,220	\$2,392
7	Total market value of companies (\$M)	\$5,717	\$10,922	\$5,466	\$40,473	\$10,792	\$11,618	\$31,616	\$23,813	\$11,759
<i>Venture capital backed IPOs as % of total IPOs</i>										
8	# of companies	28.4%	30.0%	27.0%	24.0%	24.9%	23.6%	23.3%	31.3%	36.5%
9	Total amount raised	38.6%	28.3%	45.2%	31.6%	29.2%	26.5%	25.9%	35.2%	31.6%
10	Total market value of companies	45.9%	33.1%	43.4%	34.7%	32.4%	28.0%	26.7%	28.9%	26.5%

\*Source: Various publications of Venture Economics (Needham, MA).

NA: not available.

Total capital (for example, panel A, row 1) is the book value of all commitments to professional venture-capital firms (net of fund liquidations). See also footnote 2 in text.

Data on initial public offerings in panel D, rows 5-7, come from Securities Data Corporation (see footnote 3 in the text).

Table 2  
The stages of venture-capital investing.<sup>a</sup>

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1. *Seed investments*

Although the term is sometimes used more broadly, the strict meaning of 'seed investment' is a small amount of capital provided to an inventor or entrepreneur to determine whether an idea deserves of further consideration and further investment. The idea may involve a technology, or it may be an idea for a new marketing approach. If it is a technology, this stage may involve building a small prototype. This stage does not involve production for sale.

2. *Startup*

Startup investments usually go to companies that are less than one year old. The company uses the money for product development, prototype testing, and test marketing (in experimental quantities to selected customers). This stage involves further study of market-penetration potential, bringing together a management team, and refining the business plan.

3. *First stage – early development*

Investment proceeds through the first stage only if the prototypes look good enough that further technical risk is considered minimal. Likewise, the market studies must look good enough so that management is comfortable setting up a modest manufacturing process and shipping in commercial quantities. First-stage companies are unlikely to be profitable.

4. *Second stage – expansion*

A company in the second stage has shipped enough product to enough customers so that it has real feedback from the market. It may not know quantitatively what speed of market penetration will occur later, or what the ultimate penetration will be, but it may know the qualitative factors that will determine the speed and limits of penetration. The company is probably still unprofitable, or only marginally profitable. It probably needs more capital for equipment purchases, inventory, and receivable financing.

5. *Third stage – profitable but cash poor*

For third-stage companies, sales growth is probably fast, and positive profit margins have taken away most of the downside investment risk. But, the rapid expansion requires more working capital than can be generated from internal cash flow. New VC capital may be used for further expansion of manufacturing facilities, expanded marketing, or product enhancements. At this stage, banks may be willing to supply some credit if it can be secured by fixed assets or receivables.

6. *Fourth stage – rapid growth toward liquidity point*

Companies at the fourth stage of development may still need outside cash to sustain growth, but they are successful and stable enough so that the risk to outside investors is much reduced. The company may prefer to use more debt financing to limit equity dilution. Commercial bank credit can play a more important role. Although the cash-out point for VC investors is thought to be within a couple of years, the form (IPO, acquisition, or LBO) and timing of cash-out are still uncertain.

7. *Bridge stage – mezzanine investment*

In bridge or mezzanine investment situations, the company may have some idea which form of exit is most likely, and even know the approximate timing, but it still needs more capital to sustain rapid growth in the interim. Depending on how the general stock market is doing, and how given types of high tech stocks are doing within the stock market, 'IPO windows' can open and close in very unpredictable ways. Likewise, the level of interest rates and the availability of commercial credit can influence the timing and feasibility of acquisitions or leveraged buyouts. A bridge financing may also correspond to a limited cash-out of early investors or management, or a restructuring of positions among VC investors.

8. *Liquidity stage – cash-out or exit*

A literal interpretation of 'cash-out' would seem to imply trading the VC-held shares in a portfolio company for cash. In practice, it has come to mean the point at which the VC investors can gain liquidity for a substantial portion of their holdings in a company. The liquidity may come in the form of an initial public offering. If it does, liquidity is still restricted by the holding periods and other restrictions that are part of SEC Rule 144, or by 'stand-off' commitments made to the IPO underwriter, in which the insiders agree not to sell their shares for some period of time after the offering (for example, 90 or 180 days). If acquisition is the form of cash-out, the liquidity may be in the form of cash, shares in a publicly traded company, or short-term debt. If the acquisition is paid for in shares of a nonpublic company, such shares may be no more liquid than the shares in the original company. Likewise, if the sellers take back debt in a leveraged buyout, they may wind up in a less liquid position than before, depending on the liquidity features of the debt.

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<sup>a</sup>This table is drawn from Plummer (1987, pp. I-11 to I-13).

Table 3  
Participation in multiple financing rounds by a venture-capital fund.<sup>a,b</sup>

Company/ Date of purchase	Security purchased	Price per share	Number of shares	Total cost
<i>Company 1</i>				
5/1/85	Convertible preferred series B	\$0.68	525,145	\$354,473
8/1/85	Convertible preferred series B	\$0.68	972,531	\$656,458
3/1/86	Convertible preferred series C	\$2.25	444,445	\$1,000,001
4/1/87	Convertible preferred series D	\$4.50	66,667	\$300,002
	Totals (average price per share)	\$1.15	2,008,788	\$2,310,934
7/24/90	Estimated value	\$23.00		\$46,202,124
<i>Company 2</i>				
6/1/85	Convertible preferred series A	\$15.00	20,833	\$312,500
11/1/85	Convertible preferred series A	\$15.00	20,833	\$312,495
4/1/86	Convertible preferred series A	\$15.00	25,000	\$375,000
5/2/88	Convertible preferred series B	\$8.60	28,588	\$245,857
	Totals (average price per share)	\$13.08	95,254	\$1,245,852
	<i>Note:</i> Loans totalling \$206,500 were made in 1987 and these were converted to series B preferred on 5/2/88			
7/24/90	Estimated value	\$3.27		\$311,463
<i>Company 3</i>				
2/1/87	Convertible preferred series B	\$1.15	347,827	\$400,001
7/1/87	Convertible preferred series C	\$1.90	131,579	\$250,000
3/16/88	Convertible preferred series D	\$1.60	283,326	\$453,322
	Totals (average price per share)	\$1.45	762,732	\$1,103,323
	<i>Note:</i> Loans totalling \$200,000 were made in 1987 and these were converted to series D preferred on 3/16/88			
7/24/90	Estimated total value	\$1.45		\$1,103,323

<i>Company 4</i>					
2/1/86	Convertible preferred series B	\$0.95	1,473,684	\$1,400,000	
12/1/86	Convertible preferred series D	\$1.85	461,808	\$854,345	
7/22/87	Convertible preferred series D	\$1.85	141,829	\$262,384	
	Totals (average price per share)	\$1.21	2,077,321	\$2,516,728	
7/24/90	Estimated value	\$4.34		\$9,005,259	
<i>Company 5</i>					
11/1/85	Convertible preferred series A	\$0.34	1,470,588	\$500,000	
3/1/86	Convertible preferred series B	\$0.45	2,083,333	\$937,500	
3/1/87	Convertible preferred series C	\$0.75	1,333,333	\$1,000,000	
	Totals (average price per share)	\$0.50	4,887,254	\$2,437,500	
7/24/90	Estimated value	\$0.00		\$0	
Total cost for 5 companies			\$9,614,336		
Total estimated value for 5 companies			\$56,622,169		
Total gain for 5 companies			\$47,007,832		

<sup>a</sup>Source: An interim report to the limited partners of a venture-capital fund with more than \$20 million in capital.

<sup>b</sup>The amounts listed do not include investments made by others at the same time or at other times.

estimate that the amount invested by so-called angels is an order of magnitude larger than the amount invested by professional venture capitalists [see, for example, Wetzel (1983) and Freear and Wetzel (1990)].

Venture-capital investing is also modest in comparison with the level of capital investment in the domestic corporate sector: total capital expenditures in 1988 by the nonfinancial, nonfarm sector exceeded \$380 billion [Economic Report of the President (1990)]. Total expenditures on research and development in the U.S. each year are estimated to top \$150 billion, of which \$74 billion is invested by private industrial concerns [Studt (1990)]. Finally, the \$3 billion disbursed by all professional venture capitalists in 1988 was only slightly less than one-third the amount invested by IBM in capital expenditures and R&D in the same year, and 25% of the amount invested by General Motors.

Despite its modest scope, the industry has helped create many successful enterprises, including Apple Computer, Intel, Federal Express, People Express, Businessland, Lotus Development, Microsoft, Sun Microsystems, Digital Equipment, Compaq Computer, Teledyne, Tandem, Tandon, Hybritech, and Genentech. Each of these companies received venture capital early in its development and later went public. In aggregate, 579 venture-capital-backed companies went public during the 11 years ending in 1988. Their total market value exceeded 30% of the total market value of all comparable companies going public during the same period (panel D, table 1).<sup>3</sup>

The payoff to venture capitalists has been handsome in some cases. During 1978 and 1979, for example, slightly more than \$3.5 million in venture capital was invested in Apple Computer. When Apple went public in December 1980, the approximate value of the venture capitalists' investment was \$271 million, and the total market capitalization of Apple's equity exceeded \$1.4 billion. Similarly, several venture capitalists invested slightly over \$4.7 million in Lotus Development Corporation in two rounds of financing in 1982: their equity was assigned a market value of almost \$130 million in October 1983. The lead venture capitalist, Ben Rosen of Sevin-Rosen Partners, played a very important role in the formation and evolution of the company [see Sahlman (1985e) for background on the Sevin-Rosen investment in Lotus].

The industry has also been involved in some spectacular failures. Well-known examples include Ovation Technologies, Osborne Computer, Ztel, and Gavilan. In each case, venture capitalists lost their entire investment. In late 1983 Ovation Technologies raised almost \$6 million in venture capital to compete with Lotus Development in microcomputer software. The product proved far more difficult and costly to complete than anticipated, however,

<sup>3</sup>Venture Economics provides the data on the venture-capital-backed companies. Data on all initial public offerings (IPOs) during the period come from Securities Data Corporation. The specific comparison sample excludes all closed-end investment companies, savings and loan conversions, and companies with an offering price under \$5.00 per share.

and the venture-capital firms chose to liquidate the company rather than continue funding development. Ovation closed its doors in late 1984 without having generated one dollar of revenues. [For further information on Ovation, see Knights and Sahlman (1986a).]

Although comprehensive data are difficult to obtain, the overall rate of return on venture capital seems to have been high from the mid-1960s through the mid-1980s, the only period for which reliable data are currently available. Between 1965 and 1984, for example, the median realized compound rate of return on 29 venture-capital partnerships over the life of each partnership (an average of 8.6 years) exceeded 26% per year [Venture Economics (1985, p. 69)]. The minimum compound annual rate of return for the 29 funds was 6%.<sup>4</sup>

A more recent and comprehensive study [Venture Economics (1988c)] suggests that funds started before 1981 experienced generally positive returns through 1987. For example, the average annual rate of return (weighted by initial investment) on the 13 funds started in 1980 was 20.6% for the period ending December 31, 1987, compared with 16% for the Standard & Poor's 500 and 16% for smaller capitalization stocks during the same period [Ibbotson Associates (1988)]. These 13 funds represented 50% of the total funds raising money in 1980 and 66% of the capital raised that year. This study also reveals that rates of return have declined since 1983, particularly for funds started later in the period. It is extremely difficult to estimate the extent to which returns have declined, however, because accounting practices in the industry typically reflect a downward bias. [See also VCJ (August 1989) and Sahlman (1989).]

Returns on individual investments in a venture-capital portfolio vary widely. According to Huntsman and Homan (1980), slightly more than half of the 110 investments made by three venture-capital firms from 1960 to 1975 resulted in a realized rate of return of less than 10%; over one-quarter resulted in an absolute loss. According to Venture Economics (1988c), more than one-third of 383 investments made by 13 firms between 1969 and 1985 resulted in an absolute loss. More than two-thirds of the individual investments made by these same firms resulted in capital returns of less than double the original cost.

Nevertheless, the returns on a few investments have more than offset these disappointments. Venture Economics (1988c) reports, for example, that 6.8% of the investments resulted in payoffs greater than ten times cost and yielded 49.4% of the ending value of the aggregate portfolio (61.4% of the profits).

<sup>4</sup>The findings reported in Venture Economics (1985) are supported by Huntsman and Homan (1980), Chiampou and Kellet (1989), Bygrave et al. (1987), Horsley Keogh (1988), and analysis of the returns reported by 20 venture-capital funds in offering memoranda used to raise new capital. No attempt was made in these studies to adjust for the systematic risk incurred in venture-capital investing.

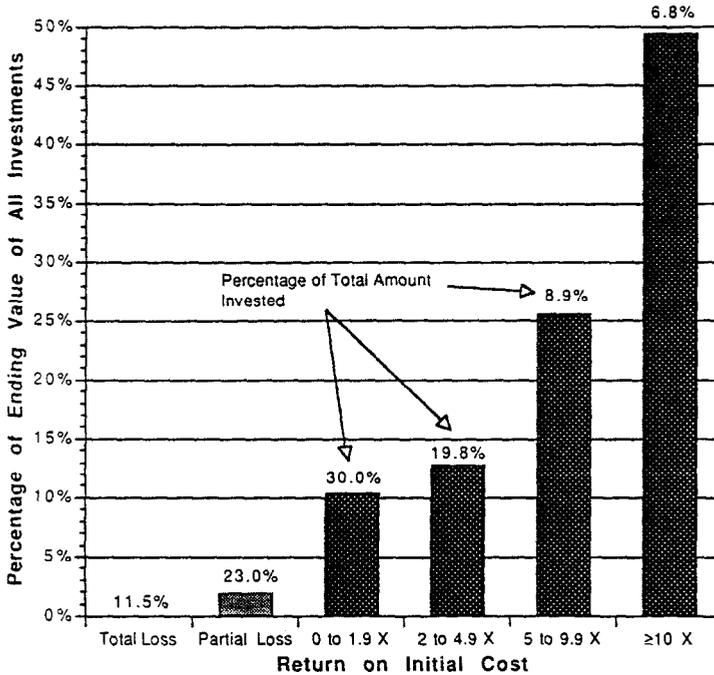


Fig. 1. Payoffs from venture-capital investing.

This graph shows the distribution of gains and losses on a group of investments made by venture-capital firms. The data are taken from Venture Economics (1988c) and cover investments by 13 venture-capital partnerships in 383 companies from 1969 to 1985. In total, \$245 million was invested, which resulted in total value of \$1.049 billion (4.3 times cost). The vertical axis shows the percentage of total ending value (that is, the \$1.049 billion) resulting from six groups of investments, comprising investments with differing returns on capital invested (from total loss to more than 10 times capital invested). At the top of each bar the percentage of total cost represented by each group is shown. Thus, 6.8% of the capital invested resulted in payoffs of more than 10 to 1 and contributed almost 50% of the total ending value. Similarly, 11.5% of the cost was invested in companies that experienced a total loss.

Fig. 1 shows the distribution of outcomes analyzed in Venture Economics (1988c). An earlier Venture Economics report (1985) reached similar conclusions: investments in 22 of 216 companies yielded more than ten times cost, and the profits realized were more than 40 times larger than the losses incurred on the 70 companies that failed to return the amount invested. The same basic patterns are found by Keeley (1986) and Horsley Keogh (1988). See also Stevenson et al. (1987) and Sahlman and Soussou (1985a).

Even companies that are successful in the long run sometimes flirt with failure. For example, an analysis of various documents filed with the Securities and Exchange Commission (SEC) reveals that Federal Express raised



Table 4 (continued)

Company (business)	Investor <sup>b</sup>	Date	Amount raised (\$000)	Cumulative funding (\$000)	Stock received (000)	Total shares outstanding (000)	% ownership acquired	Fully diluted valuation (\$000)	Price per share (\$)	Estimated ending ownership % <sup>c</sup>
Lotus Development (software)	Founders	Apr-82	13	13	4,410	4,410	100.0%	13	0.00	30.9%
	Venture 1	Apr-82	1,000	1,013	3,500	7,910	44.2%	2,260	0.29	24.5%
	Venture 2	Dec-82	3,755	4,768	3,767	11,677	32.3%	12,044	1.03	26.4%
	IPO	Oct-83	46,800	51,568	2,600	14,277	18.2%	256,988	18.00	18.2%
Midway Airlines (transportation)	Founders	Jun-76	7	7	700	700	100.0%	7	0.01	19.2%
	Venture 1	Jul-79	5,739	5,746	1,380	2,080	66.3%	8,650	4.16	37.9%
	Venture 2	Sep-80	6,000	11,746	789	2,789	28.3%	23,620	7.60	21.7%
	IPO	Dec-80	11,475	23,221	850	3,639	23.4%	53,433	13.50	23.4%
Seagate (disk drives)	Founders	Oct-79	161	161	11,723	11,723	100.0%	161	0.01	64.1%
	Venture 1	Jun-80	1,000	1,161	3,125	14,848	21.0%	4,751	0.32	17.1%
	IPO	Sep-81	25,000	26,161	2,500	18,277	13.7%	182,770	10.00	13.7%
Staples (retailing)	Founders/ Venture 1	Jan-86	4,425	4,425	1,844	1,844	100.0%	4,425	2.40	20.2%
	Venture 2	Jan-87	13,927	18,352	2,211	4,054	54.5%	25,543	6.30	24.2%
	Venture 3	Dec-87	13,597	31,950	1,563	5,617	27.8%	48,871	8.70	17.1%
	Venture 4	Sep-88	2,800	34,750	267	5,884	4.5%	61,782	10.50	2.9%
	IPO	Apr-89	61,750	96,500	3,250	9,134	35.6%	173,546	19.00	35.6%

<sup>a</sup>Sources: Annual reports, prospectuses.

<sup>b</sup>Venture 1, etc., represent rounds of financing from venture capitalists; IPO = Initial Public Offering.

<sup>c</sup>Ending ownership is based on final total shares outstanding. The figures do not always add exactly to 100%, which reflects stock options issued and other capital structure changes, including share repurchases, warrants issued, and debt conversions.

three rounds of venture capital in 1973 and 1974. With the company behind plan and over budget, the price paid per share in the third round was \$0.63, compared with the adjusted price of more than \$200 in the first round and just over \$7 per share in the second round. By 1976, when the company made its first public offering of shares, the adjusted price per share was \$6; by 1981, it was \$47.45. Table 4 shows the prices paid and capital raised in Federal Express and seven other ventures.

Conversely, companies that give venture capitalists and their investors high rates of return do not always succeed in the long run. Priam Corporation, a disk-drive manufacturer, received five rounds of venture capital before it went public. In the initial round of financing in 1978 the price per share was less than \$1, whereas the per-share value assigned soon after the company went public in 1983 was \$23. Every intervening round had taken place at a higher price per share, but although it raised more than \$70 million in its IPO, Priam filed for bankruptcy in 1989. [See Sahlman (1984), Knights and Sahlman (1986c, 1986d), and Sahlman and Stevenson (1985) for details on Priam and other disk-drive manufacturers.]

An important variable in venture-capital investments is the time that elapses between the initial investment and the return of capital. According to Venture Economics (1988c), the average holding period for an investment is 4.9 years. Roughly one-third of the individual investments studied are held for more than six years. Investments with payoffs greater than five times the invested capital are held significantly longer than investments that fail completely. The average investment in companies with high payoffs is approximately \$1 million, versus \$366,000 for the losers.

### **3. The most common structure of venture-capital firms<sup>5</sup>**

By 1988 the typical venture-capital firm was organized as a limited partnership, with the venture capitalists serving as general partners and the investors as limited partners. According to Venture Economics (1987), 500 firms with \$20 billion in capital in 1987 were structured as limited partnerships. The remaining one-third of industry capital was invested in independent private venture-capital firms not organized as limited partnerships (for example, incorporated venture-capital companies and publicly traded closed-end funds) (9% in 1987); in venture-capital subsidiaries of industrial and financial corporations (14%); and in independent small-business investment companies (SBICs) (8%), which had access to government-guaranteed debt to

<sup>5</sup>For background information on the venture-capital industry and the structure of venture-capital firms, see Gorman and Sahlman (1989), Sahlman and Stevenson (1985), Sahlman (1988, 1989), Wilson (1985), Morris (1988a), Bartlett (1988), and Venture Economics (1985, 1987, 1988a, 1988b, 1988c).

leverage their equity capital (panel B, table 1). The share of total industry capital managed by the independent private sector, which comprises mostly limited partnerships, increased dramatically over the nine years ending in 1988.

Table 1 (panel B) also reveals that in 1988 12% of the new capital committed to the private independent sector (i.e., noncorporate subsidiaries and non-SBICs) came from individuals, whereas 64% came from pension funds, endowments, and insurance companies. Typically, the general partners provide only a small proportion (about 1%) of the capital raised by a given fund. Most venture-capital firms are structured as management companies responsible for managing several pools of capital, each representing a legally separate limited partnership.

In each new fund, the capital is invested in new ventures during the first three to five years of the fund. Thereafter few if any investments are made in companies not already in the portfolio, and the goal is to begin converting existing investments to cash. As investments yield cash or marketable securities, distributions are made to the partners rather than reinvested in new ventures.

Typically, well before all of the capital from a venture-capital pool is distributed to the partners, a new fund is raised and invested in new ventures. For example, Institutional Venture Partners (IVP), a California-based venture-capital firm, raised \$16.5 million in 1980, the year it was formed. In 1982 the IVP management company raised \$40 million in a fund called IVP II. The group raised \$96 million in 1985, launching IVP III, which was followed in 1988 by IVP IV, a \$115 million fund [VCJ (May 1989, pp. 26–29)]. Thus investment and distribution periods overlap. Approximately 72% of the increase in capital controlled by the private independent sector from 1977 to 1988 was attributable to so-called follow-on funds, new venture-capital pools raised by existing firms.

The average firm in 1988 had \$65 million in committed capital (measured at cost rather than market value). The largest 89 firms, as noted earlier, had average committed capital of almost \$200 million and controlled almost 60% of the industry's assets. A fund with \$200 million in committed capital is typically managed by a professional staff of between 6 and 12, who invest approximately \$15 to \$35 million each year in new companies and companies already in the portfolio.

Most venture-capital firms have several general partners and a staff of associates and administrative support personnel. Associates function as apprentices to the general partners and often become general partners themselves in later funds. In 1988, the average capital managed per professional (partner or associate) was \$12.6 million. For the independent private sector, the figure was \$15 million per professional [Venture Economics (1989)]. The

capital managed by each professional is a function of total capital under management. For independent private firms with total committed capital of more than \$200 million, each professional was responsible for managing \$34 million.

Institutional Venture Partners, for example, had six general partners and two associates responsible for managing the various active funds. In 1988 IVP invested \$11.2 million in 11 new companies not already in one of the fund portfolios and \$19.2 million in 27 follow-on deals.

By 1988 roughly one-third of all venture-capital firms had at least one partner with more than 10 years of experience, and these firms managed almost 60% of total industry capital. In the independent private sector, which was characterized by more experience, roughly 68% of the firms (managing 89% of the capital) had one partner with at least five years of experience in the industry [Venture Economics (1989)].

Venture-capital firms tend to specialize by industry or stage of investment. Some firms focus on computer-related companies, others on biotechnology or specialty retailers. Some will invest only in early-stage deals, whereas others concentrate on later-stage financings. Many firms also limit their geographic scope.

#### **4. The contract between the investors and the venture-capital firm**

The relationship between investors and managers of the venture funds is governed by a partnership agreement that spells out the rights and obligations of each group. Key elements of the contract are described in this section, and an economic analysis follows in section 5. The description of the legal structure of a venture-capital firm is based primarily on Venture Economics (1987), which studied contracts for 76 funds raised between January 1986 and August 1987. These funds represented 76% of all venture-capital funds raised during this period. Of the 76, 40 were initial funds and 36 were follow-on funds started by firms already managing other pools. The findings in that report were checked against primary-source documents from 25 venture capital firms. See also Bartlett (1988).

##### *4.1. Legal structure*

The limited-partnership organizational form has important tax and legal considerations. Limited-partnership income is not subject to corporate taxation; instead income is taxable to the individual partners. Also, partnerships can distribute securities without triggering immediate recognition of taxable income: the gain or loss on the underlying asset is recognized only when the asset is sold. To qualify for this form of tax treatment, partnerships must

meet several conditions:<sup>6</sup>

- (1) A fund's life must have an agreed-upon date of termination, which is established before the partnership agreement is signed.
- (2) The transfer of limited partnership units is restricted; unlike most registered securities, they cannot be easily bought and sold.
- (3) Withdrawal from the partnership before the termination date is prohibited.
- (4) Limited partners cannot participate in the active management of a fund if their liability is to be limited to the amount of their commitment.

General partners, in contrast, bear unlimited liability, so they can conceivably lose much more than they commit in capital. The consequences of unlimited liability are minor, however, because venture-capital partnerships typically do not borrow, nor are they exposed to the risk of having liabilities in excess of assets.

Despite restrictions on their managerial rights, limited partners are almost always permitted to vote on key issues such as amendment of the limited-partnership agreement, dissolution of the partnership before the termination date, extension of the fund's life, removal of any general partner, and valuation of the portfolio. Contracts vary, but typically a two-thirds majority of limited-partnership votes is required to effect change.

#### *4.2. General-partner contribution*

Of the 76 partnerships surveyed in *Venture Economics* (1987), 61% report general-partner contributions of exactly 1% of committed capital. This contribution can be, and often is, in the form of a promissory note rather than cash. Some tax advisors counsel those forming venture-capital partnerships to have the general partners contribute at least 1% in order to be assured of favorable tax treatment.

#### *4.3. Economic life*

For the *Venture Economics* (1987) sample, the economic life of 72% of the funds is set at ten years. All of the partnerships include provisions to extend the life of the funds, with 52% requiring some level of consent by the limited partners and 48% leaving the decision up to the general partners. The most frequent extension period is three years maximum in one-year increments. At the end of a fund's legal existence, all cash and securities are distributed and a final accounting is rendered.

<sup>6</sup>The list below is replicated from *Venture Economics* (1987, p. 7). See also Wolfson (1985), who describes the use of the limited-partnership organization form in the oil and gas industry, which is driven primarily by tax considerations.

#### *4.4. Takedown schedules*

In the survey sample the limited partners typically are required to invest a certain amount at the outset, but can phase in the remainder of their investment over time. Most fund agreements call for a cash commitment of between 25% and 33% at the close, with additional capital to be invested at some future date or dates (for example, 25% each year). The venture capitalists exercise considerable control over the timing of capital infusions by the limited partners.

If limited partners renege on a funding commitment, severe penalties are imposed on the ownership percentages associated with the partners' earlier investments and their ability to withdraw already invested funds. The kinds of penalties imposed vary considerably, though a common clause calls for the limited partner to forfeit one-half of the partner's capital account in the partnership and therefore one-half of the profits to which the partner would have been entitled.

#### *4.5. Compensation*

Venture-capital management companies typically receive compensation from two sources for managing the investments in each limited partnership. They are entitled to a management fee, and they receive some percentage of the profits over the life of each fund. More than 50% of the contracts surveyed by Venture Economics call for an annual management fee equal to 2.5% of committed capital through the life of the fund. Most of the remaining partnerships base the management fee on capital committed, though the formula varies. Only seven of the funds base the fee directly on the estimated value of the portfolio. Typically the base management fee increases annually by the rate of consumer price inflation. The survey finds little evidence that the percentage fee declines with the amount of capital under management.

In 88% of the funds surveyed, venture capitalists are entitled to 20% of the realized gains on the fund. In the remaining partnerships, the general partner's share of realized gains ranges from 15% to 30%. Given the diversity of fund organizers and their differing stated purposes, this seems remarkably consistent, in sharp contrast to the widely varying contract terms found in oil and gas partnerships [Wolfson (1985)].

#### *4.6. Distributions*

Half of the partnership agreements studied by Venture Economics require annual distributions from realized profits. In 18% of the agreements, the general partners state their intentions to make annual distributions, whereas

the remaining partnerships leave the issue of distribution to the discretion of the general partners.

In 29% of the contracts studied, the general partners are entitled to take their profit participation (called the 'carried interest') – in income or gains without restriction. In the other partnerships the general partners are not entitled to take the carried interest until the limited partners have received an amount at least equal to their cumulative capital contribution.

General partners generally have the option to make distributions in the form of securities, cash, or both. Often when a portfolio company becomes successful, its shares are registered with the SEC and a public offering takes place [see Barry et al. (1990)]. Typically, the venture-capital firm does not or cannot liquidate its shareholdings on the offering. The shares can be distributed to the limited partners in proportion to their ownership of the fund, or the fund can continue to hold the shares, taking responsibility for distributing them at some future date, or converting them to cash through a transaction such as a secondary offering. If the shares are distributed to the limited partners, the value assigned is the last price in the stock market before the distribution.

#### *4.7. Reporting and accounting policies*

All venture-capital firms surveyed agree to provide the limited partners with periodic reports on the value and progress of portfolio companies, including an annual meeting with the general partners and selected portfolio-company management teams. Because most investments are made in private companies with highly uncertain prospects, assigning values is very difficult. Often the partners agree to recognize losses quickly and to write up the value of an investment only if there is a significant arms-length transaction at a higher value. If no such transactions have occurred and no loss seems likely, cost is used as a basis for reporting. As a result of these policies, most venture-capital firms report negative rates of return during the first few years of the fund [see also Venture Economics (1988c)].

#### *4.8. Specific conflicts of interest*

Most contracts specify the percentage of time the venture capitalists propose to devote to the management of the fund being raised. A small number of partnership agreements restrict the ability of general partners to coinvest or receive securities from portfolio companies. Some partnerships restrict follow-on funds from investing in securities held by a previous fund managed by the same venture capitalists. Other fund agreements prevent the general partner from raising a new fund until some percentage (for example,

50%) of the capital raised in the existing fund has been invested in portfolio companies.

#### *4.9. Special advisory committees*

Of the 76 funds studied by Venture Economics (1987), 41 establish formal advisory boards; another 17 create informal advisory boards. Of those with formal advisory boards, 19 require limited-partner representation. An additional 18 funds establish boards composed solely of representatives of the limited partners; these boards are separate and distinct from the advisory board.

Advisory boards and boards composed of limited partners are often designed to provide access to deals or technical expertise. Some boards are structured like traditional boards of directors, providing guidance and oversight for the operation of the venture-capital fund. Still other advisory committees are assigned specific responsibilities, the most important of which is determining the value of the portfolio.

### **5. Analyzing the relationship between external investors and venture capitalists**

Venture capitalists act as agents for the limited partners, who choose to invest in entrepreneurial ventures through an intermediary rather than directly. In such situations, conflicts arise between the agent and the principal, which must be addressed in the contracts and other mechanisms that govern their relationship.

In the venture-capital industry, the agency problem is likely to be particularly difficult. There is inevitably a high degree of information asymmetry between the venture capitalists, who play an active role in the portfolio companies, and the limited partners, who cannot monitor the prospects of each individual investment as closely.

The contractual provisions outlined in section 4 can be explained as attempts to resolve the agency problem, the operating cost problem, and the sorting problem simultaneously.

#### *5.1. Agency costs*

Venture capitalists have many opportunities to take advantage of the people who invest with them. To a degree, the agency problem is exacerbated by the legal structure of limited partnerships, which prevents limited partners from playing a role in the management of the venture-capital partnership.

Contracts are designed with several key provisions to protect the limited partners from the possibility that the venture capitalists will make decisions

against their interests. First, the life of a venture-capital fund is limited; the venture capitalist cannot keep the money forever. Organizational models like mutual funds or corporations, in contrast, have indefinite life spans. Implicitly, the investors also preserve the right not to invest in any later fund managed by the same venture capitalists.

Second, the limited partners preserve the right to withdraw from funding the partnership by renegeing on their commitments to invest beyond the initial capital infusion as described in section 4.4. Third, the compensation system is structured to give the venture capitalists the appropriate incentives. The fund managers are typically entitled to receive 20% of the profits generated by the fund. For reasons which will be explored more fully below, the profit participation and other aspects of the contract encourage the venture capitalist to allocate the management fee to activities that will increase the total value of the portfolio.

Fourth, the mandatory distribution policy defuses potential differences of opinion about what to do with the proceeds from the sale of assets in the portfolio. The general partners cannot choose to invest in securities that serve their own private interests at the expense of the limited partners.

Finally, the contract addresses obvious areas of conflict between the venture capitalist and the limited partner. Thus, the venture capitalist is often explicitly prohibited from self-dealing (for example, being able to buy stock in the portfolio on preferential terms or receiving distributions different from those given to the limited partner). Also, the venture capitalists are contractually required to commit a certain percentage of their effort to the activities of the fund. Although this requirement is difficult to monitor, egregious violations can be the subject of litigation if fund performance is poor.

### *5.2. Further analysis of the compensation system*

The compensation system plays a critical role in aligning the interests of the venture capitalists and the limited partners. To understand the implicit incentives, consider a \$200 million fund with eight general partners that receives a management fee of 2.5% of total capital committed. Annual revenues are \$5 million and revenues per partner are \$625,000. Various expenses must be subtracted, including partner base salaries, office expenses, travel, insurance, and support staff. A reasonable estimate of the partners' base pay is \$250,000 per year per partner, equivalent to 40% of total revenues. An informal survey of five venture-capital firms with this amount of capital under management revealed that the firm can be expected to clear a profit each year. If total expenses are 2.1% of the capital committed (the average reported in the informal survey), the annual operating profit is \$800,000, or \$100,000 per partner. Such profits are typically distributed to partners at the end of the year as a bonus.

If this hypothetical \$200 million fund is successful and achieves a 20% rate of return on committed capital over its five-year duration (before consideration of the profit participation but after taking into account the management fee), the ending value will be approximately \$498 million. The general partners will be entitled to 20% of the \$298 million profit, or \$59 million, equivalent to \$7.4 million per partner. This figure translates to a \$4.2 million present value per partner, assuming payment at the end of the last year and a 10% discount rate, or roughly \$1.2 million per year per partner on a comparable annuity basis (also assuming a 10% discount rate). This figure far outweighs each general partner's combined base salary and annual bonus, estimated at \$350,000 per year. An extra 1% in compound rate of return increases the present value of the carried interest from \$4.2 million to \$4.5 million, based on the assumptions used earlier. As long as the compound annual rate of return on the fund is positive, the percentage increase in the venture capitalists' share exceeds the percentage increase in the total value of the portfolio.<sup>7</sup>

Gathering hard data on venture-capital compensation is very difficult: many firms do not reveal key statistics about their business. According to a survey of 63 private independent venture-capital firms with over \$5 billion in total committed capital in 1988 [Hay Management Consultants (1988)], however, the average 1987 base pay of a managing partner of a private, independent venture-capital firm was \$223,000. The annual operating bonus was \$51,000 and the average realized profits distribution was \$163,000, resulting in total compensation of \$437,000. These figures are not as dramatic as the simple numerical calculation used above, which accurately reflects the data provided by the four venture firms interviewed specifically about compensation. Also, the Hay Management Consultants data are difficult to interpret in light of the poor overall returns for most venture-capital funds in 1987 and the tendency for general partners to defer as long as possible the recognition of income for tax purposes. Nevertheless, the carried interest component of compensation is large in relation to the other components.<sup>8</sup> The implication is that the venture capitalists have incentives to engage in activities that increase the value of the carried interest, which is precisely what benefits the limited partners.

<sup>7</sup>These calculations ignore the return the venture capitalists receive on their direct investments in the partnership (for example, on the 1% investment described in section 4.2).

<sup>8</sup>The informal survey cited earlier also revealed that a number of successful venture-capital firms operate on an annual budget, which is negotiated each year with the limited partners. Examples include Greylock, Sutter Hill, and Charles River Partners. In these firms, the partners receive modest cash salaries and the venture-capital management company does not realize an annual profit. The partners are dependent on the carried interest to supplement current salaries. It is difficult to find evidence of a correlation between compensation structures and performance, however. For example, one highly regarded firm, Kleiner Perkins, receives a management fee of 3% and a carried interest percentage of 30%.

Although the compensation system seems to provide appropriate incentives, there are some difficult issues. One area of potential conflict between the limited and general partners relates to risk. The venture capitalist's equity participation may be thought of as an option that entitles the venture-capital management firm to 20% of the increase in value of the underlying fund. The exercise price of the option is the cost basis of the fund, and the life of the option equals the life of the fund.

Numerical analyses, based on a simple Black-Scholes model, suggest that the *ex ante* value of the venture-capital contract might be as high as 10% of the initial total capital of the fund. Thus the value of the contract on a \$100 million fund might be \$10 million at the time of signing. Table 5 presents estimates of the value of the contract (as a fraction of the original cost of the fund assets) based on different assumptions about the volatility of returns, current fund value, the carried interest percentage, and the life of the fund.

The fact that the management contract can be viewed as an option suggests the inherent agency problem: if one party has a contingent claim on value, there is an implicit incentive to increase risk [Myers (1986)]. The value of the contingent claim increases as risk increases. In the example above, the value of the contract would rise from approximately \$13.2 million to \$16 million if the assumed annual volatility were increased from 50% to 80%. In some situations, it will pay a venture capitalist to make negative-net-present-value investments because doing so increases the value of the option by more than the loss in value on his portion of the equity claim.

Partnership agreements respond in several ways to the possibility that the venture capitalist will take undue risks. Since the contract can be cancelled by the limited partners at any point in the life of the fund, the venture capitalist's incentive to incur such uncompensated risks is reduced. Although this solution helps resolve the agency problem from the limited partners' perspective, however, it can be abused. In one situation [Sahlman (1988c)], for example, a contract was cancelled by the sole limited partner after three years of a ten-year term. At the time of cancellation, the estimated value of the fund's underlying assets was close to the cost of those assets. The contract stipulated that the only payment due the venture-capital management company by the limited partner upon cancellation was the 20% share of estimated realized and unrealized gains on the portfolio. The limited partner was not contractually required to pay anything to the venture-capital management company for canceling the contract *per se*, even though from an option-valuation perspective the contract was clearly valuable. Most contracts, however, make cancellation more difficult than this (for example, by defining a narrow set of circumstances – such as fraud – under which the general partner can be fired).

Other mechanisms are also used to manage the perverse incentives of the contract. For example, the partnership agreement usually limits the amount

Table 5

Sensitivity of the present value of the carried interest of a venture-capital fund (as a fraction of original cost) to changes in volatility, current market value of fund assets, carried interest percentage, and life of the fund.

<i>Assumptions:</i>		<i>Results:</i>	
Total original capital of the fund (cost)	\$ 100,000,000	Estimated present value of carried interest 13,212,516	
Current market value of fund assets	\$ 100,000,000		
Profit participation % - Carried interest	20%		
Time to maturity - Economic life in years	7		
Risk-free interest rate	10.0%		
Volatility - Standard deviation of annual returns	50.0%	Estimated value of carried interest as a % of original capital (cost) 13.2%	

Volatility	Current market value of fund (millions)						
	\$70.00	\$80.00	\$90.00	\$100.00	\$110.00	\$120.00	\$130.00
10.0%	4.2%	6.1%	8.1%	10.1%	12.1%	14.1%	16.1%
20.0%	5.0%	6.7%	8.5%	10.4%	12.3%	14.2%	16.2%
30.0%	6.0%	7.7%	9.4%	11.2%	13.0%	14.9%	16.7%
40.0%	7.1%	8.7%	10.4%	12.2%	14.0%	15.8%	17.6%
50.0%	8.1%	9.8%	11.5%	13.2%	15.0%	16.8%	18.6%
60.0%	9.0%	10.7%	12.5%	14.2%	16.0%	17.8%	19.7%
70.0%	9.9%	11.6%	13.4%	15.2%	17.0%	18.8%	20.7%
80.0%	10.6%	12.4%	14.2%	16.0%	17.9%	19.7%	21.6%
90.0%	11.3%	13.1%	14.9%	16.8%	18.7%	20.5%	22.4%

Present value of the carried interest as a fraction of the original capital of the fund as a function of volatility and the current market value of the fund assets

Table 5 (continued)

Volatility	Present value of the carried interest as a fraction of the original capital of the fund as a function of volatility and the profit participation — Carried interest (%)					
	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%
10.0%	2.5%	5.0%	7.6%	10.1%	12.6%	15.1%
20.0%	2.6%	5.2%	7.8%	10.4%	13.0%	15.6%
30.0%	2.8%	5.6%	8.4%	11.2%	14.0%	16.8%
40.0%	3.0%	6.1%	9.1%	12.2%	15.2%	18.3%
50.0%	3.3%	6.6%	9.9%	13.2%	16.5%	19.8%
60.0%	3.6%	7.1%	10.7%	14.2%	17.8%	21.3%
70.0%	3.8%	7.6%	11.4%	15.2%	19.0%	22.8%
80.0%	4.0%	8.0%	12.0%	16.0%	20.0%	24.0%
90.0%	4.2%	8.4%	12.6%	16.8%	21.0%	25.2%

Volatility	Present value of the carried interest as a fraction of the original capital of the fund as a function of volatility and the time to maturity (life) of the fund					
	2.5	4.0	5.5	7.0	8.5	11.5
10.0%	4.5%	6.6%	8.5%	10.1%	11.5%	13.7%
20.0%	5.1%	7.1%	8.9%	10.4%	11.7%	13.8%
30.0%	6.0%	8.0%	9.7%	11.2%	12.4%	14.3%
40.0%	7.0%	9.1%	10.8%	12.2%	13.3%	15.1%
50.0%	7.9%	10.1%	11.8%	13.2%	14.3%	16.0%
60.0%	8.9%	11.2%	12.9%	14.2%	15.3%	16.8%
70.0%	9.9%	12.2%	13.9%	15.2%	16.2%	17.5%
80.0%	10.8%	13.2%	14.8%	16.0%	16.9%	18.1%
90.0%	11.6%	14.0%	15.7%	16.8%	17.6%	18.6%

of capital that can be invested in a single venture, which prevents excessive investments in high-risk ventures with inadequate rewards. As mentioned earlier, many contracts call for mandatory distributions of realized gains. If venture capitalists were allowed to invest realized gains in new ventures, they might increase the risk to the fund without a commensurate increase in return. Mandatory distributions also protect the principals against activities not consistent with the goals of the fund.

One final contractual response to the problem of risk is to force the general partner to invest more in the fund than the customary small amounts mentioned earlier. Then the venture capitalists bear a greater share of the costs of investing in ventures that perform poorly. On the other hand, the risk problem will be intensified if the venture capitalist is required to pay a fee up front for the right to manage the funds of the limited partners.<sup>9</sup> This has the effect of making the exercise price on the option higher. The same basic problem arises if there is a rate-of-return hurdle that has to be exceeded before the venture capitalist is entitled to a carried interest. In this case, the exercise price of the option rises each year, which means that an increase in risk has a significant payoff to the option holder.

One other area of concern in the compensation system used in the venture-capital organization relates to incentives to increase the amount of capital under management and/or to manage multiple pools of capital over time. The basic issues are discussed in the next section.

### *5.3. Operating costs*

Two kinds of operating costs deserve analysis when discussing venture capital, taxes, and continuing operating costs. With respect to taxes, partnership gains are not subject to partnership-level taxation. The limited and general partners report the realized gains and losses on their individual tax returns. Second, securities can be distributed without triggering immediate taxable income for the recipient. Thus a limited partner who receives stock in a portfolio company can defer recognizing the gain (or loss) until that security is sold. Third, the venture capitalists do not incur taxable income when they receive their carried interest in the partnership: they report taxable income only as gains and losses are realized on the underlying securities.

Finally, the partnership's compensation scheme can be structured to allocate losses to those who can make best use of them. This feature of partnerships has been used widely in structuring oil-and-gas partnerships [Wolfson (1985)] and research-and-development limited partnerships. Tax

<sup>9</sup>In a number of cases, venture-capital management firms have been purchased. Examples include Ampersand Ventures, TA Associates, and Brinson Partners.

incentives in venture capital are less important, however, because many of the investors in venture funds are tax-exempt. More importantly, there are no significant tax losses to be allocated because a fund's unrealized losses are not recognized by the IRS for tax purposes unless the underlying securities are transferred to another party in an arms-length transaction. Often partnerships do allocate these losses to the limited partners, but the economic impact is minimal.

With respect to operating costs, scale economies, scope economies, and learning-curve effects are often very significant to a venture-capital management company that manages one or more funds. Scale economies exist if the unit cost of production and distribution of a product or service declines as volume increases. In the venture-capital organization, production and distribution encompass raising capital, finding and structuring deals, monitoring the investments, and distributing the proceeds. Scope economies exist if unit costs decline if multiple products or services are produced simultaneously (for example, if more than one fund is managed at a time). Learning-curve effects exist if the unit cost of a process declines over time with accumulated volume.

With respect to scale economies, it seems likely that unit costs decline with the absolute size of the venture-capital pool under management because there are a number of fixed (or near-fixed) costs, including items in the overhead budget such as rent, information acquisition, accounting, and certain legal costs. Economies of scope are also likely because the cost of managing multiple pools of capital does not rise linearly with the number of such pools.

Finally, with respect to learning-curve effects, venture-capital firms become repositories of useful institutional knowledge. Venture capitalists and their support staffs benefit from learning-curve effects as they become adept in dealing with each other and with other resource suppliers, such as law firms, accounting firms, investment bankers, and management recruiting firms. They cultivate a deal flow based on networks of contacts and relationships. The venture-capital organization develops a reputation that has economic value. The ultimate effect is to make the firm more efficient as time passes and experience accumulates.

Compensation practices give evidence of scale and/or scope economies as well as experience effects. According to the Hay Management Consultants (1988) survey, the total compensation for the managing partner of a venture-capital fund with less than \$25 million in capital averages \$163,000. The comparable figure for a managing partner of a fund with more than \$200 million under management is \$581,000. The annual bonus, which is based on the operating profit of the management company rather than the investment performance of the fund, constitutes 28% of total compensation in the larger funds, compared with 17% in the small funds. These differences suggest that

venture capitalists have an incentive to increase the size of the firm. One driving factor in this regard is the fact that the percentage fee charged to manage a venture-capital fund does not appear to decline with the size of the fund [see *Venture Economics* (1987)].

There can also be incentives to create multiple funds over time, all managed by the same venture capitalists. Doing so accomplishes two goals. First, keeping the venture-capital management company in existence preserves the learning that has taken place. Second, managing multiple funds takes advantage of any scale or scope economies. From 1977 to 1988, new funds averaged less than one-half the size of follow-on funds (panel B, table 1).

Even though unit costs decline as the size of the venture-capital management firm (or number of funds under management) increases, the limited partners and general partners will not necessarily agree about the optimal size and structure of the firm. This is because the unit costs and risk-adjusted rates of return to the limited partners may be negatively correlated, and because the limited and general partners do not have equal stakes in all the income streams generated by the fund. There could easily be situations in which the venture capitalists find it more profitable to have a large firm, one effect of which is lower returns to the limited partners. This would be true if there were diseconomies of scale or scope in the investment-return-generating process.

The possibility that the interests of the general and limited partners will diverge over time is addressed directly by limiting the lifespan of the venture-capital partnership. If the venture capitalists make decisions that aren't in the best interests of the limited partners, they can be denied access to capital. Any learning, scale, or scope economies will then go to waste. The ability to withdraw funding support is the ultimate tool for aligning the interests of the agent and principal in this organizational form, and is reinforced by the existence of the scale or scope economies and learning-curve effects.

#### *5.4. The sorting problem*

The final component of this analysis of the economic relationship between the limited partners and the venture capitalists is an examination of how limited partners decide which venture capitalists to back. For obvious reasons, filtering out the 'good' from the 'bad' venture capitalists is extremely important. 'Good' venture capitalists have the skill and intention to generate high risk-adjusted rates of return for the limited partners. Actual rates of return will also depend, of course, on such factors as the capital markets, competition among venture capitalists, and the market for innovation.

Limited partners in venture-capital firms typically invest at least \$1 million in each fund. Before committing this amount of capital, the investors spend resources on due diligence. They read the offering memoranda prepared by the venture capitalists in accordance with SEC regulations, and they often check the venture capitalists' credentials. This investigation acts as a preliminary screen on potential investments.

The governance structure also helps potential investors distinguish between good venture capitalists and weak ones. The basic argument is simple: good venture capitalists are more likely than weak venture capitalists to accept a finite life for each new partnership and a compensation system heavily dependent on investment returns. By doing so, they agree explicitly to have their performance reviewed at least every few years: if they engage in opportunistic acts or are incompetent, they will be denied access to funds. In addition, most of their expected compensation comes from a share in the fund's profits. If they perform well, they will participate handsomely in the fund's success. They will also be rewarded by being able to raise additional capital and, most likely, benefit from the various economies characteristic of the business. If they are not confident of performing well, or if they intend to neglect the interests of the limited partners, they will probably not agree to the basic terms of the contract.<sup>10</sup>

### 5.5. *The overall incentives*

In sum, the relationship between the limited and general partners in a venture-capital fund is fraught with agency problems. The limited partners structure a contract that creates incentives for mutual gain, and they specifically forbid certain obvious acts of self-interest like buying stock in portfolio companies at prices less than those paid by the fund. The limited partners then expend resources to monitor the fund's progress, often through special committees. At the same time the venture capitalists agree to forego certain self-interested acts and to supply information to the limited partners. The venture capitalists willingly enter into an agreement with a finite life, exposing the contract to renewal. In effect, the limited partners stage the commitment of capital to the venture capitalists while preserving mechanisms to ensure that the profits will be distributed rather than kept inside the venture-capital fund. And the terms of the contract both communicate the

<sup>10</sup>This description of the incentives of the venture capitalists is drawn from the signaling literature [Spence (1973), Ross (1977), Leland and Pyle (1977), and Bhattacharya (1979)]. The implicit condition for the sorting process to work is that the short-term payoff (in present-value terms) to the venture capitalist must be less than the opportunity cost for a 'bad' venture capitalist. Note also that each limited partner spends time and resources researching venture capitalists seeking to raise funds, which helps guard against false signaling. From another perspective, accepting these terms may be viewed as a bonding commitment by the venture capitalist, who implicitly agrees not to divert money from the fund.

expectations of the limited partners to the venture capitalists, and filter out those who are unable or unwilling to meet those expectations.

The contracts and operating procedures that have evolved in the venture-capital industry address three issues simultaneously: sorting good from bad venture capitalists, minimizing the present value of agency costs, and minimizing the present value of operating costs. The same basic issues confront the venture capitalists when they invest in entrepreneurial ventures. In this case, the venture capitalists become the principals and the entrepreneurs the agents. Analogous contractual and operating responses to these issues are made by the venture-capital fund.

## **6. The venture-capital investment process**

Once a venture-capital fund is raised, the venture capitalists must identify investment opportunities, structure and execute deals with entrepreneurial teams, monitor investments, and ultimately achieve some return on their capital. For the purposes of this paper, I focus on structuring deals.

Just as venture-capital partnerships have many elements in common, the contracts between the venture capitalists and the companies they invest in are similar in many ways. The basic document that governs the relationship between the venture-capital firm and the venture is the stock-purchase agreement, which is described below.<sup>11</sup> The economic rationale for the terms and conditions of this document and other aspects of the venture-capital process are explored in section 7.

### *6.1. Amount and timing*

Each stock-purchase agreement fixes the amount and timing of the investment. Venture capitalists typically invest more than once during the life of a company, and the amount invested often increases with each round (see tables 3 and 4). They expect the capital invested at each point to be sufficient to take the company to the next stage of development, when it will require additional capital to make further progress.

<sup>11</sup>This account of stock-purchase agreements is drawn from a number of sources. First, I have gathered approximately 40 such agreements from a broad range of venture-capital partnerships. Venture capitalists tend to use the same deal structure in all of their deals so that knowing how one deal is structured sheds light on many investments made by the same fund. Some of these materials have formed the basis for case studies used at Harvard Business School, including Knights and Sahlman (1986a, 1986b, 1986c, 1986d), Sahlman (1983a, 1983b, 1984, 1985a, 1985b, 1985c, 1985d, 1985e, 1986a, 1986b, 1986c, 1986d, 1988c, 1989b), Sahlman and Knights (1986), Sahlman and Scherlis (1988), Sahlman and Soussou (1985a, 1985b), and Soussou and Sahlman (1986). See also Sahlman (1988). A broad survey of the characteristics of deals struck by venture-capital firms is included in Plummer (1987). Finally, a number of texts describe standard operating procedures in the industry, including Bartlett (1988) and Morris (1988a).

### *6.2. Form and terms of investment*

Many venture-capital investments are made as purchases of convertible preferred stock. Specific terms concern:

- (1) conversion price, which can vary according to the performance of the company;
- (2) liquidation preference, including a description of the events that trigger liquidation (for example, a merger or reorganization with a total value less than some predetermined amount);
- (3) dividend rate, payment terms, and voting rights (typically on an as-if-converted basis).

Typically, the convertible preferred stock does not pay a dividend on a current basis, but at the discretion of the board of directors. Some preferreds have provisions that call for accruing dividends but deferring the payment of cash. The liquidation preference amount is equal in most cases to the face amount of the convertible preferred issue and all accrued but unpaid dividends.

### *6.3. Puts and calls*

Agreements typically give the venture capitalists the right to put the security by calling for redemption of the preferred stock. Less frequently, contracts give portfolio-company management the right to call the security away from the venture capitalists at some point.

### *6.4. Registration rights*

Most agreements give the venture capitalists the right to register their shares at some point or points in the future. This enables the venture capitalists to demand registration at any two dates in the future, with the expenses of registration paid by the company. Venture capitalists also insist on piggyback registration rights that entitle them to register shares at the same time as the company, subject to limitations imposed by the SEC and the underwriters.

### *6.5. Go-along rights*

Many agreements specify that the venture capitalists can sell shares after conversion at the same time and on the same terms as the key employees.

#### *6.6. Preemptive rights and rights of first refusal*

Many agreements entitle the venture-capital investors to participate in new financings by buying newly issued shares from the company, often in proportion to their common-stock-equivalent holdings before the issuance of new equity-equivalent shares. The terms of such financing rounds are not typically negotiated in advance; they reflect the then-current conditions in the capital markets and the performance and prospects of the firm.

#### *6.7. Option pool*

Most agreements fix the number of shares outstanding and the size of the pool of shares that can be granted or sold to current and future employees. Provisions for modifying the option pool are also included in the stock-purchase agreement.

#### *6.8. Employment contracts*

Most agreements require that key employees execute employment contracts and agree to noncompete clauses. Such contracts usually specify compensation, benefits, and, most important, the conditions under which the contract can be terminated and the consequences of termination.

#### *6.9. Vesting schedules and buy-back provisions*

Employees of venture-capital-backed companies often accept modest cash salaries in return for equity ownership. Many agreements set explicit vesting schedules for management shares and also grant the company being financed the right to repurchase shares in the event of an employee's voluntary or involuntary departure. When shares are repurchased under these agreements, the price paid by the company to the departing entrepreneur is often based on book value, which may be below market value.

#### *6.10. Information rights*

Most agreements call for regular transmission of information, including financial statements and budgets, and permit the venture capitalists to inspect the company's financial accounts at will. Venture capitalists insist on timely access to such information. They typically receive detailed monthly financial statements and more frequent operating statements. They evaluate this information to anticipate problems and respond expeditiously when performance falls short.

### 6.11. Board structure

Most agreements call for venture capitalist representation on the company's board of directors [see Barry et al. (1990) for information on venture-capitalist board representation of companies going public]. Often, the agreement calls for other mutually acceptable people to be elected to the board. The venture capitalists typically receive no cash compensation for board duties; if any cash is received for board membership, it is paid into the partnership. Outside members recruited to join the board usually receive inexpensive common stock or warrants to acquire shares, and little or no cash compensation.

## 7. The relationship between the venture capitalists and the entrepreneurial ventures

Each year venture capitalists screen hundreds of investment proposals before deciding which ideas and teams to support. The success or failure of any given venture depends on the effort and skill of the people involved as well as on certain factors outside their control (for example, the economy), but the capabilities of the individuals involved are difficult to gauge up front.

Once investment decisions are made and deals consummated, it is difficult to monitor progress. The probability of failure is high (see fig. 1, which shows that 34.5% of the capital invested in the survey resulted in a loss). The venture capitalist and the entrepreneur are also likely to have different information. Even with the same information, they are likely to disagree on certain issues, including if and when to abandon a venture and how and when to cash in on investments.

Venture capitalists attack these problems in several ways. First, they structure their investments so they can keep firm control. The most important mechanism for controlling the venture is staging the infusion of capital. Second, they devise compensation schemes that provide venture managers with appropriate incentives. Third, they become actively involved in managing the companies they fund, in effect functioning as consultants. Finally, venture capitalists preserve mechanisms to make their investments liquid.

### 7.1. Staging the commitment of capital and other control mechanisms

Venture capitalists rarely, if ever, invest all the external capital that a company will require to accomplish its business plan: instead, they invest in companies at distinct stages in their development. As a result, each company begins life knowing that it has only enough capital to reach the next stage. By staging capital the venture capitalists preserve the right to abandon a project

whose prospects look dim. The right to abandon is essential because an entrepreneur will almost never stop investing in a failing project as long as others are providing capital.

Staging the capital also provides incentives to the entrepreneurial team. Capital is a scarce and expensive resource for individual ventures. Misuse of capital is very costly to venture capitalists but not necessarily to management. To encourage managers to conserve capital, venture-capital firms apply strong sanctions if it is misused. These sanctions ordinarily take two basic forms. First, increased capital requirements invariably dilute management's equity share at an increasingly punitive rate. (This was the case with Federal Express). Second, the staged investment process enables venture-capital firms to shut down operations completely. The credible threat to abandon a venture, even when the firm might be economically viable, is the key to the relationship between the entrepreneur and the venture capitalist [see also Stiglitz and Weiss (1983) for a similar argument in the banking industry].<sup>12</sup> By denying capital, the venture capitalist also signals other capital suppliers that the company in question is a bad investment risk.

Short of denying the company capital, venture capitalists can discipline wayward managers by firing or demoting them. Other elements of the stock-purchase agreement then come into play. For example, the company typically has the right to repurchase shares from departing managers, often at prices below market value (for example, at book value). The use of vesting schedules limits the number of shares employees are entitled to if they leave prematurely. Finally, noncompete clauses can impose strong penalties on those who leave, particularly if their human capital is closely linked to the industry in which the venture is active.

Entrepreneurs accept the staged capital process because they usually have great confidence in their own abilities to meet targets. They understand that if they meet those goals, they will end up owning a significantly larger share of the company than if they had insisted on receiving all of the capital up front. As discussed below, entrepreneurs also must make conscious choices about who provides capital and what value they can add in addition to capital.

Finally, whereas venture capitalists insist on retaining the option to abandon a particular venture, they also want to be able to invest more if the company requires and warrants additional capital. This option is preserved by insisting on rights of first refusal or pre-emptive rights.

<sup>12</sup>The seemingly irrational act of shutting down an economically viable entity is rational when viewed from the perspective of the venture capitalist confronted with allocating time and capital among various projects. Although the individual company may be economically viable, the return on time and capital to the individual venture capitalist is less than the opportunity cost, which is why the venture is terminated.

### 7.2. *The compensation scheme*

Entrepreneurs who accept venture capital typically take smaller cash salaries than they could earn in the labor market. The shortfall in current income is offset by stock ownership in the ventures they start. Common stock and any subsequent stock options received will not pay off, however, unless the company creates value and affords an opportunity to convert illiquid holdings to cash. In this regard, the interests of the venture-capital investor and entrepreneur are aligned.

This compensation system penalizes poor performance by an employee. If the employee is terminated, all unvested shares or options are returned to the company. In almost all cases, the company retains the right to repurchase shares from the employee at predetermined prices.

Without sanctions, entrepreneurs might sometimes have an incentive to increase risk without an adequate increase in return. An entrepreneur's compensation package can be viewed as a contingent claim, whose value increases with volatility. The sanctions, combined with the venture capitalists' active role in the management of the venture, helps to mitigate the incentive to increase risk.

### 7.3. *Active involvement of venture capitalists in portfolio companies*

No contract between an entrepreneur and venture capitalist can anticipate every possible disagreement or conflict. Partly for this reason, the venture capitalist typically plays a role in the operation of the company.

Venture capitalists sit on boards of directors, help recruit and compensate key individuals, work with suppliers and customers, help establish tactics and strategy, play a major role in raising capital, and help structure transactions such as mergers and acquisitions. They often assume more direct control by changing management and are sometimes willing to take over day-to-day operations themselves. All of these activities are designed to increase the likelihood of success and improve return on investment: they also protect the interests of the venture capitalist and ameliorate the information asymmetry.

According to one survey [Gorman and Sahlman (1989)], lead venture investors visit each portfolio company an average of 19 times per year, and spend 100 hours in direct contact (on site or by phone) with the company. Since each venture capitalist in the survey is responsible for almost nine investments and sits on five boards of directors, the allocation of time to each portfolio company is considerable [see also MacMillan et al. (1989) and Timmons (1987)]. In addition to devoting time to companies already in the portfolio, a venture capitalist must allocate time to raising capital for the venture-capital firm, finding new deals, managing the venture-capital firm, and meeting with various resource suppliers, such as bankers and accountants.

Successful venture capitalists bring instant credibility associated with their capital, their contacts, and their range of projects. A venture-capital-backed company can often gain access to more capital from the fund itself, and the venture capitalist's contacts in the financial community can make it easier to raise new capital from other sources. In addition, resource suppliers form implicit and explicit relationships with venture capitalists in an attempt to piggyback on the data-gathering and monitoring process [see the HBS cases Sahlman (1986d, 1985e) and Knights and Sahlman (1986b)]. Venture capitalists have incentives not to exploit a resource supplier on any individual deal, since the repercussions can affect other deals. At the same time, the resource suppliers have incentives to preserve their relationship with venture-capital firms by avoiding opportunistic behavior on individual deals.

Finally, venture capitalists maintain close ties to investment bankers who can assist companies going public or merging with other companies [Barry et al. (1990)]. Venture capitalists also often have contacts in large companies to which entrepreneurial ventures might be sold.

#### *7.4. Mechanisms related to liquidity*

Both venture capitalists and entrepreneurs want eventually to convert their illiquid holdings into cash or cash equivalents, but they can disagree on the timing or the method. The standard stock-purchase agreement has a number of features that control the process by which the venture capitalists and the entrepreneurs achieve their goals. Chief among these is the decision to invest in the form of a convertible preferred.

Using preferred stock with a dividend creates a mechanism for deriving some income from an investment if the company is only marginally successful. Most deals defer payment of the dividend until the board allows it, but because venture capitalists often control the board, they can make the decision. Since the dividends are not tax-deductible, the burden of paying dividends is often onerous, which often leads the entrepreneurs to try to buy out the preferred.

Many agreements also give the venture capitalists the right to force redemption of a preferred stock or the right to put the stock to the company, to achieve liquidity. This option may be exercised if the company is financially viable but too small to go public. Some contracts give entrepreneurs the right to sell stock back to the venture capitalist, as might happen if the venture capitalists terminate the entrepreneur's employment without cause.

Finally, venture capitalists are concerned about situations where the entrepreneurs have an opportunity to sell their shares before the venture capitalists sell theirs. Therefore, the contract typically specifies that the venture capitalists can sell their shares at the same time and on the same terms as the entrepreneur.

### *7.5. Additional implications of using convertible preferred stock*

Using a convertible preferred also provides flexibility in setting the conversion terms. The venture capitalist often can base the conversion ratio for the preferred stock on the company's performance. If the company does well, the conversion price might be higher, with lower dilution for the management team. A similar tool is the 'ratchet', which ensures that the effective price per share paid by the venture capitalist is at least as low as any price paid in the future.

Flexible conversion terms alter the risk-and-reward-sharing scheme. One intent is to discourage entrepreneurs from overstating their projections to increase the initial valuation, and to encourage them to build value. Incorporating these provisions into contracts also serves as a negotiating tool to account for differences of opinion about future prospects.<sup>13</sup>

One final consequence of having preferred stock in the capital structure relates to taxation: using a preferred creates two kinds of securities, one with superior rights. A security that is senior in rights to common stock in effect lowers the economic value of the common. Members of the management team can therefore buy the common stock at low prices without incurring taxable income. Common-stock value is frequently set at 10% of the conversion price of the preferred. If the common stock had the same rights as the preferred, the managers would have to report taxable income on the difference between the price they paid and the price paid by the venture capitalists. There is no immediate tax disadvantage to using preferred stock, however, because the dividend is deferred and many of the ultimate recipients are tax exempt.

### *7.6. Using the contract to sort out entrepreneurs*

A key feature of the contracts and operating procedures is that risk is shifted from the venture capitalists to the entrepreneur. The entrepreneur's response to these terms enables the venture capitalist to make informed evaluations and judgments. It would be foolish for entrepreneurs to accept such contract terms if they were not truly confident of their own abilities and deeply committed to the venture.

For example, by substituting stock ownership for higher current income, the contract shifts the risks of poor performance to the entrepreneur. Similarly, the convertible preferred security shifts some of the costs of poor performance to the entrepreneurial team. Given the liquidation preference

<sup>13</sup>See Knights and Sahlman (1986b) for a description of a conditional conversion price. In that situation, the venture capitalists agreed to increase the conversion price (from \$0.45 to \$0.67) if the company met its business-plan sales-and-profit targets.

Table 6<sup>a</sup>

Stage	Discount rate range (%)
Startup	50 to 70
First stage	40 to 60
Second stage	35 to 50
Third stage	35 to 50
Fourth stage	30 to 40
IPO	25 to 35

<sup>a</sup>Source: Plummer (1987, p. I-18).

embodied in the security, the venture capitalists will be entitled to a larger share of total value if total value is low.

Moreover, the entrepreneurs typically hold undiversified portfolios. Much of their wealth is invested in the securities of the company they manage. The entrepreneur's willingness to bear diversifiable risk also conveys useful information to the venture capitalists.

### 7.7. Evaluation techniques

The methods venture capitalists use to judge the prospects of individual projects are also used to sort out entrepreneurs. In screening potential ventures, venture capitalists use certain standard evaluation techniques, including this simple method for determining the value of the companies<sup>14</sup>:

- (a) A forecast is made reflecting successful attainment of achievable long-term goals.
- (b) The venture capitalist estimates a possible terminal value that would obtain if the investment in the company were harvested at that point.
- (c) The terminal value is converted to a present value by applying a high discount rate, usually between 40% and 60%.
- (d) The proportion of company stock to be owned by the venture-capital firm is then calculated by dividing the required investment by the total present value.

The most important element of this process is determining the discount rate. According to Plummer (1987), the discount rates used by venture capitalists vary by the company's stage of development. The results of that study are summarized in table 6 (the stages are defined in table 2):

These discount rates seem high compared with other rates of return in the economy [for example, the returns on publicly traded stocks and bonds as reported in Ibbotson (1988)] or even the actual returns reported by profes-

<sup>14</sup>See Plummer (1987), Morris (1988b), and Sahlman and Scherlis (1988) for more detailed descriptions of the method.

sional venture-capital funds [Venture Economics (1985, 1988c)]. In theory the required rate of return on an entrepreneurial investment reflects the risk-free interest rates in the economy, the systematic risk of the particular asset and the market risk premium, the liquidity of the asset,<sup>15</sup> and compensation for the value added by the supplier of capital (including favored access to other resources). This last adjustment is required to compensate venture capitalists for monitoring the company and playing an active role in management, while leaving the limited partner with the appropriate rate of return after taking into account the venture-capital fund's management fees and profit participation.

In practice, the use of high discount rates also reflects a well-known bias in financial projections made by entrepreneurs. Because few companies ever do as well as their founders believe they will, the numerator used in the calculation described above is typically higher than the expected value, though it may be an unbiased estimate conditional on success. To adjust for the bias, projections can be lowered or a higher discount rate can be used. The latter mechanism seems to dominate in the venture-capital industry [Keeley (1986)].

The use of high discount rates, however, means that few projects are feasible. Suppose a venture requires a \$2 million capital infusion (the average invested in recent years in each venture) and that in five years the company will be worth \$12 million. If the required rate of return is 50% per year, the \$2 million investment must be worth approximately \$15.2 million by the end of the fifth year, an amount exceeding the likely value of the entire company. Accordingly, venture capitalists are reluctant to back any company that cannot reasonably be expected to generate at least \$25 to \$50 million in total value in five years [MacMillan et al. (1985)]. The entrepreneurs' willingness to accept high discount rates indicates belief in the prospects of the company.

The use of high discount rates in venture-capital investing seems to fly in the face of conventional wisdom. One often reads that high discount rates discourage investments in highly uncertain, long-term projects [Hayes and Garvin (1982)], but in venture capital high discount rates are part of a more complex process of investing and managing the agency problem.

### *7.8. Adverse selection*

Using very high discount rates might have the unintended effect of driving the most competent entrepreneurs to seek alternative sources of capital, leaving only those with no other financing options.

<sup>15</sup> Venture-capital investments are illiquid for a number of reasons, including the existence of information asymmetries and restrictions imposed by regulatory authorities on transfers of unregistered securities.

The adverse-selection problem is a difficult one in venture capital. Venture capitalists argue that by playing a positive role in the venture, they can increase total value by enough to offset the high cost of the capital they provide. To the extent that venture capitalists make good on this claim, the adverse-selection issue is effectively mitigated. In addition, the due diligence conducted before an investment is made is intended partly to make sure the entrepreneurs are qualified.

Although it seems that venture capitalists retain much of the power in the relationship with entrepreneurial ventures, there are checks and balances in the system. Venture capitalists who abuse their power will find it hard to attract the best entrepreneurs, who have the option of approaching other venture capitalists or sources other than venture capital. In this regard, the decision to accept money from a venture capitalist can be seen as a conscious present-value-maximizing choice by the entrepreneur.

#### *7.9. Comparing the venture-capital fund – limited partner and venture capitalist – entrepreneur relationships*

The relationship between the limited partners and the venture capitalists shares several elements with that between the venture capitalists and the entrepreneurs. First, each relationship entails staging the commitment of capital and preserving the option to abandon. The limited partners insist on a limited life for the fund, and the venture capitalists invest in stages related to the attainment of specific goals by the venture.

The compensation schemes are similar as well. The venture capitalists have strong incentives to create value because they share in the profits of the fund. The entrepreneurs receive a significant share of the value they help create (see table 4 for evidence about the share held by founders).

Also, in both cases, there are defined mechanisms in place to achieve liquidity. The limited partners insist on distributions of investment returns. The venture capitalists build into their stock-purchase agreements a number of mechanisms for achieving liquidity, such as the right to demand redemption of their convertible preferred stock.

Finally, the venture capitalist and entrepreneur alike face serious consequences if they fail. Entrepreneurs will be denied access to capital, their equity participation will be retracted, and their reputations damaged. Similarly, venture capitalists will find capital more difficult and costly to raise and their reputations will suffer as well, though their penalties are modest in comparison with those confronting entrepreneurs. In both cases, however, the multiperiod nature of the game creates strong incentives to perform well and to forego opportunistic behavior.

These common elements reinforce each other. For example, because venture capitalists capture 20% of their funds' profits, they structure incen-

tives for the entrepreneurs that reward value creation. Similarly, because venture capitalists are legally required to liquidate the fund in ten years or so, they build mechanisms into their contracts with the entrepreneurs to make that feasible.

## 8. Other organizational forms

The venture-capital organization has evolved in response to the demanding investment environment in which new businesses are built. But, sorting, agency, and transactions cost problems are present in other settings as well.

A venture-capital firm performs economic functions similar to those of a corporation. Both raise capital from outsiders and invest in projects on behalf of the outside investors. The outside investors in both cases create a governance structure for monitoring the decisions made by the agents. When investments are made in individual projects, the managers within the venture-capital fund or within the corporation must monitor performance. Ultimately, the outside investors insist that they receive some return on their capital.

A venture-capital firm is also similar to a leveraged buyout fund. Each organization raises capital to invest in individual projects. In the venture-capital example, the projects tend to be early-stage ventures: in the leveraged-buyout example, the projects are more mature businesses with substantial debt capacity. The following sections compare the venture-capital organization, the corporate organization, and the leveraged-buyout-fund organization.

### 8.1. *Capital budgeting*

Corporate managers confront issues similar to those facing venture capitalists, yet their responses are very different. For example, consider an opportunity to invest in a new computer technology that could be funded inside a large company or as a separate business by venture capitalists.

If the project is funded within a corporation, the project initiation and management team probably will not receive a significant share of the value it creates. More likely, if the project is successful, their rank in the company and current compensation will increase [see Baker (1987)]. Team members often own or receive some stock options in the company, but the value of these options does not necessarily reflect the success of the project they undertook.<sup>16</sup> If the project is not successful, on the other hand, team members probably will find other tasks within the corporation, provided they

<sup>16</sup>See Jensen and Murphy (1990) for information on the relationship between compensation and value changes for American managers.

were not guilty of gross incompetence or malfeasance. Though the pecuniary rewards for success are modest, so too are the consequences of failure.

During development of the technology, the in-house team receives assistance from other members of company management, who monitor performance and try to increase the chances that the project will succeed. The specific team generally does not need to compensate these advisors. To the extent that the project is charged with the costs of monitoring, the costs reflect standard overhead-absorption charges rather than the amount of assistance provided or its perceived value, and the compensation of the advisors will probably not be dramatically affected by the project's outcome.

In contrast, if the project is financed by a venture-capital fund, the initiators and key members of the team own part of the venture, and they probably receive lower salaries than an in-house management team. If the project succeeds, management participates directly in the value it helped create. The team is not broken up as often occurs in large companies when individual managers in a team are promoted or transferred after a successful venture.<sup>17</sup> If the project fails, management suffers the consequences directly. If the project falters in midstream, entrepreneurial managers stand a good chance of being fired, often losing equity shares because of the vesting schedules used by venture capitalists. Further, the compensation of the venture capitalists (and the other outside directors) mirrors that of the entrepreneurial team: they will benefit only if the company succeeds, and they will suffer the consequences if the venture fails.

There is often one other substantive difference between the two approaches. In the corporate setting, projects are often funded all at once. In the venture-capital situation, the capital is meted out according to perceived performance at each successive project stage. Although in either situation managers will not purposefully pour good money after bad, team managers inside the company feel more secure about access to future capital than managers do in the venture-capital scenario.

If the typical American corporation were organized like a venture-capital fund, its discrete business units would be separated into individual business entities, equity shares in those entities would be awarded to their managers, capital would be meted out according to the attainment of specific business goals, a separate board of directors would be constituted for each business entity, and each board would be compensated according to the value created in each unit. The board would have the right to demand that funds be returned from the operating units to the holding company, and the ultimate

<sup>17</sup>The venture capitalists ultimately do leave the team, often when the company goes public, and always when the company is sold. In these instances, however, new directors are recruited who bring skills and resources appropriate to the issues confronting the company as it matures. Also, in many instances (for example, Teradyne, Thermo Electron, New England Business Services, Apple Computer), the venture capitalists remain on the board long after the limited partners have received distributions of shares in the company.

owners of the holding company would also have the right to demand distribution of the rewards of investing (for example, by imposing a finite life on the organization). In contrast to a traditional corporation, the new organization would be structured as a limited partnership, which would eliminate the possibility of adverse tax consequences in distributing the rewards of investing to the ultimate owners. In effect, the entire incentive system for directors and unit managers would be radically altered, as would the process of allocating capital. This model is similar to the leveraged-buyout fund, described in the following section.

### *8.2. Leveraged-buyout funds*

Separation of ownership and management has become a pressing problem in American business [Jensen and Ruback (1983), Jensen (1986, 1988)]. Evidence from the capital markets suggests that corporate managers do not always make value-maximizing decisions. One response to this problem has been the leveraged buyout (LBO). In an LBO, a company or business unit is acquired by a group of managers and financiers who end up owning the equity in the new organization. Most of the capital required to finance the acquisition is raised as debt rather than equity.

The reallocation of equity to management and the imposition of heavy debt burdens (interest and amortization) can be interpreted as a direct response to the agency problems inherent in corporations [Jensen (1989)]. After an LBO, managers have greater incentives to create value than they did when they had little or no equity stake in the outcome. Because of the substantial debt burdens, there is little or no discretionary cash flow that can be dissipated on negative-net-present-value investments, including perquisites.

In LBO organizations the relationships among the company, its management, and financiers are similar to the deal struck between venture capitalists and management teams in entrepreneurial ventures. The compensation scheme is oriented toward equity, whose value depends on the efforts and skills of the managers involved. There are severe penalties for underperformance: for example, managers' equity shares are often vested over time so that, if they are fired before full vesting has occurred, they lose the unvested portion of their claim. The debt used in LBOs is similar in function to the staged-capital-commitment process used in venture-capital deals; in neither is there much discretionary cash flow. The critical characteristic of the debt is really the contractual right to take control of the project by denying access to new funds or changing the terms of that access if the company's performance falters.<sup>18</sup>

<sup>18</sup>See Hart and Moore (1989) for a discussion of the nature of control in a firm and the somewhat arbitrary distinction between debt and equity.

Venture-capital funds and LBO funds are also similar in structure; indeed, many venture-capital firms also invest in leveraged buyouts. LBO funds are typically organized as private limited partnerships with the LBO fund managers acting as general partners: each partnership has a finite life, typically ten years. These funds raise capital from larger financial institutions such as pension funds and endowments, and they invest in diversified portfolios of companies. LBO fund managers also raise multiple funds over time; as investment activities wind down in one fund, a new one is raised, often from the same investors. LBO fund managers are active in the operation of the companies in which they invest, typically assuming control of the board of directors, but they are generally less likely than venture capitalists to assume operational control. They bring a great deal of process knowledge to bear, particularly in the area of financing, and they have close contacts with financial institutions and investment bankers. Their compensation is highly sensitive to value creation; like general partners in venture-capital deals, general partners of LBO funds typically receive a 20% share of the value created in addition to a periodic management fee. Most importantly, LBO fund managers are skilled and active monitors of the decisions being made by the company managers. They are the antithesis of the passive institutional investors who have come to dominate ownership of American companies.

Both the venture-capital fund and the LBO fund invest capital on behalf of institutions that could conceivably invest directly rather than through intermediaries. The LBO-fund model is interesting because the same institutions that invest in publicly traded residual claims also choose to participate through the LBO limited partnership in the new structure. Investing through the LBO fund addresses some of the inherent agency problems in publicly traded securities while also minimizing the present value of tax burdens.

There are also some significant differences between the venture-capital model and the leveraged-buyout firm. First, leveraged buyouts are typically restricted to companies that have modest growth rates and stable cash flows, firms in which management would otherwise have significant control over discretionary cash flows. After the LBO, management has an incentive to use its cash flow to pay down debt, thus increasing the value of its equity. In the traditional venture-capital model, there is little discretionary cash flow to begin with. Value is created by building the company to gain access to more resources, which in turn facilitates more growth. A final distinction to be drawn is that leveraged-buyout funds often charge up-front investment banking fees and continuing management fees to the companies in which they invest: venture capitalists rarely if ever charge fees to portfolio companies.

## **9. Conclusions**

The venture-capital industry is a productive place to study organizational responses to agency and other problems. The environment is characterized

by substantial uncertainty about payoffs on individual investments and a high degree of information asymmetry between principals and agents. To cope with the challenges posed by such an environment, certain standard operating procedures and contracts have evolved, including staging the commitment of capital, basing compensation on value created, and preserving mechanisms to force agents to distribute capital and profits. These procedures and contracts help sort out the skills and intentions of the participants while simultaneously addressing cost and taxation issues.

The venture-capital organizational form may be applicable in other settings, particularly corporate and project governance. At the corporate level, adopting some aspects of the venture-capital organization, such as the compensation system and the finite-life form of organization, might solve some of the problems that lead to leveraged-buyout transactions in the first place. Then the goals of shareholders, monitors, and managers would be better aligned [see Sahlman (1990) for a description of the specific issue of compensating corporate boards of directors].

At the project level, there are also important insights from studying the organization of venture-capital firms. For example, establishing project boards of directors, with skills and resources specifically tailored to the project, seems to make sense. Also, implementing value-sensitive compensation systems and staging the commitment of capital has potential advantages, particularly for projects designed to exploit new business opportunities.

Much research remains to be done on the venture-capital organization. Though the economic resources under management are modest, the model seems to have been effective. Understanding why it works is in the interests of academics and practitioners alike.

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